

for EABA™

Fires of Heaven™

adventure and intrigue among the united worlds



BTRC

patrick sweeney

Fires of Heaven™ v1.0

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▼ **AUTHOR'S NOTE** - I originally wrote **Fires of Heaven** for another game publisher, but the project turned into such a mammoth undertaking that, by the time I'd finally completed it, the company had changed hands and it no longer fit into the plans of the new owners.

Fortunately, Greg Porter, whom I'd recruited to design the starship creation system for the game, offered to give **Fires of Heaven** a new home, with a new ruleset. I'm eager to see what you think of it.

Most space opera games feature sprawling, ancient galactic empires or federations of hundreds of alien races, with all sorts of hyper-advanced technologies. And while there's nothing wrong with such universes, I had something different in mind for **Fires of Heaven** – an interstellar civilization with enough size to provide plenty of adventure, yet not so vast the heroes will never see more than a tiny fraction of it. A young, expanding union of worlds with plenty of room for heroes to explore new worlds, make first contact with unknown alien races, and play key roles in the unfolding story if desired. I also wanted to keep technological and societal advances as plausible as possible, extrapolating from the modern-day save for nods to two science fiction mainstays – faster than light travel and artificial gravity. Finally, I set myself the challenge of basing the systems off current astronomical data on nearby stars and extrasolar worlds.

It's been a very long road to publication for **Fires of Heaven**. I hope you think it's been worth the wait.

- Patrick Sweeney



INTRODUCTION

Such is the life that leads to heaven, and to the company of those who, having finished their lives in the world, are now freed from their bodies and dwell in that region you gaze upon, the Milky Way. As he said this, he pointed to a circle of light, flashing brilliantly among all the other fires of heaven. As I looked around from my vantage point in every direction, the whole view was complete and beautiful. I saw stars never seen from the earth, larger than anyone has ever imagined.

Cicero, *The Dream of Scipio*

▼ **INTRODUCTION** - *Out there.* It's a powerful concept. The itch to find out what lies beyond the horizon has inspired most of the great adventures and stories in history.

Now, Earth stands on the verge of a bold new frontier - exploration of space. Like every frontier before, it has excited the imagination of creative thinkers who have envisioned all kinds of people, places, and things awaiting humanity in the stars.

Science fiction presents a virtually inexhaustible well of ideas about possible futures, from exciting tales of galaxies far, far away to parables about the day after tomorrow. Some of the best science fiction ties innovative ideas to scientific fact, basing technology, society, and science on logical extrapolations from modern-day Earth to present a fantastic yet believable world. Obvious astronomical errors, impossible physics, and unlikely aliens don't necessarily ruin a rip-roaring space opera tale, but each step away from realism makes it just a bit more difficult for the reader to suspend disbelief and enjoy the story.

Besides, there's something inherently challenging in remaining reasonably true to scientific fact while still creating an intriguing and colorful futuristic setting.

But science fiction isn't just technobabble, scientific accuracy, and theoretical flights of fancy. The best science fiction conveys a sense of wonder - unmistakable awe at the infinite possibilities that await humanity in the vastness of space.

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And for all its starships, techno-gadgets, aliens, and other accouterments, science fiction is, at heart, about humanity. *About us.*

In fearful times, science fiction reassures us that we have a future, a grand and glorious one; a shared destiny in which the stars are ours and they belong to every one of us. While it can also reflect our darkest fears, in its purest form science fiction distills our brightest hopes.

In this spirit comes **Fires of Heaven**, a science fiction roleplaying setting filled with the joy, wonder, and endless potential of the great adventures ahead.

We have always looked to the stars - for inspiration, for guidance, for a glimpse at destiny.

We are looking still.

▼ **HOW TO USE THIS BOOK** - **Fires of Heaven** is a campaign book providing all the information necessary to use **EABA** for a science fiction role playing game set in the United Worlds of the 23rd century. This book explains how to use those rules to create adventurers, run combats, build starships, and so on in the science fiction genre. It also provides a comprehensive overview of a science fiction campaign setting. This book is *not* a stand-alone product; to use it you must also have the **EABA** roleplaying rules.

If you have never used EABA before - If you have never played in any **EABA** gameworld, such as **Ythrek**, then this book is *not* the place to start. **Fires of Heaven** explains how to use the **EABA** rules, but it doesn't actually *contain* those rules. Familiarize yourself with the **EABA** rules, then come back and use **Fires of Heaven** to build a science fiction campaign.

If you have used EABA before - If you have used **EABA**, then you already know how the rules work. **Fires of Heaven** just describes how to use those rules in the science fiction genre. **Fires of Heaven** is *not* an exhaustive look at the entire science fiction genre. Instead, it is carefully tailored to a specific, strongly detailed setting. The rules, worlds, extras, gear, aliens, starships, and other elements are all designed for the United Worlds federation of the 23rd century. For example, there are no rules for transporters because teleportation does not exist in this setting. Similarly, some of the rules are designed for this heroic setting and may be less realistic than is *possible* with **EABA**, but they suit *this* gameworld just fine.

▼ **FIRES OF HEAVEN IN A NEW CAMPAIGN** - **Fires of Heaven** provides a complete foundation for a new campaign. The gamemaster and players should jointly define the style of game desired; for example, a team of freelance explorers on the far frontier. The gamemaster should then detail the star system where play will initially take place and prepare an adventure or two. The players can create some adventurers, and a new campaign begins.

This book can also be used as a resource to stock a gamemaster's homemade campaign universe with extras, aliens, weapons, equipment, robots, starships, and worlds.

▼ **FIRES OF HEAVEN IN EXISTING CAMPAIGNS** - As in a new campaign, gamemasters can use **Fires of Heaven** as a resource to round out an existing science fiction campaign with new extras, starships, aliens, worlds, and other elements.

In a setting of thousands of star systems, the compact confederation of worlds described in this book could be used as a pocket empire of humanity - perhaps just emerging from a long dark age of technological stagnation following a centuries-old collapse.

▼ **FIRES OF HEAVEN IN ANOTHER GENRE** - With a little tinkering and inventive thinking **Fires of Heaven** can also be of use to gamemasters and players outside the science fiction genre.

Superheroes - Adventures in space and alien encounters are staples of the comic-book superhero genre. **EABA** gamemasters can easily use the stars, worlds, and aliens described herein for these kinds of adventures. This book also contains countless high-tech gadgets, from laser guns to starships, that can be used in an **EABA** campaign. Finally, the complete United Worlds setting could be utilized for a time-travel adventure that pitches superheroes into the distant future.

Cyberpunk - An **EABA** campaign of corporate intrigue, data-thieves, cyberware, and high tech can easily be run within the **Fires of Heaven** setting. The advanced core worlds, home to numerous sprawling cities and mega-corporations, are an excellent place for far-future cyberpunk gaming.

Gamemasters seeking a more traditional, near-future cyberpunk setting can adapt some of the high-tech gear, weapons, armor, cybernetics, and so on to a slightly less distant future.

Fantasy - Otherworldly lifeforms detailed in **Fires of Heaven** can just as easily serve as fantastic plants and creatures from a fantasy world. Likewise, the alien civilizations in **Fires of Heaven** can be turned into non-human races for a fantasy setting.

A bizarre twist might be to combine the science fiction and fantasy genres in a medieval world of wizards, knights, and dragons suddenly invaded by laser-toting aliens in advanced starships. Magic might face technology in the ultimate battle for the destiny of a world.

Horror - Alien lifeforms and intelligent extra-terrestrial beings are part of many horror settings, and creatures borrowed from **Fires of Heaven** can play these roles, or perhaps be recast as minions of evil or extra-dimensional invaders. Some advanced weaponry and other gear outlined in this book could be used to equip an ultra-secret team of government operatives - either to fight the insidious evil at work in the world or as one of its tools.

Modern-Day - As in a horror setting, the aliens and equipment from **Fires of Heaven** could be used in a modern campaign based on an alien invasion, whether overt or covert. A few of the high-tech gadgets in this book are based on modern innovations or proposals. Railguns and lasers, for example, have shown up in numerous films set in the modern day, particularly action or espionage stories. They could just as easily show up in a modern adventure, perhaps as stolen prototypes.

The corporations described here would also be useful in a modern campaign - simply change the histories and product lists to reflect modern times.

Pulp - While the pulp adventure era might be best remembered for stories of gangsters, daring explorers, and foreign saboteurs, it also produced the thrilling tales of **Flash Gordon**, **Buck Rogers**, and **John Carter, Warlord of Mars**, to name but a few. With a little work, a gamemaster could retune the **Fires of Heaven** setting into a pulp-era campaign of finned rocketships, beautiful alien princesses, and outer space derring-do.

Wild West - Although **Fires of Heaven** might not see much regular use in a western campaign, a trend toward more bizarre Wild West tales featuring the undead and other oddities could pave the way for an alien encounter or high-tech gadget. The campaign could also have a "western" theme. The short-lived TV series **Firefly** was effectively a Reconstruction-era space western. Plus, the life stories of some extras detailed here could be modified to even this setting with some creative transposition.

▼ **THE CAMPAIGN SETTING** - The focus of **Fires of Heaven** is the United Worlds setting of the 23rd century. The book provides a comprehensive overview of the history, worlds, corporations, alien races, and other elements of the campaign universe. **Fires of Heaven** is a *thick* book. It is not so much a space opera setting as it is a space opera encyclopedia. In addition to the gameworld, it has a lot of information on a lot of subjects, probably more than you will actually need. At first glance, it may seem *too* complex, *too* much information. But, you are not *supposed* to take it all in at once. Go through the contents and look for subjects that interest you, take it in a bite at a time...

▼ **THE UNITED WORLDS** - The United Worlds is a federation of semi-independent human colony worlds and two extraterrestrial races. Spanning fourteen star systems, the federation has made contact with five alien civilizations.

Government - The United Worlds government regulates interplanetary commerce, handles diplomatic relations with alien civilizations, controls the interstellar military, administers pioneer colonies, and guarantees the basic civil rights of all citizens.

Planetary governments (including those of Earth's nations) are somewhat autonomous, within restrictions laid down by interstellar law. Variants on democratic forms of government predominate, but constitutional monarchies and other less common styles of government also exist.

The United Worlds Assembly gives each of the independent worlds a voice in governing the federation, and the Assembly elects its own president. The federal government also contains countless ministries, divisions, and agencies that put into practice the laws laid down by the Assembly.

Star Systems - United Worlds authority extends to 14 star systems radiating outward from Sol. Systems closest to Sol, known as core systems, contain the older, more established colonies, many of which have earned independence. Core system worlds are well populated, with robust economies and easy access to advanced technology. Society on these worlds tends to be staid, at least on the surface, with tighter laws and more restrictions on personal weaponry, but a more cosmopolitan attitude towards lifestyles and greater guarantees on civil liberties. Core systems are bustling centers of government, military, corporate, political, scientific, and cultural activity in the United Worlds. And as with any other major population centers, some core system worlds are hotbeds of corporate skullduggery, organized crime, and espionage.

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Frontier systems, found farther out from Sol, are rough-and-tumble places with danger lurking around every corner. Most of these are pioneer colonies, or are still being explored, and are under the authority of the federal Colonial Affairs Ministry. Colonists are certainly aware of high technology, but don't have a lot of access to it on worlds where the industrial base has not yet developed to manufacture sophisticated goods, and limited personal wealth prevents large scale importation of high-tech products. Laws are less strict and harder to enforce, and on some colony worlds nearly everyone carries weapons for protection against hostile native life-forms (and other colonists). Pirates, Vorn incursions, and the unknown itself are constant threats.

Science and Technology - Technology has made tremendous leaps in the 23rd century, even if it has fallen short of some of the wilder predictions of 20th-century futurists. Most commonly available tech in the core systems is Early Post-Atomic Era, and the very first Post-Atomic Era items are being built for certain military technologies, with limited medical and computer breakthroughs also making an appearance in the core systems.

Starships are commonplace, if expensive - using the reality-bending Rozhkov Drive to instantaneously traverse the vast distances between stars. Robots are a part of everyday life, handling simple tasks on their own or assisting with more complex operations. Powerful, compact computers, some outfitted with virtual reality capabilities, are the norm.

The field of medicine has seen similar advances. Regeneration tanks can heal most injuries quickly and without risk of infection, while cybernetic limbs and sensory organs are available in cases of more serious wounds. Antigeria treatments greatly extend youthfulness and lifespans, although the high cost keeps the process out of reach of most United Worlds citizens.

Human cloning and gene engineering is highly advanced, but lingering public revulsion toward some biotechnology has largely relegated these procedures to rogues operating outside the law.

Psionics have stepped from fables to reality with the emergence of undeniable, quantifiable psi powers among humans. Hosts to an alien spore that awakens the power of the mind, human psions exhibit amazing talents but face a terrible, hidden price. One alien race also possesses prodigious psi powers.

Armor and armaments have also benefited from technological advancements. Conventional firearms are lighter, more reliable and more accurate, but a host of new weapons, including railguns, lasers, stunners, and particle beam rifles, are also commonly employed on the battlefields of the 23rd century. New alloys and protective materials have kept pace, enhancing armor for those expecting combat.

Hovercraft, environment suits, holovids, maglev trains, handheld scanners - the list of amazing devices commonly available in the United Worlds goes on. And science continues to advance: recent innovations include artificial gravity generators, and antimatter-based starship drives.

▼ **ALIENS** - By the 23rd century, humanity has made contact with five alien civilizations. Two, the **D'eira** and **Nutoa**, are now respected members of the United Worlds federation.

D'eira - The D'eira hail from a low-gravity, silicate world orbiting the 70 Ophiuchi binaries. Tall, gangly bipeds, the D'eira have colorful markings on their blue or green skin, as well as patches of skin that change coloration in response to strong emotions. A highly cooperative society that finds human concepts of competition and conflict difficult to grasp, D'eira dwell in faerie-like cities of glass. The austere D'eira are superlative mathematicians, and approach the study of mathematics with a reverence bordering on religious awe.

Nutoa - The Nutoa are an arboreal race originating in the jungles of a world orbiting the hot white star Procyon A. Barely a meter tall, Nutoa are agile bipeds capable of gliding on membranes stretched between their limbs. Primitive tool-users with a tribal society when they were discovered by human explorers, the Nutoa adapted quickly to the advanced milieu of the United Worlds. Tinkerers *par excellence*, the Nutoa are fascinated by technology and many serve on starships as engineers.

Humans have also encountered three starfaring alien civilizations:

Ethereans - The so-called Ethereans, whose true race name can only be spoken telepathically, are a race of psions who evolved beneath the seas of their homeworld in the Eta Cassiopeia A star system. Physically weak, they possess sweeping psionic powers. The Ethereans are an inwardly-directed race, friendly to humans but disinclined to offer much assistance or leave the comfort of their worldwide mind link, known as the Unity.

Jodoni - Jodoni civilization spans five star systems just outside United Worlds space. The delicate Jodoni have a supportive exoskeleton and a keen sense of smell associated with antenna-like appendages. Jodoni are master traders and negotiators who hail from a society composed of millions of independent socio-political-economic units known as demesnes. Only constant bargaining keeps the fractious Jodoni Combine functioning. Some Jodoni demesnes are hostile to the United Worlds, but most are open to trade and diplomacy.

Vorn - Aggressive and hostile, the Vorn are worldless starfarers who travel from star to star mining asteroid belts and comets for resources. The Vorn are masters of crystalline and gravitic technology, with advances far beyond those of humankind. The United Worlds federation fought an interstellar war with the Vorn a decade ago that ended only when the aliens mysteriously withdrew. Vorn raids are a continuing problem on the frontier.

Tantalizing clues to the existence of a highly advanced race that vanished eons ago have been discovered on far-flung worlds. The "Progenitors" left behind only a few unfathomable ruins, but some believe they seeded life throughout the galaxy.

▼ **Note** - While **Fires of Heaven** details several alien races, including some suitable for use as adventurers, this book has been written with the assumption that most campaigns will focus on humans. Thus, source material and rules deal primarily with humankind, although vital information on alien races has not been overlooked.

▼ **OPPORTUNITIES FOR ADVENTURE** - Adventures in the 23rd century come in all stripes, from exploring a frontier planet to jacking into the net for a datatheft run on a prosperous core world. Free traders ply the interstellar spaceways in search of excitement and profit, while colossal corporations vie for economic supremacy in endless shadowy intrigue.

Field agents for the scientific Institute of Psionics seek out reports of psi phenomena throughout the United Worlds and beyond. Initiates of the mystic Order of the Mind, on the other hand, strive for personal mastery of the powers of the mind.

Human diplomats, traders, and other visitors stroll beside the towering glass spires of D'eir or the gossamer cities of the Jodoni Combine, striving for understanding with alien cultures.

Ever vigilant, the StarForces protect against Vorn incursions, ruthless pirates, and other threats. Rogue biotech labs, smugglers and crimelords thrive in the underworld even as interstellar marshals strive to curtail their criminal empires.

Cloned slaves dream of freedom in unregistered factory habitats floating in the eternal darkness of space. Intrepid colonists set out to tame new worlds, facing untold dangers as they struggle toward independence. And scientists challenge a different frontier: the ever-expanding boundaries of human knowledge.

In short, almost any kind of science fiction adventure imaginable can be played out in the **Fires of Heaven** setting.

▼ **DESIGN PRINCIPLES** - **Fires of Heaven** is based on certain principles of world-building. In order to present a coherent, cohesive setting, everything in this book is designed to adhere to a few key guidelines.

The book is deliberately limited in scope to offer a highly detailed setting while still providing for a full range of science fiction gaming. Adventurers can be high-tech corporate spies, valorous starfighter pilots or daring explorers, but they adventure in a tight-knit, richly developed cluster of star systems as opposed to vast stellar empires of nameless, ill-defined worlds. While there is combat, it isn't of the mindless sort: if the heroes enter a ship-to-ship duel with a hostile Jodoni captain, their defense may be complicated by the desire to avoid creating an interstellar diplomatic incident.

There are no pointy-eared humanoids or anthropomorphic Earth animals in **Fires of Heaven**: these aliens are *truly* alien, with unusual physiologies, societies, and perspectives.

Fires of Heaven emphasizes *people* over technology. All kinds of high-tech gadgets are available, but they are designed specifically to *aid* the adventurers, not to *replace* them.

EXAMPLE: 23rd-century medical technology is very advanced, but there are no "autodocs". No technological wonder can ever match the knowledge, experience, and intuition of a trained physician. In this way, **Fires of Heaven** creates a futuristic feel that still puts the players first.

Fires of Heaven^{v1.0}

The book also presumes that humans of the future will still be a lot like people today. They may live longer, interact with aliens, and flit about the galaxy in starships, but at heart the people of the 23rd century still love, laugh, and seek a better tomorrow for their children.

Finally, **Fires of Heaven** is designed to provide a comprehensive look at the setting while still leaving room for development by gamemasters and players. No vital rules or critical data have been left out, but though 400-plus pages thick, this book is still very much just an overview.

Future products may offer extra details to enhance and enliven campaigns, but everything strictly necessary to use the **Fires of Heaven** setting, outside the basic **EABA** rules, is contained in these pages.

▼ **REALITY CHECK** - *Scientific reasonability* is a vital component of the **Fires of Heaven** setting. While it is not a *strict* hard-science setting, every effort has been made to ensure, if not *strict scientific accuracy*, at least *scientific plausibility* under modern theories. There are some departures from scientific accuracy, however. These are noted by the occasional **Reality Check** paragraphs scattered throughout the book, which give the *facts* on the subject - at least, as we understand them now.

Why depart from scientific accuracy at all?
Some departures, such as positing faster-than-light travel, are almost as much a part of the science fiction genre as real science. Others, such as habitable planets orbiting binary stars, are useful for playability reasons. Finally, some concepts, such as artificial gravity, are just fun to explore.

In the other direction, **Fires of Heaven** downplays some likely future developments in the interests of playability, coherence, and a desire to create a future society reasonably comprehensible to 21st-century gamers. Theories on nanotech and biotech are maybe the most apparent examples. Nanotech, if it lives up to its advance billing, could radically alter our technology, economy, government, and society. Its offshoot, biotech, has the potential to change the very nature of humankind. Attempting to accurately (or even plausibly) predict how this will affect mankind over the next two centuries is simply beyond the scope of *any* prognosticator.



THE UNITED WORLDS



We're back.

- Maj. Michael Deacon,
lunar mission commander, 2010CE

▼ **INTRODUCTION** - The United Worlds has a long and colorful history, tracing its origins back to the early days of spaceflight on a fractious Earth still divided by nationalist loyalties.

▼ **THE HIGH FRONTIER** - The new millennium dawned bright for humanity, and nothing seemed a more apt symbol of its hopes for the future than the completion of International Space Station *Alpha* in the early 21st century.

Station planning began in the mid-1980s, and construction by space shuttle crews assembling modular components boosted into orbit by rockets took more than five years. Sixteen nations, including the United States, Russia, Japan, and the United Kingdom, took part in the project. Nearly eighty meters long, the completed *ISS Alpha* had six labs and quarters for a crew of seven. Photovoltaic arrays that rotated to follow the sun provided power to the habitat in its orbit four hundred kilometers above Earth. Regular shuttle missions carried fresh supplies and rotating crews of astronauts and mission specialists to the station.

The remarkable advances engendered by research aboard the station only accelerated the relentless pace of scientific progress on Earth.

The emerging field of nanotechnology, the manipulation of atoms and molecules by microscopic machines, made possible new polymers and alloys for construction, manufacturing, and other uses. Early superconductors also aided the development of new high-energy technologies, as did refinements in microcircuitry.

Fires of Heaven^{v1.0}

Computers reached new heights in speed, memory, and compactness even as scientists explored the science of optonics for the next generation of computers, using light, not electronic pulses, for their calculations.

Hypersonic aircraft traveling at the edge of the atmosphere pared travel times while a global positioning satellite system all but eliminated problems for lost, stranded, or misdirected travelers.

Vaccines and, later, cures for diseases that had burdened humanity for ages became possible. Researchers also took the first steps toward the prevention and even reversal of the deleterious effects of aging on the human body.

Prostheses gave way to early cybernetics, artificial limbs and organs that came ever closer to matching or exceeding the capabilities of biological tissues.

Biotechnology, using nanotechnology to alter cells and genes, gave scientists the power to directly modify DNA - opening a staggering new range of possibilities. Ethical and moral debates raged as potential human bioengineering, cloning, and biowarfare applications became clear.

Reversing a trend toward smaller and cheaper missions, humans returned to Luna for the first time in decades, even as preparations for a more ambitious space exploration project continued.

As a response to a number of high-profile failures of Mars missions in the early 21st century, the United States, enjoying the benefits of a remarkably strong economy, redoubled its efforts. The first manned expedition to Mars was launched from orbit in 2014CE. The international crew of astronauts and scientists spent six months in transit, then explored the red planet for a span of five hundred days before returning to Earth. Their findings vastly expanded human knowledge about the world and held out hope for eventual colonization of Mars.

But even as science lifted humanity starward, on Earth the rise of new technologies sowed the seeds for the deadliest conflict in the long, violent history of the world.

▼ **REALITY CHECK** - Future histories are remarkably fallible, *particularly* in the near term. No doubt some of the expectations underlying this possible future will turn out to be incorrect in coming years; in fact, there are already indications that the United States is taking a more cautious approach to further Lunar or Mars missions as opposed to the fairly aggressive strategy posited in **Fires of Heaven**.

In **Fires of Heaven**, completion of *ISS Alpha* fostered a boom in science and technology. New research avenues opened by the chance to conduct long-term experiments in freefall yielded advances in medicine, life sciences, metallurgy, construction, and scores of other fields. Faster semiconductors, stronger alloys, improved polymers, and high-efficiency superconductors were just a few products of station labs.

Insights into combustion provided new energy conservation techniques, while astronomical observations enhanced humanity's knowledge of stellar bodies - particularly that of planets around nearby stars.

Protein crystals grown aboard the space habitat aided research on cancer, diabetes, emphysema, parasitic infections, and immune system disorders. Zero-g medical studies advanced the treatment of numerous health problems and diseases, including cardiovascular illnesses, osteoporosis, and respiratory ailments.

The station also offered the opportunity to field-test innovations in robotics, recycling, air, and water purification, power management, computer science, sensors, communications, and other key systems. Finally, extended stays aboard *ISS Alpha* supplied invaluable data about living in space.

No one at Columbia-Presbyterian had ever seen anything like it. The New York Flu knocked people flat in no time. In 72 hours, patients either recovered or died. Most died.

By the time CDC identified it as a bioengineered pathogen, the flu had crippled New York City. We had patients in the hallways, lobbies, tents out in the parking lots. Then doctors, nurses, paramedics - all the emergency personnel started to come down with it.

People died in their homes or on the streets with no one to help them. The city was like a morgue. At some point, we heard a war using bioweapons had broken out, but by then we didn't have time to think about anything but fighting the epidemic.

I lost my parents, an uncle, my husband, and two of our children.

- Dr. Leslie Frieden, Columbia-Presbyterian Medical Center, 2021CE

▼ **THE BURNING EARTH** - A series of bloody conflicts, known collectively as the Biotech Wars, plunged Earth into apocalyptic high-tech carnage from 2016CE to 2021CE. The excesses of the era induced a fear of biotechnology and gene-tampering that still reverberates more than two centuries later.

Most historians date the start of the Biotech Wars to the April 18, 2016CE detonation of a terrorist nuclear device in New Delhi, India. A glut of other conflicts soon broke out, and crises and chaos multiplied worldwide.

No single altercation dominated the Biotech Wars. Rather, scores of disputes (new and old) erupted into violence around the globe. Corporate power plays, rebellions, racial hatreds, government coups, border clashes, religious jihads, terrorism, and underworld crime wars blended together in a seemingly endless tide of destruction, as local disputes swelled into global conflagrations by way of treaties, alliances, mutual interests, and the unanticipated side effects of untested new weapons.

Genocidal death camps arose as age-old enemies reignited grudges dating back to antiquity. Millions perished in the name of ethnic cleansing, religious purity, or simple convenience.

Famines, some caused by biowarfare, others exacerbated by the reallocation of scarce resources to military ventures, struck around the globe. Poverty, malnutrition, and pestilence festered in almost every nation.

Most combatants in the Biotech Wars eschewed conventional engagements in favor of more covert operations, biowarfare, silicon battlegrounds, and long-range missile strikes. Highly industrialized combatants, including most Western nations, outfitted soldiers with early cybernetic devices to even the odds against enemy forces with inferior technology but numerical superiority. Along with ever-more deadly firearms, troops carried prototype hand lasers, blinders, microwave-based weaponry, and other innovative armaments. Experimental wetware computers, interfacing excised human neurological tissue with optronic hardware, were but one of the nightmarish products of the era.

Advanced stealth technology, intercontinental missiles, and elite covert operations units visited the horrors of war on every corner of the Earth. In cyberspace, shadow conflicts of computer viruses, logic bombs, and code breakers mirrored the bloody real-world battles.

But the most feared armaments, the ones which gave the wars their name, were the chemical, bacterial and viral bioweapons crafted in the secret labs of governments, terrorists, and crimelords on every continent. Terror attacks released nerve gases in major population centers, while suicide bombers targeted government centers, military high commands, and communications facilities.

Biowarfare stockpiles contained everything from plagues to assassin viruses keyed to unique DNA patterns. Anti-material bacteria, designed to destroy specific non-living substances such as rubber or plastics, threatened the equipment carried by foes rather than the troops themselves.

In 2021CE, the slaughter climaxed when some unknown faction, by accident or design, released a host of bioengineered bacteria and viruses that propagated like wildfire around the globe.

Fast-moving epidemics tore through urban centers, paralyzing entire cities. The rapid spread of the pathogens overtaxed emergency systems but also checked the spread of infection by preventing carriers from spreading the contagion very far.

Barely twelve days after it began, the Doomsday Plague burned itself out, an estimated 960 million people having died. Some of the worst hit areas were completely depopulated, towns and even cities left completely devoid of human life. In the 23rd century, some of these still remain empty except for skeletons, mute monuments to human excess, stating "never again" in a way that the crumbling WWII death camps were apparently never able to manage.

Fires of Heaven^{v1.0}

▼ Bioassassins - Biogenic assassins

DATA DUMP

were one of the worst excesses of the Biotech Wars. Advances in biotechnology intended to benefit humanity were twisted to create sociopathic killers with physical attributes, cunning, and skills far beyond those of ordinary humans. Even against the backdrop of the Biotech Wars, these inhumanly efficient assassins were the stuff of nightmares. Using retroviral gene therapy, surgery, hormone manipulation, DNA-mapping computers, and other cutting-edge techniques, bioengineers carefully shaped selected individuals from normal pre-adolescents into near-superhumans with heightened physical and mental abilities.

Biolabs also manipulated brain chemistries and formative life experiences to purposely produce sociopaths capable of carrying out their deadly tasks without conscience or compunction. An intense training regimen using traditional as well as biofeedback and hypno-learning techniques turned out assassins expert at armed and unarmed combat, disguise, demolitions, use of poisons, and other tradecraft. In certain cases, bioassassins honed their skills by slaying scores of political prisoners, homeless people, or other undesirables in controlled situations.

Some were government products, while others were created in black market labs for sale to the highest bidder. Few in number and incredibly expensive, bioassassins still proved highly effective. No one knows how many victims fell to them during this chaotic period. Military chiefs, heads of state, crimelords, religious leaders, captains of industry, and political figures all perished at their hands. Bodyguards, police, corporate security officers, and countless other protectors died as well. In one case, two bioassassins destroyed an infantry company sent into the ruined city of Caracas, Venezuela, to hunt them down. Over the course of three days, the pair slew nearly 120 soldiers before escaping.

Following the carnage of the Biotech Wars, the resurgent United Nations declared bioassassins a threat to the newfound peace. The labs responsible for unleashing the bioassassins turned new profits by gene-crafting killers specifically designed to hunt their brethren. Then a concerted effort was made to eradicate the DNA maps, computer software, and equipment used to create both sets of assassins, succeeding in all but wiping out these executioners. Fearsome in their time, by the 23rd century they are just a bogeyman from the dim past to most citizens.

Why we Fear our Genes - reference r1892134.987342.1567452 - .05Cr

Just imagine: it wasn't all that long ago that we contemplated the possible destruction of all humankind. Now we ride solar winds to other worlds. There are children on Luna and Mars who have never set foot on Earth. We haven't seen the last of strife and peril, but hope for humanity dawns anew.
- the Rev. Gordon Wright, African Methodist Episcopal Church, 2060CE

▼ **RIDING ON SUNLIGHT** - Out of the ashes of the Biotech Wars arose a determination to progress beyond the rabid nationalism at the root of the apocalyptic conflict. While they still took pride in their national and cultural origins, the diverse societies of Earth increasingly began to view themselves as one people.

The United Nations, once maligned for its weakness and ineptitude, shed its toothless image to take a prominent place in the new world order. Relying on moral authority and the cooperative philosophy taking hold, rather than military force, the revitalized U.N. brought almost all nations closer together.

U.N. Secretary-General Hikeji channeled this cooperative spirit into a colossal project. New homes must be found for humankind, he declared, in order to prevent a single catastrophe from ever again threatening the entire race. While the space-faring nations of Earth refused to cede control over their national programs to the U.N., they did fund the new United Nations Space Agency (UNSA) to coordinate the efforts of the U.S., European, Russian, Japanese, Chinese and other space programs, guaranteeing that no single world power would dominate humanity's destiny in the stars.

The aging *ISS Alpha*, mothballed during the wars, experienced a rebirth as the orbiting base for the construction of a larger, more advanced platform, *Gagarin Station*, named after the first man in space.

A renewed series of expeditions to the moon climaxed in the founding of a permanent lunar settlement in 2036CE. The international base at the edge of Mare Crisium established humanity's first foothold on another world.

Named *Armstrong*, in honor of the first person to set foot on Luna, the initial base consisted of pre-fabricated modules hastily assembled and buried under the loose rock and dust covering the lunar surface to provide radiation shielding.

Later installations dug deeper, extending down and out as the population grew. Underground ice pockets and permafrost in the permanently shadowed craters of Luna's polar regions provided the water essential for life on the moon. Solar arrays bathed in the perpetual sunlight of a peak in Aitken Basin near the south pole powered the habitats. Hydrogen and oxygen, gleaned from lunar water, powered fuel cells to cover peak loads, and this water then sustained life support systems, as did oxygen converted from carbon dioxide in the extensive hydroponics tunnels that also yielded food for the colonists.

Mining operations commenced almost immediately, extracting more oxygen from lunar minerals that could be combined with hydrogen to refuel supply vessels from Earth. As lunar installations prospered, other processing operations began to extract glass, ceramics, and other useful products from lunar dust.

While such efforts at self-sufficiency made life on Luna feasible, for the most part lunar habitats remained heavily dependent on Earth. The early settlement of Luna, still expensive and dangerous, centered on scientific pursuits and space exploration support operations.

Resource-poor compared to Earth, Luna *did* benefit from easy access to space due to its lack of atmosphere and low gravity. Lunar ores launched into space for construction of orbital habitats constituted the bulk of its exports for many years.

The advent of fusion power in 2048CE changed everything. A decades-long drive to induce a sustained fusion reaction culminated in creation of the first fusion reactor in Livermore, California in the United States. Within a decade clean, safe, and efficient, fusion became the chief source of power on Earth and Luna.

The invention also revolutionized economic life on Luna. Second-generation fusion reactors used a helium isotope that was rare on Earth as a secondary fuel. Conveniently, that isotope had been deposited in the lunar regolith by solar winds for eons, and cargoes of helium gleaned from the moon began to correct the Earth-Luna trade imbalance.

Tourism eventually complemented the industrial core of the lunar economy. The first lunar hotels catered to the ultra-rich, but over time visits to the resorts on Luna gained in affordability. Low-g flying using personal wings in sealed, pressurized caverns below ground became a popular pastime for residents and visitors alike.

Microgravity made the moon especially attractive to the aged, who could expect longer and more comfortable lives there. Mass emigration to Luna became feasible in the late 2050's, following the construction of a so-called beanstalk, a tether extending from the peak in Kenya on Earth to a terminal station in high Earth orbit. People and goods traveled up the beanstalk on high-speed elevators to the station, officially named Clarke Station but commonly called EarthPort, and then transferred to ships docked at the terminus. The savings in time, fuel, and accidents by reducing ship landings proved considerable, and eliminating the need for a high-g rocket liftoff provide a means for transporting elderly or weak patients to zero-g orbital medical facilities or to low-g retirement communities on Luna.

As new settlements, such as Korolev, Aldrin, Verne, Komatsu, and Heinlein took shape on Luna, the people of Earth also pursued a second path into space. Composed of rings or cylinders, space habitats constructed with lunar ores used the centrifugal force of rotation to provide a semblance of gravity. Solar panels and fusion reactors provided power.

Corporations built orbital factories, while private stations populated by utopian societies and religious groups sprang into being high above Earth. Hospitals, military bases, research labs, and luxury resorts added to the proliferation of orbital habitats, as did the first space-based center of higher education: the orbital campus of McAuliffe University whose graduates stood at the forefront of the exploration and colonization movements.

EarthPort served as the key administrative center for United Nations regulation of space commerce as well as a major trading center and passenger terminal.

Fires of Heaven^{v1.0}

When the lunar colonies seemed solidly established, humanity set its sights on the next stepping stone to the stars: Mars. Robot probes and manned expeditions paved the way for the colonization of Mars in 2045CE. Scores of colonists, carefully selected for their skills, knowledge, intelligence, and psychological aptitude, set forth to establish a permanent human presence on the red planet. Waves of new settlers soon followed the first, and communities arose across Mars.

Vast bermed domes constructed from native resources covered the settlements, trapping heat and pressurized air to make life possible in the chill deserts of Mars. Hydrogen, carbon, nitrogen, and oxygen gleaned from the Martian atmosphere and minerals recharged life support systems inside the domes. Some domes held factories or housing, while others protected agricultural operations designed to feed the burgeoning population.

Named for two science-fiction authors who wrote about Mars, the settlements of Bradbury and Burroughs rapidly expanded into full-sized cities. Other key Martian communities included Strugatsky, Lowell, Xiada, Robinson, Bova, Komarov, and Wells.

As the first colonists explored the surface of Mars, they discovered traces of bizarre alien ruins. The eons-old remnants of some advanced civilization offered the first proof that humanity was not alone in the galaxy, but provided few clues as to the origin or fate of the long-lost extraterrestrial race - although most scientists agreed they were most likely *not* native to Mars.

Found primarily in a region known as the Labyrinth of Night, a five hundred by two hundred kilometer network of criss-crossing valleys often filled by clouds of ice crystals at dawn, the ruins were crystalline structures of fantastic geometry and indecipherable purpose.

The alien structures inspired a furor. Scientists, politicians, religious leaders, and ordinary citizens debated the implications of the existence of at least one alien civilization, albeit long-dead. In time, the vanished alien race came to be known as the Progenitors. The paucity of hard information on the aliens quelled the firestorm of excitement for a time, though the entertainment industry had a field day, with dozens of alien-inspired features coming out over the following several years.

While Luna remained closely tied to Earth both economically and culturally, Martian colonists had almost all the resources necessary to create a self-sufficient, even prosperous new society. Sunlight and soils made farming beneath the protective domes a viable enterprise, and experts predicted Mars would someday export food.

But the real treasures of Mars were its extensive mineral resources: iron, aluminum, manganese, carbon, phosphorus, copper, and silicon. Indeed Mars even possessed vast quantities of deuterium, the heavy isotope of hydrogen used with helium in fusion reactors.

With a lower gravity, thinner atmosphere, and a conveniently equatorially located twenty kilometer-tall mountain, Mons Pavonis, in the early 2050's Mars was the test site for the beanstalk that would be built above Earth later in the decade.

Once this easy method of moving Mars' mineral wealth into space was constructed, the red planet quickly developed into a compact but key industrial center, providing ores and fuels for the next crucial step in settling the solar system: exploration and exploitation of the mineral-rich asteroid belt.

Thinly scattered across the millions of kilometers between Mars and Jupiter, the asteroids were blessed with valuable resources of all kinds, chiefly iron, nickel, cobalt, iron-magnesium silicates, and iron sulfides, as well as platinum, gold, silver, manganese, copper, titanium, and uranium.

Raw materials from the Belt provided the key to unlocking such long-held dreams as a universal rise in standards of living, mass emigration from a crowded Earth, and the start of a centuries-long drive to terraform Mars.

As mining operations crowded the resources of the Belt, the frontier moved out to the Trojan asteroids in Jupiter's orbit as well as the moons of Jupiter and Saturn. Daring space explorers searched for water on Titan and for life on Europa, giving humanity new insights about other worlds. Ice miners braved the frigid moons to blast chunks of ice into orbit to slake the thirst of habitat populations.

Long-haulers, powered by slow but efficient solar sails, plied the orbits between the outer and inner worlds of the solar system, trading speed for cargo capacity and economy in competition against fission- and the early fusion-drive ships.

Within a few decades of colonization, Luna boasted over 35,000 permanent residents (as many as 20% born off-Earth), while almost 10,000 people called Mars home (10% native-born). Thousands more lived in space habitats and the asteroid belt. While this is a lot of people, it was still less than one thousandth of a percent of Earth's population. The wealth of these planets compared to their populations started to become a social problem.

On Earth, access to the solar system's vast resources fueled the rise of what were called transnational corporations. One of the first, Amex, began as a credit and finance company in the late 20th century. Several transnats rivaled small nations in power. Indeed, some even used their financial strength and political influence to virtually take over weak national governments. Inevitably, distance and differing perspectives created a rift between the people of Earth and their brethren in space.

Pressured by the great nations and transnats of Earth, in 2066CE the U.N. imposed high taxes and tariffs on colonies, intended to repay the vast outlays of capital expended to develop spaceflight and settle the solar system. Colonists on Luna, Mars, and the asteroids chafed under a financial drain forced on them by an off-planet government. Those transnats with extensive off-Earth holdings, such as Amex, subtly encouraged rumblings of discontent.

Growing tension magnified every petty incident until the people of Earth and those in space found themselves almost inalterably opposed.

▼ **Solar-Sail Craft** - Developed in the early 21st century, solar-sail vessels utilize the minute pressure of sunlight for propulsion and power, accelerating slowly but eventually building up considerable speeds. Carrying only a small fuel reserve for docking and emergency maneuvers, craft with thousand-square-kilometer sails of carbon fiber or ultra-thin Mylar panels served chiefly as enormously efficient long-haul freighters during colonization of the solar system.

DATA DUMP

Crewed primarily by families, independently owned solar-sail vessels were the tramp steamers of the 21st century, carrying bulk cargoes too expensive to convey by more conventional ships. Trade within the solar system depended heavily on solar sailors until advances in ship drives and designs superseded these highly practical but severely limited vessels. In the 23rd century, solar-sail ships are used only in niche applications where their passive propulsion system is an operational requirement.

Light Riders - reference sd645192.092322.198742 - .05Cr

I've argued with some Earthers. They seem to think we're only out here to benefit them. But I was born in space, and I'll live here until I die. Why should I care about a world I've never even visited? The Earthers just don't understand.

- Sonja Thorstensen, coxswain, *Sunrider*, 2072CE

▼ **BLOOD OF PATRIOTS** - In 2072CE, the Mars Free Congress, an elected body not recognized by the U.N., rejected U.N. authority over Mars, abolished all taxes and tariffs imposed by Earth, and unilaterally declared Martian independence, while expressing hopes of peaceably reaching a new accord between the two worlds respecting the autonomy of each.

An uneasy calm followed the announcement, as diplomats strived for an amicable resolution to the breach, but behind the scenes all factions quietly prepared for the possibility of open conflict. The U.N. created the United Nations Colonial Defense Force, a spaceborne military with the express purpose of maintaining order in the solar system. Engineers on Earth set to work designing the first military space vessels.

Outworlder secessionist elements formed home defense militias armed with jury-rigged weaponry. Some solar-sail craft turned smuggler, conveying black market arms purchased on Earth to their compatriots in space, dropping stealthed cargo pods into low-energy transfer orbits for pickup by belt miners. Most arms shipments to Mars were stopped by increased vigilance by U.N. customs agents at the beanstalk terminus and smugglers were forced to drop shipments from orbit in auto-piloted re-entry containers, not all of which survived their hard landings.

The first bloodshed of the war occurred in early 2073CE, when some U.N. officials were grabbed by angry protesters on Luna. Fearing for the lives of the officials, police forces confronted the mob and a riot began. The effort to rescue the U.N. officials resulted in the loss of life on both sides.

When news of the incident reached Mars, a wave of agitation and indignation swept the red planet. The Mars Free Congress nationalized the beanstalk, and rebels seized control of this engineering marvel. Its next passengers were the remaining U.N. personnel on Mars. Expelled by the Free Congress, they were forcibly placed aboard commandeered freighters for the long trip back to Earth.

Fires of Heaven^{v1.0}

Soon, rioting erupted in every Martian city as angry colonists attacked U.N. offices and properties owned by Earth-based corporations. Retaliation by private security forces only worsened the conflict. The underground warrens on Luna also experienced violent uprisings, and in several cases rebels seized control of entire communities. Waves of U.N. personnel, corporate officials and other refugees ejected from the insurgent cities flooded those warrens still under U.N. control.

In the asteroids, many zero-g prospectors announced solidarity with the rebels, fashioning weapons from their tools to resist any effort to dislodge them, while others withdrew into isolated regions of the Belt to simply wait out the conflict.

A handful of space habitats in high Earth orbit declared independence as well, but most (tethered to Earth by the need for vital resources) remained at least outwardly loyal.

Over the next five years, a series of skirmishes sputtered along and kept tensions high. The vast distances and long transit times involved harkened back to the wars of the 18th and 19th centuries, when months or even years could pass between engagements. Rebel forces declared an embargo on Earth, constricting the flow of resources to and from the homeworld.

The first skirmishes took place high above Earth late in 2073CE as U.N. troops stormed rebellious orbital habitats. The zero-g conflicts presaged the fighting on Luna early the next year as freighters converted to UNCDF troopships landed to retake control of the moon.

Using lunar facilities still under U.N. control as bases of operation, UNCDF troops invaded warrens held by rebel forces one by one. Some of the fiercest fighting took place in the city of Heinlein, where rebels armed with mining lasers and other makeshift weapons repulsed repeated assaults. In time, however, nearly all of Luna once again lay under enforced U.N. control.

As battles raged beneath the lunar craters, rebel forces on Mars and the asteroids steeled themselves. Independence-minded spacers formed a rag-tag rebel fleet, outfitting their freighters for combat as best they could.

The pacification of Luna accomplished, the United Nations Colonial Defense Force next prepared to regain control of the asteroid belt between Mars and Jupiter, restoring the flow of critical raw materials to Earth. A handful of newly commissioned warships joined the converted-freighter force to meet the rebel fleet in the 2075CE Battle of Pallas, named for a nearby asteroid.

Earth vessels scattered the makeshift rebel fleet, but not before a desperate revolutionary captain rammed the *UNS Hyperion*, flagship of the U.N. fleet, resulting in the death of all aboard both ships.

The UNCDF paid a high price for the victory, with many ships badly damaged and scores of personnel killed in action. Although they never again assembled for a setpiece battle with U.N. forces, the remnants of the rebel fleet continued to raid freighters carrying ores from the reopened asteroid belt, restricting the flow of raw materials to Earth.

The long-anticipated invasion of Mars late in 2076CE began with the seizure of the orbital platform at the head of the beanstalk while UNCDF troopships carrying advance forces established beachheads on the surface. Rebel engineers foiled the invasion by severing the tether with explosives; spinning the platform into space and preventing the bulk of UNCDF troops from reaching the surface. The tether and its cargo cars crashed down on Mars like a hypersonic whip, causing a number of casualties on the ground.

With only the advance forces on the ground, and no hope of reinforcement until Earth could produce more precious surface landers, the UNCDF troops surrendered to Mars authorities.

As wartime losses mounted, both sides began to reconsider their positions. The rebel embargo showed the populace of Earth just how dependent it had become on the colonies. But without the beanstalk to carry supplies to the rebels, the Martians realized that Earth would be able now to slowly starve them into submission. A peace movement took root among the war-weary people of Earth and space, and a diplomatic effort, engineered behind the scenes by the Amex corporation, finally brought U.N. officials and rebel leaders face-to-face at a neutral outpost on Luna. The Lunar Accord of 2078CE ended hostilities and set the stage for negotiations leading to a permanent resolution of the rift between Earth and its former colonies.

In exchange for a degree of autonomy, each world joined a new interplanetary government intended to unify humanity no matter how far its reach extended.

The United Worlds government, in which the people of every planet (at first Earth, Luna, and Mars, followed by major Belt settlements as they grew) had a voice, would oversee interplanetary commerce, administer pioneer colonies, keep the peace, and protect the basic human rights of all its people. The United Nations ceded authority over space to the new federation, restricting its role to affairs between the various nations of Earth. The UNCDF was restructured into the StarForces Navy and Marine Corps in anticipation of the next colonial development: mankind's first interstellar colony.

▼ **Mars First!** - As the spread of habitat domes, pit mines, and ice reclamation facilities changed the face of Mars, some settlers began to agitate for a less intrusive human presence on the red planet. In their minds, the thirst to exploit its resources and flood it with colonists from Earth would destroy the stark, unique beauty of Mars.

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Believing that someone had to speak for the silent world, in 2061CE adherents of these views founded Mars First!, a radical environmental group inspired by an Earth-based organization. As efforts to lobby for stricter colonization policies failed, the organization arranged for public protests, court actions, and bureaucratic red tape to snarl projects it opposed, sabotaging those that could not be stopped by other means.

When rebellion broke out, Mars First! joined forces with those opposing Earthly authority over the red planet. Its expertise in explosives and guerrilla tactics proved invaluable to the rebels.

In the 23rd century, Mars First! continues to advocate protection for the natural state of Mars. A recognized political party, the organization elects a handful of legislators each year but a continued, if disavowed, reliance on dirty tricks has prevented Mars First! from gaining widespread support among ordinary citizens.

Ecowarriors through the Ages - reference Jk094234.450342.673400 - .05Cr

We had our first meal of all-native foods tonight: dragon steaks, baked thumproot, lakecress salad, and dewberry pie for dessert. Of course, we can't survive on an Eden diet without nutrisupplements, but it was a nice change from the freeze-dried rations. It's going to be a while yet before the first terran crops come in and the livestock herds are large enough to start slaughtering for meat, so a little variety is going to be important.

Feasting under the stars, with the two moons and Alpha Centauri B shining bright in the sky - this place is starting to feel like home.

- Evangelina de Souza Oliveira, Eden, 2096CE

▼ **A NEW EDEN** - In 2056CE, an immense colony ship departed from Earth orbit, bound for another star. The *UNS Argo* faced a 40-year journey to Alpha Centauri A. Telescopes had discovered a system of planets orbiting the yellow star, part of a trinary star system, the nearest system to Sol. Unmanned deep space probes and very long baseline telescopic surveys had revealed that one world in particular seemed a likely candidate for human settlement.

Propelled by powerful fusion drives, the ship carried six hundred colonists carefully selected for their scientific and practical knowledge, psychological stability, and compatibility.

Designers overcame the problem of supplying hundreds of people on a decades-long journey by placing most colonists in cryogenic hibernation. Shifts of awakened colonists served as crew for a few years at a time before going back into hibernation, which also retarded aging and ensured that all would arrive at Alpha Centauri A still in the prime of life.

Back at Sol, the rebellion delayed launch of a follow-up colony vessel. The *UNS Odyssey*, nearing completion at the outbreak of hostilities, was hastily converted into a troopship. Following the Lunar Accord, the renamed *UWS Odyssey* departed on the trail blazed by its sister ship.

A third colony vessel, the *UWS Conestoga*, set forth in 2089CE, but signals from the ship ceased in 2093CE. The vessel never arrived at Alpha Centauri A, and no traces of it have ever been discovered.

In 2096CE, the *Argo* arrived at its destination. A flurry of orbital surveys, robot probes, and other investigations of the Earth-like third planet revealed a breathable atmosphere with no toxins, microbes, or other unseen threats. In fact, native vegetation and animals on the world seemed surprisingly biocompatible with those of Earth.

Fires of Heaven^{v1.0}

After weeks of study from orbit, a shuttle conveyed a small landing party to the surface. Elisabeth Knight, second-in-command of the *Argo* expedition, became the first human to set foot on an extrasolar planet. She named the garden world Eden, and settlement of the world began in earnest following construction of a base camp near the coastline of a small continent.

But a hidden flaw in the cryogenic equipment became apparent when the sleeping colonists aboard the *Argo* awoke. Ice crystals had formed in the brains of some sleepers, causing neurological damage resulting in memory loss, emotional instability, motor-control problems or, in extreme cases, strokes, retardation, or death. Almost a score of colonists failed to awaken from coldsleep.

With no hope of return, the colonists named the base camp Horizon, and set to making the best of their situation. Agronomists planted crops of seeds and seedlings brought from Earth, while biologists thawed frozen embryos for maturation into the first generation of livestock for the colony. Ex-military personnel ensured the security of the precarious human presence on Eden, as mineralogists scouted for suitable ore deposits, and experts in a hundred other fields handled the myriad specialized tasks involved in establishing a permanent colony.

Dozens of colonists perished in the first few dangerous years as they faced the challenges of a new world. Animal attacks, plant toxins, exotic diseases, and accidents claimed numerous lives, but each tragic death only made the survivors more resolute in their determination to make the colony a success, both for themselves and for those to follow.

When the initial reports from the colonists reached Earth by communications laser four years later, news of the problems with the hibernation equipment brought plans for new colony ships and exploration craft to a standstill. But the news came far too late for the *Odyssey*, now over halfway to Alpha Centauri A, and the vanished *Conestoga*.

Dragons of Eden - Settlers on

Eden discovered a variety of native lifeforms, ranging from tentacular krakens in the ocean depths to cork-like sponge-trees on land. But among the most intriguing were the sizable land animals that came to be known as "dragons".

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Dragons resemble enormous wingless lizards, nearly eight meters in length and standing three meters tall on four legs ending in clawed feet. They have a tough, scaly hide, with a spiky dorsal ridge running from the skull down the body to the tip of a long, whip-like tail. Despite their vaguely reptilian appearance, dragons are warm-blooded. These voracious omnivores aggressively hunt live prey, even those few Eden land animals larger than themselves. Dragons are found chiefly in the lowlands of equatorial Eden.

Several colonists were slain by dragons in the early days of the Eden colony, and even in the 23rd century these creatures occasionally claim human victims. The world government offers a limited number of permits to hunt dragons each year, and they are a prized trophy for big-game hunters throughout the federation.

Young People's Exobiology - reference yu983430.239822.499823 - .05Cr

Note - The stats for dragons are left to the gamemaster. Basically, they should be tough and smart enough to be a challenge for adventurers at whatever point in a campaign they happen to be encountered.



All those worlds circling distant suns are as islands on an uncrossable ocean to us now. Like our ancestors, we must learn to build better boats.

- Dr. Fadil Boustami, astronomer, 2100CE

OCEAN OF NIGHT - The fatal flaws in coldsleep technology stranded Eden's settlers on an alien shore, cut off from aid or even a return home. Inhabitants of the solar system felt the gateway to the stars slam shut. Colonists of previous centuries might have accepted an outright casualty rate of one person in thirty just during the journey, and an equal chance of crippling injury, but few of the 21st century would take that chance, especially when our home system was still largely unexplored...and significantly safer.

Astrophysicists had long speculated that singularities, points in spacetime to which the laws of physics do not apply, might be used to skip across light-years of space in the blink of an eye.

Singularities are created in nature by stellar collapses so complete the star achieves infinite density and gravity while occupying a point in space infinitely small: black holes. Theory had long predicted that matter dropped into a black hole in one place could pop out in another, the singularity effectively creating a wrinkle in the fabric of the universe, causing two points in space any distance apart to momentarily co-exist.

But all experiments to test the radical hypothesis failed. A test station in the void between Neptune's orbit and the Kuiper asteroid belt and Oort comet cloud, built far from any planets to assuage public concern about runaway black holes, induced a series of artificial singularities. On the rare occasions that a singularity remained stable long enough to test, the unmanned probes fired into the roiling gravitic forces emerged, if at all, only as crumpled debris or streams of high-energy particles.

As desperation to solve the riddle of faster-than-light travel mounted, scientists turned to the notes of an eccentric researcher dead nearly 20 years.

Yevgeni Rozhkov had devoted most of his life to study of a collection of bizarre Progenitor relics written off by most researchers as an indecipherable enigma. The artifacts, which Rozhkov believed to be the remnants of a starship, had been discovered in 2040CE in a stable orbit on the far side of Sol from Earth, occupying a Lagrange point, a point in space where gravitational forces between the Earth and Sol balance one another. While some Lagrange points are gravitationally stable, and used for placement of permanent space habitats, many others (including the one on the far side of Sol) are not.

Curiously, however, efforts to relocate the artifacts to research facilities on Mars failed when they resisted all efforts to budge them from orbit. In frustration, a scientific base was constructed around the relics in 2060CE. Rozhkov was one of the mix of civilian and military researchers assigned to the facility in hopes of unraveling the secrets of the Progenitors.

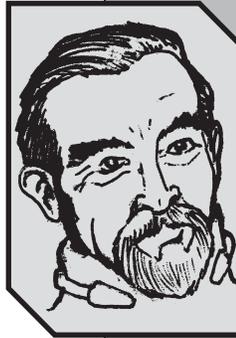
Although originally considered a prestigious assignment, as the years passed without any result from their examinations, most of his peers gave up on the inscrutable relics and moved on to other, more fulfilling, assignments. But Rozhkov persisted, examining the components of the hulk for the next twenty-five years. In time, he claimed to have deduced some principles of controlling gravitic forces from his studies but by then his obsession with the artifacts had all but destroyed his credibility in scientific circles. Rozhkov died in 2085CE, leaving behind notebooks filled with designs and concepts gleaned from his scrutiny of the Progenitor relics.

Now those "crackpot theories" yielded the answers sought by scientists experimenting with jump technology. In 2108CE, using new controls based on Rozhkov's notes to precisely calibrate the intense gravitational forces involved, researchers succeeded in sending a probe through a singularity to emerge an instant later, unharmed, motionless, thousands of kilometers distant.

Further tests using plants, animals, and finally humans, proved that living tissue could pass unharmed through the singularity. Most test crews reported a brief period of disorientation and physical weakness after emerging, however.

Construction of a permanent jumpgate capable of routinely inducing jump singularities commenced. Upon its completion in 2111CE, the first vessels sent through carried workers and materials to build a duplicate at the Alpha Centauri binaries. A ship filled with medical experts and equipment, the *UWS Angel of Mercy*, quickly followed to treat the cryogenically-induced neurological damage suffered by the people of Eden on their long journey from Sol.

Fires of Heaven^{v1.0}



Yevgeni Rozhkov - All

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but ignored in his own lifetime, Yevgeni Rozhkov now stands out in history as the father of interstellar flight. The theories he developed over years of studying Progenitor relics solved the monumental problems facing early jump theorists, making possible the jump drive that now bears his name.

Born in Moscow in 2000CE, Rozhkov excelled in school and earned several advanced degrees in physics. But as a young adult, he proved something of a dilettante, teaching mathematics in China for a time, then spending a few years as an unsuccessful artist in Paris, then holding a succession of other odd positions before returning to academia.

Unable to gain tenure due to his gadabout youth and eccentric habits, Rozhkov flitted from university to university, project to project, before landing an assignment in 2050CE to the team examining a collection of Progenitor relics found in orbit on the far side of Sol from Earth. Some biographers speculate that Rozhkov's dean at the time only gave him the assignment to send him as far away as possible from the university.

Finally, Rozhkov had found something that captured his attention.

He spent the rest of his life examining the indecipherable relics, even as his peers drifted away to more fruitful endeavors. Rozhkov persevered through budget cuts and staff reductions, thoroughly convinced that he was only an inspiration away from unlocking the secrets hidden in the Progenitor artifacts. Rozhkov kept track of his studies and speculations in his meticulously kept old-fashioned notebooks. While his three decades of research failed to wholly explain even a single Progenitor relic, Rozhkov's analyses inspired him to jot down countless theories and designs for devices far too advanced to even be adequately tested in his day.

By the time he died in 2085CE, Rozhkov had been relegated by most to the crackpot fringe of scientific thought - an eccentric old man obsessing over ancient relics in a lonely space habitat. Rozhkov did not seem embittered by his obscurity, however, but continued his tireless scrutiny of the Progenitor relics until the very day of his death.

Let's see what's out there.

- Capt. Hanne Ronningen, commander, UWS Calypso, 2112CE

▼ **VOYAGERS IN A SEA OF STARS** - The gateway to the stars thrown open to humanity, a daring band of explorers, scientists, and spacers from every nation and planet prepared to step through that portal.

While the first interstellar jump voyages, the Alpha Centauri rescue missions, were a success, it was soon realized that the requirement of building an extensive jumpgate facility at the far end of each trip would make jump exploration prohibitively expensive. Instead, research turned toward incorporating jump capabilities into the ship itself.

Construction began on the *UWS Calypso*, an exploration vessel intended to scout nearby star systems for habitable worlds. Built in Earth orbit by the United Worlds government, the ship took its name from a respected 20th century oceanographic vessel.

Cutting-edge, purpose-built and extremely expensive, *Calypso* was nonetheless an ungainly vessel, unable to safely land on any planet. It carried a fusion power plant and a skimmer to scoop hydrogen from the upper atmospheres of gas giants for refueling. Almost eighty percent of its mass were the power systems and Rozkhov Drive that gathered and stored a full week's output from the fusion plant to initiate a single jump. The sensor measurements and astrogation calculations for each jump took nearly as long, even using the state-of-the-art computers aboard the ship.

In 2112CE, the *UWS Calypso* set out on its historic first journey, jumping first to Alpha Centauri. From there, the craft departed on a three-year trek through unknown space.

Known to every schoolchild, the exploits of the *UWS Calypso* have been retold in nearly every format, from literature to holovids, and still excite the imagination as can few tales of adventure fiction: the frantic escape from a pack of cunning razorclaws stalking the landing party in the sultry jungles and grasslands of Loki at Epsilon Eridani; the heroism of medical officer Dr. Maureen Halpern, who succumbed to an alien infection burning through the ship even as she finished synthesizing an antibiotic at Tau Ceti; the desperate hunt for a saboteur among the crew as *Calypso* lay crippled off Epsilon Indi, marooned light-years from home; the daring jump to Alpha Centauri on a jury-rigged Rozkhov Drive - arriving months behind schedule just as authorities prepared to declare the ship lost; and through it all, the iron will and determination of Captain Hanne Ronningen conveying her vessel past every obstacle to its homecoming.

The *Calypso* returned with a wealth of scientific data and amazing discoveries. Its survey of Epsilon Eridani, Tau Ceti, and Epsilon Indi revealed the existence of numerous worlds suitable for human colonization. The hard data gathered by the ship's science staff on stellar phenomena, planetary formation, and biocompatibility kept scientists in dozens of fields busy devising new theories for decades to come.

Evidence that life was relatively common throughout the stars yielded hope that intelligent alien races might someday be encountered, while tantalizing hints from other Progenitor ruins on worlds in numerous systems deepened the mystery surrounding the vanished race.

Exploration of the stars continued with new vessels and new crews, but none could ever match the courageous first journey of the *Calypso*. The fully restored *UWS Calypso* now holds a place of honor at the orbital annex of the Smithsonian Institution above Earth, alongside such pioneering craft as *ISS Alpha*, the service modules of two Apollo missions, and the deactivated original Pluto-orbit jumpgate.

Barely 50 years after the voyages of the *UWS Calypso*, humanity had established footholds on eight extrasolar worlds, as explorers ranged outward cataloguing new stellar systems, followed by waves of science outposts, corporate operations, and pioneer colonies.

The StarForces military expanded alongside the federation, defending against internal threats, such as piracy, and the unknown dangers awaiting humanity in unexplored space.

StarForce Academy, a cylindrical habitat orbiting Luna, opened its doors to midshipmen and cadets in 2150CE. This prestigious four-year academy trains young men and women for duty in the StarForces officer corps.

Even as humanity spread across the cosmos, advances in science continued apace. In time, progress in the fields of superconducting alloys, energy production, and micro-circuitry made ship-mounted Rozhkov Drives less expensive (though transit through jumpgates between established systems would always remain cheaper).

Refinements in architecture, life support systems, and construction materials enabled humans to establish colonies on less Earth-like worlds, although at considerable expense and great risk. The fields of agronomy and exobiology provided vitally needed information on raising crops and livestock on alien worlds or artificial habitats.



Fires of Heaven^{v1.0}

▼ Ruins of the Progenitors - A

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mysterious alien race that vanished millennia before humanity ventured into space, the Progenitors are a topic of endless speculation and debate among exoscientists. Definitive facts about the Progenitors are very hard to come by, despite almost two centuries of research. Their weird, crystalline ruins have been discovered on six worlds, including Mars in Sol system. Examination of relics found in orbit around the sun yielded insights vital to development of the Rozhkov Drive, yet revealed few concrete facts about the artifacts themselves.

Curiously, while numerous Progenitor ruins have been found, none appear to be settlements or homes. In fact, no one knows quite what the ruins do, if anything, or what purpose they once served. They are universally impervious to penetrating sensors. Constructed of superhard crystal materials beyond the capacity of any known race to duplicate, the design of the ruins follow a bizarre geometry in which lines look straight to the eye but aren't when measured by instruments, no two chambers have walls that meet at the same angles, and in which explorers tend to get lost with ridiculous ease despite the fact that it should be easy to backtrack through a series of such completely unique rooms - just a few hours studying the ruins is enough to cause headaches in a small fraction of researchers. Isolated artifacts recovered are similarly constructed and equally puzzling.

The government, society, and language of the Progenitors remain a mystery as well. Scientists are not even certain of their physiology, although analyses of their ruins suggest a bipedal form. There are even some indications that the Progenitors were not one race, but several. The Progenitors left behind no records and very few tools or other objects, but what remains hints at a mastery of science far beyond that of humans or other races.

Some say the Progenitors seeded life throughout the galaxy, citing the biocompatibility of species on worlds light-years apart as well as the tendency of bipedal forms among sentient races as evidence. Backers of this theory also point to the coincidence that the homeworld of each sentient race so far encountered by humanity has a single, large moon, believed by some to be critical to the rise of sentient life due to the creation of strong ocean tides that encouraged evolution of land-based life. Detractors belittle the notion that the existence of these moons signifies Progenitor influence, and not coincidence, at work.

Farming the Stars: Seeds of Sentience - reference gl826300.131994.692392 - .05Cr

One day in the language lab, the Nutoa suddenly burst out singing "Ding dong, the witch is dead!" Apparently someone had shown them a vid of "The Wizard of Oz" (the flat version with Judy Garland, not the holo-vid remake) and they seemed to identify strongly with the Munchkins.

Funniest thing I ever heard. Think about it, though. First contact occurred when an exploration shuttle crashed in the jungle - falling out of the sky, right? And the strange, towering humans inside told the Nutoa they hailed from a faraway star, correct? I'd have to look it up, but I think one of the explorers was even born in Kansas.

The Nutoa may look and act like a bunch of furry, good-natured adolescents sometimes, but they are actually pretty damn clever.

- Dr. Andwele Msuya, linguist, 2168CE

▼ **FIRST CONTACT** - Over a century before, the discovery of Progenitor ruins had demonstrated to mankind that it was not the only species in the galaxy. As new worlds were explored and settled, more inexplicable Progenitor structures were discovered. While that puzzle was not about to be solved, the long-anticipated moment of first contact with a living alien lay within reach.

Deep-space probes launched on one-way trips through the Sol system jumpgate had revealed the presence of a life-bearing world orbiting third from Procyon A, a hot white star sharing a binary system with a white dwarf. The *Horizon*, an independent exploration ship based in the Epsilon Eridani system, accepted an Amex contract to investigate the system in 2162CE.

Establishing orbit around the targeted world, explorers began a closer examination. A sultry, tropical planet covered by lush vegetation, Procyon A-3 possessed extensive lakes, rivers, and swamps. The soaring equatorial rainforests rising from mist-shrouded bogs exhibited a stunning diversity of plant and animal life, although the dense forest canopy precluded detailed study from afar.

Exploration parties from the *Horizon* began landing on Procyon A-3 after several weeks of orbital investigation approved the world for human visitors. Shuttles set out for different regions of the planet to collect specimens of native life, conduct mineralogical surveys, and undertake other tasks necessary to provide a complete picture of the fascinating planet.

Then the hand of fate intervened.

A quick-brewing storm caught one of the exploration shuttles near the equator. Buffeted by extreme winds, the shuttle crashed into the thick jungle marshlands. Violent storms prevented the orbiting *Horizon* from launching a rescue mission for days. The crash survivors awoke to find themselves in a village high in the treetops, surrounded by diminutive, furry, mammaloid bipeds. Using hand gestures and pantomime, the beings explained they had pulled the humans from the shuttle wreckage to protect them from vicious predators lurking in the bogs below; humanity had made first contact with an intelligent alien race.

While their technology was primitive, barely equivalent to the human Iron Age, the friendly aliens seemed skilled at natural medicine. Employing a detailed knowledge of the healing properties of their jungle habitat's rich plant life, they treated the injuries of the crew as each group learned more about the other.

By the time rescue shuttles arrived from the *Horizon*, the crash survivors had befriended the inquisitive aliens and made a start at establishing meaningful communication between the two races. The Nutoa, as they called themselves, seemed particularly fascinated by the advanced technology carried by their strange visitors. Promising to return, the *Horizon* set course back to the United Worlds with the electrifying news.

As reports of the incredible encounter spread through the federation, a full complement of scientists, diplomats, linguists, and other experts returned to Procyon A with the *Horizon*'s crew to establish permanent relations with the Nutoa.

Linguists began learning Nutoan and teaching the aliens Anglic, while exosociologists delved into Nutoan culture and exobiologists studied their physiology.

In 2170CE, the Nutoa agreed to establish a planetary government and join the United Worlds. Forward-looking Amex swallowed its disappointment at lost colonization rights and capitalized on its contact with the first alien race met by humanity. The corporate giant quickly established trading ties with the Nutoa and sponsored cultural exchanges to bring the aliens fully into federation society.

Discovery of the Nutoa seemed to open the floodgates to encounters with intelligent extra-terrestrial races as United Worlds explorers pushed ever deeper into the cosmos.

In 2172CE, an expedition to Eta Cassiopeia A, a yellow star in a binary system with a red star, yielded humanity's portentous second encounter with intelligent life; this time, an ancient, highly evolved civilization.

Orbital surveys of the worlds orbiting Eta Cassiopeia A by robotic probes had failed to turn up any sign of them, but in 2172CE the enigmatic aliens on the fourth planet chose to make contact with the human expedition to their star. The strong telepathic powers of the Ethereans eliminated all language barriers and allowed instant communication with the United Worlds scientists and diplomats dispatched to Etherea.

In time, the wise but baffling Ethereans agreed to permit human visitors on their planet and send an ambassador to the United Worlds government (a tremendous sacrifice for the Etherean volunteer). While they have declined full U.W. membership, they are benign neighbors of the federation, providing little direct help beyond inscrutable advice and vaguely worded prophecies.

The Ethereans, whose true race-name could only be spoken telepathically, dwelt deep below the oceans covering Etherea. A physically weak aquatic race of powerful psions, Ethereans had no cities or settlements. They roamed the vast seas of their homeworld, physically alone yet enveloped in a worldwide psychic bond known as the Unity. While capable of interstellar travel via living organisms native to space, the Ethereans rarely left the comfort of the Unity.

The Etherean's psi powers resulted from a symbiosis between the aliens and a microscopic, non-intelligent spore native to Etherea. As a byproduct of this symbiosis, the spore awakened the psionic potential of the host's mind. Millions of years of evolution adapted most forms of life on the watery planet to the symbiosis; not only were the Ethereans perpetually mind-linked in the Unity, but they shared a psychic bond with all life on Etherea on a primal level.

The beautiful song of the Worldvoice reinforced the Etherean disinclination to travel, explaining their failure to establish colony worlds or embark on journeys of exploration despite the age and sophistication of their civilization. Charting the infinite possibilities of the future via precognitive psi powers, the Ethereans awaited contact with other races on their own terms.

Fires of Heaven^{v1.0}

The year 2181CE brought news of an encounter with yet another intelligent alien race. The D'eira inhabited the world first in orbit around its primary at 70 Ophiuchi A, one of a pair of orange stars nearly 17 light-years from Sol. The *UWS Kit Carson*, an old Frontiersman-class frigate of the StarForces Navy, detected the launch of a primitive solar sail spacecraft while investigating confusing electromagnetic radiation signals that had been detected coming from the system. Following protocols set up after the first meeting with the Nutoa, the frigate jumped back to U.W. space. A federation first contact team soon returned to establish communication with the D'eira.

An austere, peaceful race of thinkers, scientists, and philosophers, the vaguely reptilian D'eira welcomed human contact. Their highly cooperative society had reached the point of early spaceflight, but D'eiran mathematical knowledge outstripped even human higher math. D'eira considered math the key to unlocking the mysteries of the universe - a language for expressing reality. The ages-old family lines of the D'eira, reproducing asexually through natural self-cloning, inhabited beautiful cities of glass on their metal-poor homeworld.

Shared interests and a reasonably common perspective drew humans and D'eira closer together. In 2186CE, the D'eira agreed to join the United Worlds as full members.

As U.W. explorers pushed back the edges of unknown space, however, humanity faced an even more astonishing change: the rise of human psions expanded the frontiers of the human mind.

In the mid-2180s, cases of verifiable psionic powers among humans began to appear. U.W. researchers quickly discovered the presence of an alien spore in these newly emerged human psions and traced its origin to Etherea. Amazingly, a very small percentage of humans were adequate hosts for the Etherean micro-organism, and it awakened the psionic potential in its new human hosts.

The organism could be passed from human to human and, when no host could be found, formed exceptionally hardy spores. After more than a decade of contact with the Ethereans, dormant spores had spread throughout the United Worlds. *There was no getting rid of them.*

The discovery of human psions, followed shortly by news of the alien origin of their powers, ignited a firestorm in federation society. Unrest and confusion rapidly gave way to public fascination with psi powers, psions, and the Ethereans, as tales of psychics and psi phenomena went from fanciful fiction to reality. Some psions became celebrities, while the entertainment industry rushed to produce films, holocaust series, dreamscapes, and games featuring psions as heroes.

Not everyone welcomed the rise of human psi powers, of course.

Extremists accused the Ethereans of deliberately seeding the United Worlds with the spore, ascribing nefarious motives to the cryptic aliens. In fact, the Ethereans had simply not considered the topic relevant to their contacts with humanity and seemed baffled by the uproar.

Even those who dismissed the conspiracy theories voiced concern about the potential for abuse of psionic talents. Evidence that some human psions could read thoughts or influence the will of others gave rise to fears of mind-rape and other violations. Some speculated that psions might use their powers to overthrow governments and subjugate non-psions (or that psions would be used by governments to oppress their citizens). The wave of public fascination and even adoration of psions drowned out many of these cautionary voices. U.W. citizens soon came to accept the radical notion of human psi powers, helped by the crafting of new laws to protect the rights of psions and non-psions alike.

Federation ships encountered the vessels of another starfaring race at Epsilon Indi in 2218CE, when a Jodoni exploration craft jumped into U.W. space. United Worlds officials established friendly relations with the insectile aliens aboard, and soon made contact with others of their kind in Jodoni-held space.

The Jodoni Combine, a seemingly fragmented civilization composed of countless independent socio-political-economic units dubbed "demesnes" by humans, consisted of five star systems near the edge of federation space. While a few demesnes proved unfriendly, most were open to diplomacy and trade with the United Worlds.

At peace with itself and its neighbors, humanity looked forward to a bright future.

▼ Crisis of Faith - Incontrovertible

DATA DUMP

proof of intelligent, non-human life threatened to shake the human perspective to its core. Centuries of speculation had prepared humanity for the idea of extra-terrestrial civilizations, but confronted with the fact of their existence many humans faced a tremendous readjustment in thinking. For the first time, people had to consider just what it meant to be human, sentient, and intelligent. Nowhere was this reconsideration of basic beliefs more profound than in Earth's religions. Humans had long turned to religion for reassurance about their role in the universe. Contact with not one but several intelligent races, some even starfaring civilizations, seemed to throw long-held assumptions about that role into doubt.

In addition, many faiths faced difficult questions about the origin and spiritual nature of the aliens themselves.

Some religious sects splintered under the strain, with one faction embracing the opportunity to save alien souls and another rejecting the concept that human religious teachings had anything to do with extra-terrestrial races.

The Christian belief that God created man in his own image, in particular, divided many churches. A reconsidered view that the passage referred to the divine origin of all sentient beings, regardless of physical appearance, won acceptance among some religious scholars, while others argued for a literal interpretation that seemed to impart a spiritual superiority to humankind.

Naturally, many fringe sects also grappled with the spiritual questions raised by alien contact. The role of the Ethereans in the rise of human psi powers, in particular, fostered the evolution of a variety of radical sects viewing the aliens as agents of evil and human psions as carriers of their infection.

The Nutoa, D'eira, and other races encountered by humanity in the stars had their own opinions on faith and spirituality, of course. Some races, such as the Nutoa, proved fertile ground for missionaries sent to spread the word of God throughout the cosmos, while others remained largely dubious of human concepts of religious belief.

Overall, an atmosphere of tolerance emerged among the various faiths, both human and alien, of the 23rd century, but the precise role of humans and aliens in the spiritual makeup of the cosmos continues to inspire contemplation and impassioned debate among religious thinkers of all races.

I was on duty as helmsman when the Vorn destroyer jumped right into the middle of the convoy. An alarm sounded on the bridge as the jump point opened, and the Vorn ship appeared, firing. I still remember the way it moved - not like any human starship. It almost glided through space. No inertia debt - instant course changes.

A second jump point opened off the port bow, but our sensors picked up only debris coming through. It must have been another Vorn ship that didn't survive jumping into the star's gravity well. I guess the Vorn figured that it was worth the chance. As it turned out, one ship was all it took, anyway.

The skipper ordered full-burn evasive and opened fire with the ion cannon as the freighters scattered. Then the damned Vorn gravitic beams caught us. The sensors op shouted something about quantum gravity waves and the ship just shook itself apart. I got to an escape pod just in time.

Floating out there in space, helpless, I watched the Vorn ship finish off the freighters full of refugees.

- Chief Petty Officer Dmitri Putin (ret.), StarForces Navy, 2229CE

▼ **A STORM IN HEAVEN** - The horrific carnage of the Interstellar War began with a freelance jaunt by a civilian exploration company. The white star Chi Draconis seemed an unlikely candidate to have any habitable worlds, but in 2228CE the crew of the *Jie Wu* judged the potential reward worth the effort.

An exploration craft out of Tawhirimatea in the Lalande 21185 system, the *Jie Wu* emerged from a jump outside the Chi Draconis system, and its sensors picked up numerous ships of alien design, some incredibly huge. Many of the ships seemed to be harvesting the cometary cloud around the outer edge of the system, and the crew of the *Jie Wu* (ignoring federation first contact policies in their eagerness to gain a place in history) set course to investigate.

As a contingent of the alien ships broke off to intercept them, failing to respond in any way to the hails of the *Jie Wu*, the crew grew uneasy, but it was too late to turn back. Intense beams of never-before-seen gravitic force lashed out at the lightly armed exploration vessel.

As hull breaches and explosive decompression tore the *Jie Wu* apart, the communications officer beamed a distress call and images of the attacking ships into space. The *Jie Wu*'s last signal reached the nearest United Worlds outpost, at Sigma Draconis, nine years later - but the aliens got there first.

Fires of Heaven^{v1.0}

Worldless starfarers who ages before rendered their home planet uninhabitable through ceaseless warfare, the Vorn roamed the stars in vast crystalline cityships attended by armadas of warships. Driven by a sense of evolutionary imperative to better their race by culling the weak or deficient, the Vorn sought constant challenges. War posed the greatest challenge of all, the crucible in which the Vorn purified themselves and proclaimed their fitness to a hostile universe.

Three months after the Chi Draconis encounter, sensor buoys in the Sigma Draconis system detected ships of an unknown design emerging from a rip in spacetime outside the star's gravity well. A Star-Forces task force stationed in the newly colonized system set an intercept course for the oncoming vessels.

As had happened to the *Jie Wu*, silence met all attempts at communication. Without warning, beams of destructive power ripped the Navy vessels apart, while answering laser and ion cannon fire proved ineffective against the seemingly fragile alien ships. Without pausing, the alien fleet carved its way through the Navy task force and continued inward to the human colonies of Sigma Draconis.

The Vorn quickly eradicated the remaining spaceborne defenses of Sigma Draconis and established a blockade, fending off all human attacks with reactionless gravity-well drives that permitted Vorn vessels to glide through space unaffected by inertia, used gravity shear weapons that literally tore United Worlds starships apart, while crysteel hulls grown from a monocrystalline matrix provided them nigh-impenetrable protection.

On the ground, Vorn forces proved equally potent, fighting with a ferocity matching their monstrous appearance. An armored carapace provided Vorn warriors with formidable natural protection, while their muscular hook arms and wicked mandibles made them deadly hand-to-hand combatants. Smaller tool arms carried advanced hand weapons, such as continuous-beam laser rifles.

Along with the Sigma Draconis blockade, Vorn forces struck at the 61 Cygni, 70 Ophiuchi, and Lalande 21185 systems. Lightning raids, feints and reconnaissances-in-force kept federation forces off-balance and terrorized the populace.

Nonetheless, the men and women of the StarForces fought on to defend the United Worlds against the unrelenting invasion. Desperate ramming maneuvers by battered Navy ships obliterated more than one seemingly impregnable Vorn warship. Free traders took armed freighters into battle alongside Navy ships, or else fled for safer star systems packed with civilian refugees. Shipyards, factories, and other industries worked around the clock to turn out ships, arms, ammunition, and other supplies for United Worlds forces.

Meanwhile, scouts ranged into unexplored space seeking to pinpoint Vorn supply points and other key systems, while diplomats pleaded with the fractious demesnes of the Jodoni Combine for assistance and sought information from the mysterious Ethereans.

While the Vorn continued to hold the Sigma Draconis system, they seemed disinterested in the colony worlds after eradicating their meager space-defense capabilities. Apparently satisfied with sending periodic raiding parties to assault key production or population centers, the Vorn made no attempt at full-scale planetary invasions.

Even these raids sorely tested the defenders on Tin Hau and Shen Nung, however. StarForces Marine Corps units and planetary militias, reinforced by a handful of special forces troopers brought in by stealthy blockade runners, took heavy losses in every engagement with the Vorn but succeeded in either forcing the raiders back or delaying them long enough to evacuate civilians each time.

The 61 Cygni binaries, 11 light-years from Sigma Draconis, were next to face the Vorn. Curiously, however, the Vorn committed forces piecemeal to the fighting in the binary system. Countless minor skirmishes took place amid the outer planets, whittling down defending forces even as the Federation desperately rushed reinforcements to the embattled system, but the hammer blow never fell.

Harassing raids on nearby systems continued, and in 2229CE a surprise attack by a Vorn task force destroyed the Hephaistos Starport at the Alpha Centauri binaries, killing thousands. Panic swept the core worlds as news of a strike so close to Sol spread.

Rumors circulated that the Vorn were preparing for an all-out assault on multiple federation systems or in a concerted drive at Sol and the homeworld of humanity, but just as they seemed poised to overrun the entire federation, the Vorn suddenly withdrew from federation territory, only eighteen months after they burst into U.W. space. No truce was declared, but the battered defenders of humanity had no interest in pursuing the Vorn as they pulled back into deep space.

In the years since, the Vorn have been content to harass frontier systems or United Worlds ships in unclaimed star systems. These attacks typically consist of a half-dozen or fewer Vorn ships that directly engage federation ships before fleeing. Sometimes Vorn raiding parties land on colony worlds, but these forces pull back into space and depart after fighting a battle or two.

StarForces strategists are unable to explain this behavior, which seems to gain the Vorn no tactical advantage - although some experts suggest the Vorn are perhaps testing United Worlds defenses in preparation for a renewed invasion. The ease with which Vorn weapons ripped through StarForces ships in earlier encounters casts doubt on this theory.



The future wears many faces.
- *Etherean proverb*

▼ **IN THE YEAR 2237CE** - Humans now dwell on a score of worlds, side by side with friendly alien races, enjoying longer, happier, and more productive lives than ever before. Scientific progress marches on, producing such innovations as antimatter power plants and artificial gravity. Exploration, colonization and emigration has taken place on a scale that early 21st century futurists would never have predicted, technology and economic development of outer space pushing each other forward at an astounding rate. After severe stutters in progress because of the Biotech Wars and the Interstellar War, expansion of the United Worlds has resumed (following the Interstellar War) with the recent colonization of the Delta Pavonis star system nearly 19 light-years distant from Sol. Daring explorers continue to extend the boundaries of known space, often at great personal risk. Ever vigilant, the rebuilt StarForces stand ready to defend the federation against all threats. But every door opened by humanity's trek to the stars leads to new mysteries, new dangers, and new adventures.

The Vorn continue to harass frontier systems with occasional strikes, as time counts down to an explosive new confrontation with the implacable aliens.

Systems bordering the Jodoni Combine face less dire, but no less troubling problems with periodic attacks by hostile Jodoni demesnes. Diplomats seek peaceful solutions in the fractious maze of Jodoni politics, while intelligence operatives seek information on unfriendly demesnes and advance warning of impending raids. Vague reports of vanished ships on the far side of Combine space may be the first inklings of renewed Vorn aggression or hints to the presence of another potentially hostile alien power.

Internal concerns also trouble the United Worlds: ruthless corporations war for economic dominion. Interstellar crime cartels vie for mastery of the underworld; slavers selling bioengineered clones traffic in human misery; black-market factories churn out illegal armaments and other proscribed goods; and on dozens of worlds, the silent ruins of the Progenitors hold secrets and hazards yet unplumbed.

Fires of Heaven^{v1.0}

▼ **Aftermath** - Tens of thousands of United Worlds citizens, both military personnel and civilians, perished in the Interstellar War with the Vorn. While numerically small compared to the populations of Earth, Mars and the various interstellar colonies, many of these casualties came from the ranks of trained starship personnel. The eighteen months of fighting left the StarForces fleet in ruins and decimated the Marine Corps.

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And no one knew why the Vorn had departed or when they might return.

Battered, weary, and confused, the United Worlds began the colossal task of rebuilding. Nine years later, most of what was lost has been restored, yet preparations for what some believe to be an inevitable rematch with the Vorn go on. Shipyards bustle with activity replacing StarForces Navy ships lost in the fighting, while architects draft plans for a new generation of vessels employing the latest technology, and the Marine Corps continues an ambitious recruiting drive to restore its shattered strength, arming troops with weapons it hopes will even the odds on the ground. Examination of wrecked Vorn starships has already resulted in functional artificial gravity generators, and scientists strive to unlock other Vorn secrets, such as gravity-well drives and crystalline alloys.

Diplomats continue to improve relations with the Ethereans and friendly Jodoni demesnes, hoping to cultivate allies in the next war.

UW White Paper: Aftermath - reference uw0387822.821783.904475 - .00Cr

Human psions have secrets of their own, with evidence that some carriers of the alien spore responsible for awakening human psi powers have suffered progressive, irreversible neurological damage. The Institute for Psionics has concealed this startling news, fearing a public backlash.

It is a time of great danger, of threats known and unknown, an era of grand adventure, tragic loss, and joyous triumph.

An age of heroes.

▼ **UNITED WORLDS GOVERNMENT** - A federation of independent worlds and federally administered colonies, the United Worlds is the central governing authority in human space.

Based on the governmental structures of several Earth nations, the United Worlds government has three branches: legislative, executive, and judicial.

The Assembly constitutes the legislative branch. Each independent world sends a number of delegates (usually elected) based on population to the Assembly. Colonies still under some degree of United Worlds oversight dispatch two non-voting delegates. The Assembly enacts laws, ratifies treaties, adopts budgets, sets tariffs, and confirms presidential appointees.

The Assembly elects a president to a five-year term. The president names top government officials, appoints federal judges, conducts diplomacy, sets policies for government agencies, and serves as commander-in-chief of the StarForces military. Departments of the executive branch of the United Worlds government are known as ministries, with the Ministries of Colonial Affairs, Defense, Intelligence, and Justice ranking among the most important.

Finally, a hierarchical system of federal courts handles cases and appeals of lower court rulings all the way up to the United Worlds Supreme Court, the ultimate judicial authority in the federation.

The United Worlds Charter sets forth the structure, principles, and broad powers of the federation government. The Charter also guarantees certain basic rights and freedoms to all United Worlds citizens, including the rights to free speech, freedom of religion, freedom to travel, and freedom from unwarranted intrusion into private life by the government (although none of these rights are deemed absolute). More limited or derived rights include those of peaceable assembly, self-defense, political freedom and self-determination. These are often modified by planetary or local governments and are more prone to restriction through things like weapon permits, restrictions on radical political parties and so on.

▼ **Dr. Marcus Okoye** - A practicing physician before entering public life, Dr. Marcus Okoye took office as president of the United Worlds in 2233CE.

DATA DUMP



Born in Africa on Earth in 2165CE, Okoye opened a private practice after completing his medical schooling. In time, he earned a reputation as a superb physician and teacher. Okoye accepted several key public health positions in the African regional government.

Impressed by his forthright yet diplomatic performance in these posts, political leaders prevailed upon Okoye to seek election as a United Worlds Assembly delegate in 2220CE, where his low-key nature and strong personal convictions won Okoye many admirers.

When a scandal involving post-war defense contracts granted to OmniCorp toppled the former administration in 2233CE, the assembly turned to Okoye to restore the presidency's shattered credibility. Okoye has striven to cleanse the United Worlds government of any impression of corruption.

Enormously popular with the public and the Assembly, Okoye has also earned innumerable enemies in the past four years, but is considered likely to be re-elected in 2238CE.

A human of African ancestry, Okoye, 72, has thinning white hair and warm brown eyes. He stands a slim 180 cm tall.

UW Personnel 2233CE - reference uw734335.836651.200983 - .00Cr

U.W. Assembly Representation - Each fully independent world sends two delegates to the United Worlds Assembly, and selects one additional delegate for each power of 10 past 100,000 in population.

Various voting blocs exist based on system loyalties, ages of colonies, attitudes toward Earth, and so on, but these blocs are fluid (e.g., the Asteroid Belt could vote with the rest of Sol system on one issue, but with the other small worlds on another), and even the delegates of a single world are not likely to maintain constant solidarity.

Planet	System	Pop.	Delegates
Earth	Sol	10 bil.	7
Luna	Sol	1.3 bil.	6
Mars	Sol	4.8 bil.	6
Asteroid Belt	Sol	450 mil.	5
Eden	A.Centauri A	2.1 bil.	6
Hephaistos	A.Centauri B	1.8 bil.	6
Tawhirimatea	Lal. 21185 II	520 mil.	5
Asgard	Epsilon Eridani	1.1 bil.	6
Ryujin	61 Cygni A	785 mil.	5
Hachiman	61 Cygni A	320 mil.	5
Tejavelik	61 Cygni B	435 mil.	5
Brigit	Epsilon Indi	200 mil.	5
Nuadu	Epsilon Indi	75 mil.	4
Yewel	Procyon A	1.1 bil.	6
D'eir	70 Ophiuchi A	530 mil.	5
Total			82

Earth's fractious history and the resulting independence of its planetary societies makes it unique among the Assembly. Other Assembly members have significant off-world colonies in their home systems, but none of these are independent voting entities in the Assembly. Human diplomats are constantly fending off attempts to have Sol System reclassified as a single voting entity. Since this would strip away 17 of Sol system's votes, Sol system is usually a 24 vote block against this, and the rest of humanity seems content to go along with it.

▼ **ADVENTURE SEED** - The populations of Earth, Asgard, Ryujin, Nuadu and Yewel are close to the breakpoints for an extra vote. Adjusting one or more of these to be just below the threshold means that the next time a U.W. census is done, these worlds might get an extra vote in the U.W. Assembly. These seats are not only incredibly valuable and fought over, adding new seats could change delicate political alliances. This means that the outcome of the next census is a matter of great importance to some people, people who might have plans to make sure the tally comes down on one side or the other of the next voting threshold.

Fires of Heaven^{v1.0}

▼ **PROMINENT FEDERAL AGENCIES** - The executive branch of the federation contains a number of ministries that carry out the day-to-day functions of government. Many are obscure branches known only to bureaucrats, but others are quite well-known to the public.

Ministry of Colonial Affairs: Possibly the best-known U.W. ministry, Colonial Affairs oversees the settlement of new worlds and guides colonies along the path to independence. The ministry has the sole authority to grant colonization charters for new worlds. Administrators from the ministry are officially in charge of all colony worlds (alongside whatever local governments the colonies create) still under federal jurisdiction. In addition, the ministry issues licenses to corporations or other endeavors that wish to establish outposts and exploit the resources of worlds not suitable for full colonization. The agency is headed by the minister of Colonial Affairs, T'tral, a D'eira.

Civilian Construction Corps: The hard-working employees of the CCC, a branch of the Ministry of Colonial Affairs, have the unenviable task of preparing worlds and star systems for human habitation. They construct space habitats, build starports, relocate or destroy wayward asteroids, erect protective domes on hostile worlds, and perform all manner of other tasks to pave the way for colonization.

The CCC offers disaffected young people, usually from poorer families or economically depressed worlds, a chance to earn a decent wage, gain useful skills, and see the stars. Near-military discipline, hard daily labor, often-hazardous working conditions, and life in the remotest of locales test the mettle of Civilian Construction Corps employees, and the CCC has a reputation for turning rebellious young people into solid, employable citizens.

Ministry of Commerce: This ministry has authority over interstellar trade. The ministry also oversees the activities of businesses and corporations within the federation, keeping a particular eye out for exploitation or monopolization efforts by corporate behemoths, such as OmniCorp. Starship registration and licensing constitutes another of the ministry's duties. Luis Gonsalves is minister of Commerce. A human of Mexican heritage, Gonsalves ran a successful shipyard in the Epsilon Eridani system before joining the government.

DATA DUMP

Independence Hale

Strength 2d+1
 Agility 3d+0
 Awareness 3d+1
 Will 2d+2
 Health 2d+2
 Fate 1d+1



A UW spy, Independence Hale puts her considerable talent for espionage to work to uncover threats to the federation.

Hale was born on Eden at the peak of its annual celebration of recognition as an independent state - giving rise to Hale's unusual first name, which friends and family usually shorten to Indy.

After graduating from college, Hale planned to spend a year roaming the stars before buckling down to a career. While on the water world of Nai, however, she stumbled over a plot to overthrow the federal administrators of the colony and secede from the U.W. Hale helped an undercover Ministry of Intelligence agent thwart the misguided coup and joined the ministry herself soon thereafter.

During her short time as an intelligence agent, Hale has had several amazing adventures including a stint on the frontier posing as a free trader to uncover collusion between human pirates and hostile Jodoni demesnes.

Currently, Hale has spent the past several months investigating possible infiltration by Angels of the Apocalypse cult members into key government and corporate positions. The Ministry of Intelligence believes the doomsday cult may be getting some of its deadly arsenal through these contacts, and has assigned Hale (among others) to ferret out the truth of the matter. An earlier investigation undertaken by the U.W. Security Force ended in the disappearance of the undercover marshals involved, giving rise to suspicion that the force itself may be compromised.

A human of European-American descent, Hale, 26, has green eyes and shoulder-length red hair if not in disguise. Her pale complexion is prone to freckling. She stands a lithe 167cm tall. She typically carries a pocket laser for emergencies in addition to a more powerful main sidearm when needed.

Unauthorized File Access! - reference uw1284553.902341.233414 - .00Cr

Ministry of Intelligence: The secretive Ministry of Intelligence oversees information-gathering and counter-espionage activities in the United Worlds. It employs countless spies, intelligence analysts, code-breakers, and experts in a hundred other fields; the ministry's technology branch, for example, produces surveillance devices, compact weapons, detection gear, and other useful gadgets to equip agents. The ministry deals chiefly with external threats to the United Worlds. Ministry spies keep tabs on the Jodoni Combine, the Vorn, and, to a lesser extent, the Ethereans. Agents also investigate internal threats to the federation, rooting out conspiracies to overthrow the United Worlds government and other dangers. Lian Chang serves as minister of Intelligence. Chang, a human of Chinese ancestry, rarely appears in public. She prefers to operate behind the scenes as much as possible for the head of a government ministry.

Ministry of Justice: Administration of the United Worlds legal system falls to the Ministry of Justice. Attorneys from the Ministry of Justice prosecute violations of federal law and represent the federation in civil cases. Another branch of the ministry, the United Worlds Security Force, has investigatory and enforcement powers in federal crime cases. Marshals of the UWSF keep the peace in regions under federal jurisdiction, such as starports and colony worlds still under federal authority. Daniel Matoskah, a human of Sioux descent, is minister of Justice. The founder of a prominent law firm on Hephaistos in the Alpha Centauri B system, Matoskah made a name for himself handling interplanetary business disputes.

Ministry of Defense: The Ministry of Defense coordinates the activities of the StarForces, as well as planetary militias and other military entities within the federation during times of crisis. While the armed forces technically look to the U.W. president as their ultimate commander, the Defense Ministry serves as the link between military officers and civilian administrators. Sorcha Cassidy, a human of Irish descent, is minister of Defense. A former delegate representing Luna, Cassidy spearheaded the Assembly investigations into corrupt contracting practices that toppled the previous president.

Planetary Governments - The Ministry of Colonial Affairs administers colonies, with creation of a local government a key step in the process of earning independence and full U.W. membership. In the early days of a new colony, an administrator named by the ministry governs with the aid of an advisory council elected by colonists.

Over time, experts from the ministry help colonists draft a constitution and undertake other tasks vital to forming a government. The fledgling government gradually takes on more responsibility as the world nears independence, with Colonial Affairs officials withdrawing to advisory roles. Local governments are responsible for enforcement of planetary laws, collection of non-U.W. taxes, regulation of businesses on independent worlds, and so on.

An independent world may have any form of government, as long as it includes some form of democratic representation of the people. Various forms of representative democracies predominate, but a few constitutional monarchies and pure democracies are also present within the United Worlds.

On some worlds, so-called "true independence" movements have evolved, arguing that the former colonies aren't truly free if they're given no choice whether they want to join the U.W. after the end of Colonial Affairs administration. No colony has yet attempted to go it alone in this fashion. Frustrated, some true independence groups are now turning to terrorism to press their point.

All planetary governments of U.W. member worlds and colonies are subject to the provisions of their colonial charter or membership. While serious violations of these provisions can be enforced by any duly authorized U.W. peacekeeping force, in practice, all incidents are handled by ships of the race in question. So far, it is a moot point for the Nutoa and D'eir, who have had no internal problems of this level and are largely as baffled by human psychology and behavior as we are of theirs.

Fires of Heaven^{v1.0}

The StarForces - The StarForces, consisting of the StarForces Navy and Marine Corps, are the military force of the United Worlds. The federation president serves as StarForces commander-in-chief, and the Ministry of Defense handles civilian administration of the military.

StarForces High Command oversees both branches of the armed forces and represents the top military authority in the armed forces. The president selects the StarForces commander, by long tradition alternating between Navy and Marine Corps officers with each selection. Admiral Isao Kajiwara currently serves as StarForces commander.

The StarForces Navy provides the interstellar fleet protecting the United Worlds against space-borne threats, as well as transporting marines to hotspots. A variety of naval vessels patrol the federation spacelanes, defending against hostile aliens, pirates, and other hazards.

The StarForces Marine Corps constitutes the ground forces of the federation military. Marines provide security aboard Navy ships, conduct boarding actions, fight in ground engagements, and handle other combat assignments as needed.

StarForce Academy, a four-year university orbiting Luna in Sol system, turns young cadets and midshipmen into StarForces officers.

Government Revenue - A federation-wide flat tax on all personal and business income, coupled with mild tariffs on certain goods transported between worlds, funds the federal government.

Independent worlds apply a variety of taxes and tariffs to finance their own governments. The U.W. has no control of the tax policies of self-governing worlds, but it would potentially be concerned with abusive tax collection methods or with attempts to prevent citizens or corporations from fleeing planets with oppressive tax regimes.

Grigo is a great mechanic; I don't know how we'd keep the plant running without him. But at mealtime - well, I try to schedule my lunch break around Grigo. You know Nutoa don't cook their meat, right? First time I saw Grigo chewing on a raw mouse - well, I made quite a mess, especially in zero-g. It wasn't so much the raw meat as the fur.

*- Julietta Adibekian, orbital factory worker,
2235CE*

▼ **CULTURE** - The United Worlds of the 23rd century exhibit a vibrant, highly diverse society embracing the arts, entertainment, sports, and a hundred other pursuits.

Cultural Cohesion - A colorful panoply of cultures comprises the United Worlds, but the structure of the federation helps to ensure a degree of cultural cohesion, despite the plentiful differences between the U.W.'s worlds and societies.

The federal Colonial Affairs Ministry provides a common foundation for governments, economies, and social structures as it guides new colonies toward independence. In addition, the U.W. Charter affords certain basic rights to all citizens, ensuring further similarities between worlds.

Plentiful opportunities for travel, not to mention the interstellar media, prevent worlds from sinking into isolation. Every planet enjoys a constant infusion of new concepts, values, foods, clothing styles, and other cultural cues, blending together to form an interstellar society made up of numerous distinct components.

Cultural Diversity - While there are cultural features common to most U.W. worlds, there are also forces that make each planet in the federation unique.

In addition to the alien D'eira and Nutoan societies, the federation incorporates numerous worlds colonized chiefly by settlers from distinct Earthly national, religious, or ethnic backgrounds. For example, many inhabitants of watery Nai are of Polynesian descent, while arid Brigit was colonized under charter to the Roman Catholic Church.

Federal and planetary governments, as well as numerous charitable foundations, make concerted efforts to keep traditional costume, dance, food, storytelling, music, and other aspects of each culture alive.

And while the interstellar media ensure a certain minimal level of federation identity on all U.W. worlds, the inefficiencies of light-speed transmission, and the expense of instantaneous transmission through jumpgates prevents continuous large-scale cultural exchanges from one world to another, a problem that becomes more acute as the distances between any two planets increases.

As a result, the individual culture of each world reflects not only the overall United Worlds society but also the rich cultural traditions handed down by its original colonists and the local developments that have accumulated over the decades.

Arts and Entertainment - Whether on one of the core worlds of the federation or on the harshest of newly established colony worlds, only robots work all the time in the 23rd century. Everyone else needs to escape from everyday concerns once in a while - whether in art, music, a trip to the circus, or a virtual reality dreamscape program.

Digital art has joined sculpture, painting, photography, and other forms of visual artistic expression. Poetry has also prospered, particularly with the endless new topics for prose provided by expansion of human horizons across space. Novels, whether the finest literature or pure escapism, continue to be popular. Most are sold as software for portable readers, but a fair number of books are still printed on paper (actually, a recycled plastic).

The art of dance, ranging from ballet to esoteric modern forms (some of which can be performed only in low- or zero-g conditions) has also persevered through the centuries. Classical arts from a variety of cultures, such as Japanese flower arranging, are yet another respected component of the United Worlds arts scene.

Popular music continues its constant evolution, and concert tours by top acts are now interstellar affairs. Musical styles of the past, meanwhile, attract new fans through periodic nostalgia fads. Classical music as well as traditional songs from many cultures are kept alive by symphonies and performances throughout the federation.

Live theater thrives beneath dozens of suns, with performers staging everything from Shakespeare to kabuki to daring new plays. Musicals, both revivals of classic shows and the latest creations of song-smiths, are likewise presented for public acclamation or scorn.

Visual entertainment is fully three-dimensional via holographic technology, with holoplexes replacing neighborhood cinemas and a holo projector the television set. Another popular form of entertainment, computerized "dreamscapes" create partially or wholly imaginary worlds utilizing virtual reality to immerse the viewer completely in the story or even allow them to take part in it.

Amusement parks of the 23rd century are incredibly sophisticated, using holographic and virtual reality technology to devise attractions far beyond anything found in earlier parks. Super-strong carbon fibers and monofilaments have made truly wild roller-coasters possible - exceeded only by even newer designs at orbital parks incorporating zero-g and artificial gravity amusements.

The global computer datanets found on most United Worlds core worlds offer endless opportunity for entertainment, from downloadable holovids to multi-user virtual reality adventures shared with other online participants. Chatrooms, message boards, news, and opinion outlets, vidcam views of happenings elsewhere - people can always find something to do on the datanets.

In addition to the unique perspective on human artistic endeavors offered by contact with non-human civilizations, alien art forms provide a perpetual influx of insight and innovation to the art world. The Nutoa favor sculpture that interacts with the environment, incorporating sound and motion much like wind chimes. Nutoan works are popular with humans, and the Nutoa are likewise fascinated by the artwork of other races.

Works of art by the D'eira tend to be less accessible to outsiders. They focus on complex geometric shapes that, while often attractive, require a deep knowledge of mathematical principles to be truly appreciated. The D'eira are also known for their musical compositions - another expression of mathematical relationships.

Jodoni art is wildly diverse. Jodoni artists apparently practice every form of art in every variation. Some demesnes do nothing but produce art, often adhering to a particular form or style. Some Jodoni works of art are reasonably appealing to humans, while others are so bizarre as to be incomprehensible.

Nothing is known of Vorn artwork (if there is such a thing), and the Ethereans produce no physical works of art. Some Ethereans create elegant thought constructs to share with others - a form of psionic art beyond the capability of most humans to grasp.

Fires of Heaven^{v1.0}

▼ **Circuses** - The venerable Earth tradition of traveling circuses has made the transition to the stars. Several circuses now traverse the United Worlds, bringing the wonders and amazements of the big top to planet after planet.

DATA DUMP

One of the best known, the Ringling Bros. and Barnum & Bailey Circus, dates back to 19th-century Earth. The circus has six touring companies, each following a predetermined circuit among U.W. worlds, spending a few weeks or months visiting the major population centers of a world before moving to the next planet or system on its itinerary. The circus supplements traditional acts such as trapeze artists, clowns, and acrobats, with innovations including exotic animal acts, performances drawn from alien cultures, and feats using high technology. One touring company, for example, consists solely of acts tailored for low- or zero-gravity performances on starports, space habitats, and moons. A highly sophisticated corporate headquarters and skilled touring personnel manage the day-to-day details of advertising, permits, supplies, repairs and schedules.

Circuses also incorporate dance, music, and entertainment from all the diverse worlds of the United Worlds to give audiences a taste of far-off places. Circus owners are negotiating with Jodoni demesnes to send a touring company on a circuit through the Jodoni Combine.

Knowing that good business means taking advantage of your knowledge, Ringling Bros. also runs a consulting service for anyone needing to transport unusual lifeforms. Long experience with both biology and bureaucrats, alien and otherwise, has given them a number of experts on the subject, which they will hire out for projects ranging from exotic zoos to commercial enterprises.

Circus to the Stars - reference re348234.326030.040922 - .05Cr

Economics - In the United Worlds, the interstellar economy and most independent worlds operate on a capitalist system, although a few worlds experiment with socialist models.

The colonies and member worlds of the U.W. are all highly interdependent, and not all are self-sufficient - a world rich in metals may require importation of fertilizers and soil treatments, for example.

While trade goes on between all federation worlds, interstellar trading ties are strongest between core and frontier systems. Frontier systems possess abundant raw materials, some unique or at least rare elsewhere, but rudimentary industrial bases precluding manufacture of many advanced devices. Core systems, on the other hand, typically have strong industrial bases but may require foodstuffs, ores, or other raw materials found on the rim of the United Worlds. It is a matter of political pride and electoral posturing for a world to be completely self-sufficient, but most worlds are unwilling to invest the money required to produce everything they need. As a result, even core worlds rely on some interstellar imports, and most core worlds will rely on imports from off-world mines or production facilities in the same system.

Corporate shipping lines and independent haulers form the backbone of interstellar trade. Smugglers use their vessels to carry contraband or evade tariffs, while pirates prey on freighters of all kinds to steal valuable cargoes.

The availability of near-instantaneous interstellar communications permits federation-wide financial ventures, although time lag for messages to travel from a world to an interstellar comm array at the outer edge of the star system or on shipboard as a dataspikes prevents split-second stock trading or other time-dependent transactions.

Most business ventures, from the general store of a pioneer settlement to a major core world manufacturing plant, are corporations of one form or another. Some grow large enough to spread throughout the United Worlds, opening branch offices and operations on numerous worlds. The successors to Sol system's transnats, these transstellar corporations wield enormous power and influence as they compete rapaciously with each other for markets and profit.

Leolani

Leolani, whose name means "heavenly voice" in Hawaiian, may be the best-known entertainer in the entire federation. Her recordings are all top hits and her interstellar concert tours sell out months in advance. Early fame and a lavish lifestyle molded Leolani into the epitome of self-absorption. She cares nothing for the concerns or problems of others, and expects her coterie of assistants to cater to her every whim. Many around her consider Leolani the most relentlessly self-centered person they have ever met. An incredible series of events has forced Leolani to reconsider her egocentric ways, however.

DATA DUMP



Following a series of performances at resorts on Nuadu in the Epsilon Indi system, a teenage girl passed a computer dataspikes to Leolani during an autograph session and begged her to deliver it to federation authorities. Two thugs, hired security for the resort, chased the girl away and asked Leolani for the dataspikes. Leolani surreptitiously switched it with one of her own and gave an ordinary game spike to the thugs, just to be contrary. Unbeknownst to Leolani, the dataspikes she carried off Nuadu and quickly forgot about contains evidence of corruption at the highest levels of the independent planetary government, information that could trigger a federation crack-down on the criminal activity rampant on Nuadu, a proposal now mired in endless bickering in the U.W. Assembly. Facing the potential obliteration of their criminal empires, the crimelords of Nuadu and their allies in the Antares Cartel smuggling ring took immediate steps to eliminate the problem. A saboteur's bomb destroyed the chartered liner conveying Leolani to an engagement in the Epsilon Eridani system. Authorities believe there are no survivors, and news of the disaster spreading throughout the federation has plunged Leolani's legions of fans into mourning. In reality, Leolani made it to a shuttle with a handful of her companions. The shuttle crashed on the uninhabited world of Loki. The craft's smashed comm systems rendered the castaways unable to call for rescue. Now Leolani faces a desperate battle for survival in the predator-filled jungles of Loki as she helps care for those injured in the crash and seeks a way off the hostile planet. For the first time, Leolani has started to think of others instead of just herself.

Tossed into a carryall bag aboard the lifepod, the dataspikes lies forgotten amid the wreckage. A human of Hawaiian descent, Leolani, 20, stands 157 cm tall with a slim build. She has long black hair and attractive brown eyes. Leolani has the grace of a trained dancer and tremendous natural charisma.

Currency - The "credit" is the standard unit of commerce in the United Worlds. No other forms of currency exist, even on independent worlds or the various nations of Earth. The D'eira and Nutoa use credits, although remote Nutoan villages may prefer barter to cash.

Almost all credit transactions are handled electronically - there are no actual bills or coins. Most citizens carry holocards known as credit chips used to transfer credits between accounts via in-store or handheld automated transaction devices. A credit chip is programmed with the DNA code of its owner, and sensors in the holocard take a DNA scan from the card's holder at the time of a transaction, comparing it to the stored code as a security measure.

Each Jodoni demesne has its own currency, and the rules governing exchanges between them are so complicated that most humans dabbling in Jodoni currency trading lose their investments. Friendly demesnes accept U.W. credits at a fixed rate of exchange.

Ethereans have no need of money. Human exosociologists speculate that it is unlikely that the Vorn use currency.

Those engaging in interstellar travel between core worlds generally have their relevant banking information transferred via gate or sealed datacans on the ship they travel on. Those going outside the core worlds with sufficient notice will have some quantity of credits and credit information shipped ahead and deposited in a friendly financial institution. Last, credits can be encoded as debit cards, acceptable anywhere there is a DNA reader that can verify the codes (confirming that the card and its holder match). The system is not foolproof, but is generally good enough to prevent interstellar fraud schemes. Transfers from credit mediums that are outside a planet's financial network are allowed once. That is, you could accept a transfer from one credit or debit card to another virtually anywhere, but the balance transferred is "locked" until it can be verified. You can't spend it until a planetary bank can verify it.

▼ **Note** - Players can compare it to travelling to a less developed country in the early 21st century. There is no guarantee that someone you want to buy something from will be able to process your credit card, so you need to have backup options, like traveller's checks or the generally accepted US dollar.

Fires of Heaven^{v1.0}

Education - Independent worlds in the United Worlds devise their own educational systems, from early childhood all the way to institutions of higher learning. Most worlds mandate schooling up to a certain age, driven by custom, societal values, and the economic benefits of a well-educated workforce.

Schooling on frontier worlds tends to be more practical, educating children in survival and useful trades as well as coursework in the traditional fundamentals of mathematics, language, history, and so forth. Even on newly settled worlds, modern technology helps students learn thoroughly and efficiently: educational holovids and virtual reality software can take pupils to the battle of Sekigahara in 16th-century Japan, inside a living cell, or into a scene from Macbeth. Desk computers provide individualized lesson plans, administer tests, assist teachers with grading, offer help to students struggling with an assignment, and perform other useful functions. In time-honored tradition, students attempt to subvert these functions, which is a form of education itself.

In the field of higher education, prestigious universities and colleges are found on many worlds. Of course, nearly all of the most renowned institutions (some nearly a thousand years old) are found on Earth. The best universities are also centers of research and experimentation, where many a technological innovation or radical theory has originated.

Since there is nothing quite like being there, many institutions will have satellite branches on distant worlds, or sponsor expeditions to the frontiers, especially for researchers in the so-called "exo-" or "xeno-" fields (exobiology, xenoarchaeology, etc.).

I had dewberries for the first time on my honeymoon on Eden. I love them! But Hachiman is a long way from Alpha Centauri A and we don't make much money, so they're too expensive for us. Every year on our anniversary, though, my husband brings home dewberries.

- Chanah Levy, nurse, 2235CE

Food - Typical cuisine in the United Worlds depends almost entirely on where the meal is being served. On a space habitat, meat may be an expensive luxury, while on Tawhirimatea (a world initially settled by colonists from China) most dishes will be Chinese. Certain foods grow well on some worlds, and hence predominate in local foods. A few planets even have native plant and animal life edible by humans, allowing truly exotic dishes to be created.

Food can also provide important clues to the local culture. At a zero-g mining operation, meals may be bland, easy to prepare, and designed to fulfill basic nutritional needs with a minimum of fuss. In contrast, formal meals on some worlds are elaborate, multi-course affairs requiring hours or even days of preparation, playing a vital role in the social life of the participants. Food continues to be inextricably linked to celebrations, from traditional dishes served at cultural festivals to the cake served at a wedding.

Language - Anglic, derived primarily from English, and modified so that it can be spoken more easily by D'eira and Nutoa, is the standard language of official U.W. documents and inter-world commerce. As a side effect, Latin has largely disappeared from legal documents, replaced by equally dense and obscure Anglic terms designed to have a commonly held meaning for humans, Nutoans and D'eira (no easy task). Though all youngsters are taught at least basic Anglic in school, many languages from the diverse heritages of Earth thrive in the 23rd century, often dominating daily life. For example, on Ryujin, while most people can speak Anglic, almost all conversation takes place in Japanese. Signs are in Japanese *and* Anglic, and users of the worldwide datanets have the option of receiving data in either language.

Mass Media - Various mass media enterprises help knit the diverse societies of the United Worlds together. Some systems have holocast networks that beam programming throughout the star system. In addition, there are regular network news programs produced in Sol system that are recorded daily and transported throughout the United Worlds for replay, ensuring that all U.W. member planets and colonies are informed about federation-wide events and governmental decisions. Obviously, the absence of real-time interstellar communications precludes live news or entertainment broadcasts outside a single star system.

Computer datanets, found on most core worlds, are a vibrant form of 23rd century mass media, providing opinion, news, entertainment, and artistic content.

Wireless service correspondents through the United Worlds send reports to the services, which disseminate stories to datanet online services, holocast networks, and other news outlets. The two largest services are Reuters-AP and United Worlds Press, or UWP.

Accredited representatives of recognized news providers are accorded certain legal privileges regarding the confidentiality of their sources, and freedom to disseminate information based on those sources, while public and private figures alike have certain protections against being slandered by the media. While U.W. worlds may not infringe on either of these protections, they can be selective in their enforcement of them, and it can take quite a while for the U.W. Assembly to address such problems.

The U.W. Assembly can impose limited media blackouts or delays, and has the option of restricting release of any information that would compromise ongoing investigations or military operations.

Some people say the more we learn about the universe, the harder it is to believe in God. For me, though, it's just the opposite. The more worlds I visit, the more forms of life I see, the harder it becomes for me to believe it's all just some cosmic accident.
- Kiril Mladenov, explorer, 2237CE

Religion - Despite predictions that humanity would someday outgrow religion, faith remains central to the lives of billions of United Worlds citizens.

Christianity and Islam are predominant, trailed by Buddhism, Hinduism, Shintoism, and Judaism. Less prevalent faiths abound, from ancient beliefs to recent fads. As human society has adapted to new technologies, interstellar colonization, and contact with alien civilizations, so too has religion adapted... or isolated itself. Some space habitats and colonies are populated largely by adherents of a single faith who seek to pursue their beliefs secure from outside influence or fear of persecution.

Since the cloning of humans became feasible (if not legal) in the mid-21st century, spiritual questions have been debated that are no less profound than the legal and ethical quandaries raised by the existence of artificial humans. In time, most major faiths came to a consensus that clones bore the same divine spark, spirit or soul as humans of more conventional origin.

The discovery of extraterrestrial life posed a similar, if not greater, challenge to religious thought, but the varied beliefs of humanity once again evolved to continue serving the needs of the faithful.

For example, a re-examination of the Bible and related religious writings has led most Christian faiths to the interpretation that Christ died for all sentient beings, not humans alone. Biblical phrases and concepts like that of man being created in God's image are considered symbolic of sentience rather than actual physical form. Missionaries went out to spread their gospel and attempt to save countless newly discovered alien souls from damnation.

Fires of Heaven^{v1.0}

▼ **Monastic Life** - In the early 21st century, the age-old religious tradition of seeking enlightenment through isolation nearly vanished under the relentless pressure of population growth. The tide of urban sprawl engulfed once-remote religious retreats, and new institutions faced nigh-insurmountable problems in securing a suitably isolated location.

DATA DUMP

Few were quicker to grasp the possibilities opened by renewed interest in space following the Biotech Wars than the monks, priests, and nuns of a wide spectrum of religious orders. As private orbital habitats became feasible, several churches of a variety of faiths established communities in space. Already insular, disciplined, and largely self-sufficient, religious orders adapted well to life in space. Over time, these monks and nuns became a small but respected contingent among spacefarers and are credited with playing key roles in the early settlement of Sol system.

In the 23rd century, orbital monasteries, abbeys, and convents continue to prosper, particularly in Sol and other core systems. Despite the abundance of thinly populated worlds on the frontier, many religious orders prefer the extreme isolation of space to even the most remote planetary retreats. Hydroponics has replaced conventional farming and technical tasks have superseded obsolete chores, but in large part the ancient traditions of monastic life survive intact. Monks, nuns, and other religious figures continue to pray, study, and ponder much as they have for centuries.

Exoreligion and Modern Man - reference ds236784.198323.879127 - .05Cr

Naturally, agreement on issues with such deep spiritual implications did not come easily or with unanimity. A few churches splintered, while new faiths arose from the impassioned debate. For the average person, most of the big religious questions are ancient history. The Progenitors, first contact with various alien races and the following religious furor are things that were settled decades or centuries ago. The religious faith a person has joined is most likely one they are comfortable with in terms of its views of the Divine, humanity, aliens and our place in the universe.

Fringe Religions - As humanity spreads itself across the cosmos, new religions, philosophies, and theologies arise in a perpetual evolution of spiritual thought. Some have gained mainstream acceptance over time, while others are disregarded (fairly or not) as collections of kooks, fanatics, and cultists.

The Church of the Holy Mind reveres the alien race known to humans as Ethereans, teaching that the ancient psions raised humans to sentience eons ago via the power of their minds. The reaction of the enigmatic Ethereans to this faith has never been recorded. Other fringe religions, however, are grossly xenophobic, considering alien races agents of darkness corrupting the purity of human spirituality. Human psions, carriers of an Etherean micro-organism, are viewed as irredeemably tainted by these sects.

Other fringe religions worship everything from cybernetics to the stars themselves. Most followers of non-mainstream beliefs are harmless, but a handful are considered extremely dangerous. Angels of the Apocalypse, for example, seek to bring about the end of the universe and deification of their prophet through bloodshed. Terrorists who have killed thousands, the Angels represent a highly secretive and deeply feared cult.

Religious Freedom - The United Worlds Charter guarantees religious freedom to all citizens, though this freedom does not convey immunity from prosecution for illegal acts committed in the name of religion.

Individual worlds, even independent states, are bound by this mandate as well. While a particular religion sometimes predominates on a world, the planetary government may not discriminate or permit discrimination against followers of other faiths. The balance between religious freedom and rule of law remains a delicate one that continues to inspire passionate debate.

Alien Religions - Humankind is not the sole practitioner of religion in the cosmos.

Deep-thinking philosophers by nature, the D'eira have formulated several moral codes, all based around the principles of cooperation and pacifism to some degree. They possess nothing akin to deist beliefs, however, although some humans slyly note that the D'eira devotion to mathematics exceeds the religious fervor of worshippers in many human churches.

Nutoa follow a variety of faiths, varying slightly from village to village. Most center on some form of ancestor worship. A peculiar new faith, vaguely resembling the cargo cults of Earth history, has arisen in some villages with little human contact. Adherents ascribe a divine origin to the fantastic technology brought to Yewel by humans, but disagree on how the Nutoa are to gain more of the wondrous gifts.

The Jodoni Combine is home to *thousands* of religions. Each demesne follows its own faith, or none at all. Even when numerous demesnes share fairly similar beliefs, they are more akin to a religion split into hundreds of sects than any human church. Jodoni beliefs run the gamut from animism to monotheism to esoteric, non-deist philosophies and codes of conduct.

Ever enigmatic, Ethereans seem to have no analogue to human religion. The Vorn, likewise, practice no religion beyond a total commitment to the evolutionary imperative that drives them to seek out challenges in order to better their race. Even so, both races have beliefs and behaviors that border on the spiritual, leading philosophers to ponder whether spirituality is common to all sentient species.

Sports and Recreation - Leisure activities remain a vital part of 23rd century lifestyles. Despite advances in technology, entertainment, and medicine, humans still need to relax, play, and compete through physical activity. Traditional sports, such as football, soccer, jai alai, rugby, baseball, basketball, golf, martial arts, and racing continue to be popular. New versions of these old favorites have been developed for worlds with variant gravities or atmospheres and other offbeat conditions.

The possibilities opened by space travel have resulted in development of numerous new sports as well. Gravball, a team sport fusing elements of basketball and football in freefall, has a faithful following on space habitats throughout the United Worlds.

Solar-sail regattas are another favorite variation on an old Earth sport, though non-aficiandos compare it to watching paint dry through a telescope. The Mars Cup, a series of races held every three years, is widely considered the most prestigious of these races. Competition between Mars and Earth, in particular, for the coveted cup is fierce.

Humans have carried many traditional recreational pursuits, including ocean diving, rock climbing, gliding, skydiving, and spelunking, to other worlds where exotic conditions bring fresh challenges.

Fishing and hunting are popular on colony worlds with transplanted Earth animals (game animals often being introduced alongside terran plants to alien ecosystems), but especially on worlds with indigenous lifefoms. Exotic trophies, such as Naian seadragons and Asgardian snowbeasts, are highly prized by anglers and hunters.

One of the most extreme of the "extreme sports" is re-entry diving, in which a person wearing re-entry thrusters, chutes, and protective ablative armor dives off a low-orbit shuttle or platform to fall all the way to the planet's surface. The diver actually undergoes atmospheric re-entry much as a starship does in a landing cycle. The practice is illegal on a number of worlds, which makes it no less popular in these places.

▼ **ADVENTURE SEED** - The U.W. intelligence services might find an adventurer (or extra) who is skilled enough to pull off a personal re-entry and evade law enforcement authorities after landing to be a prime recruit. Adventurers could be (benignly) chased, not knowing it is a hiring attempt, or be hired to find such a person and offer them a job.

Fires of Heaven^{v1.0}

▼ The Olympic Games - The

DATA DUMP

Olympics are the pinnacle of athletic endeavor, as they have been for centuries. Held every four years, the Olympic site rotates among the United Worlds. Competition to host the games, which bring an influx of tourism as well as interstellar prestige, is strong.

Such longtime favorites as track-and-field events mix with newer sports such as gravball in a weeks-long celebration of personal endeavor. But athletics are no longer the only form of competition; intellectual and artistic events provide individuals of all types and talents an opportunity to test and be tested against the best of the best.

Alien races are welcome to participate as well. Several traditional D'eira and Nutoan games are now recognized Olympic events. In contests where some race possesses an inherent advantage, athletes compete in separate divisions (much like the men's and women's events of 21st-century Olympics). Athletes are free to challenge themselves by competing in divisions where they are at a disadvantage, and a handful of medals have been won by cross-division competitors.

The most recent games were held in 2236CE on Ryujin in the 61 Cygni A system. The next Olympics are scheduled for 2240CE on Nai in the Tau Ceti system, the first time they will be held on a non-independent world.

UWOC Press Release - reference ur374112.922867.105592 - .00Cr



Time - In an interstellar civilization, even something as simple as determining the time can be complicated. The length of a day or year depends on the rotation or orbital period, respectively, of the world involved. On tidelocked worlds, a day is a year, and in the blackness of space, there are no days or years at all.

By necessity, inhabitants of the United Worlds follow certain temporal conventions. The official time is always Greenwich Mean Time on Earth, a practice arising more from custom than practicality. Most starships and space habitats operate on GMT, more commonly known as "standard time". Luna and all Sol system space habitats also use GMT as their local time.

Since their rebellion against Earth, Mars has stubbornly operated on a day made up of 24 Mars hours (each one just under 62 Earth minutes long), and similarly, Mars minutes and seconds are fractionally different from Earth's. While a few minutes difference doesn't matter in most situations, it could be disastrous if a Martian astrogator tries to calculate a jump using the figures they are accustomed to with a ship's computer calibrated to Earth-standard units without running the proper conversion program.

Official documents, historical data, medical records, and so on measure dates by Earth years (known as e-years).

In daily life, most planetary inhabitants use local time for all but official records. Many worlds have devised local calendars for everyday purposes, but most United Worlds citizens still measure their ages by e-years. Fortunately, computer utilities for converting local times and dates to interstellar standards are commonplace and usually free. Most personal timekeeping devices are now designed to display time in a variety of units, based on high-accuracy radio time signals received by a miniature receiver in the watch itself.

Law - There are numerous codes of law in the United Worlds: a uniform set of federal laws, and the legal codes of various independent worlds. All federal and planetary laws must conform to the United Worlds Charter. Planetary laws must further meet the requirements of a world's own constitution.

Legislation enacted by the United Worlds Assembly becomes federal law. Federal laws apply to all regions under federation jurisdiction (including interstellar space), and may apply to independent worlds as well. The Assembly has the power to adopt laws that supercede those of independent worlds.

Worlds that have gained their independence create their own codes of law. Their laws may be more strict, within bounds of the rights and freedoms granted by the United Worlds Charter, but never less strict than federation laws deemed applicable to independent worlds.

For example, the federation bans personal possession of automatic lasers throughout the United Worlds, including independent worlds. A particular world may also ban possession of any other type of laser weapon, but cannot pass a law permitting personal ownership of automatic lasers.

Fines or incarceration are the most common sentences for criminal violations, although the U.W. Charter permits capital punishment in certain cases (still a touchy issue in some jurisdictions). Some independent worlds and individual jurisdictions on Earth elect to eliminate the death penalty for violations of planetary law, but federal courts on those worlds are not bound by such legislation.

The laws of the United Worlds are an evolution of the legal frameworks of various Earth nations and, as such, parallel 21st-century laws in many regards.

Laws on Equipment - Laws governing personal equipment are of particular interest to interstellar travelers, whose possessions may be perfectly legal on one world and contraband on another.

Arms and Armor: The government has a clear interest in regulating the manufacture, sale, possession, and use of armaments. Core worlds almost invariably put the needs of society ahead of those of the individual, while fringe worlds maintain a stronger tradition of individual freedom (and personal responsibility). Though specific laws vary, certain broad standards apply.

Non-lethal arms, such as electrostatic stunners and stun rods, receive the least scrutiny. They are almost always legal to own and carry, although in some cases permits are required, and even these weapons may be prohibited in federal buildings or public transport. Private companies may also have "company policy" regarding the carrying of weapons on corporate premises or on their commercial vehicles. Semiautomatic weapons like cartridge, caseless or laser weapons, which fire one shot each time the trigger is pulled, are likewise generally legal to own - although possibly not to carry loaded or concealed.

Weapons capable of automatic or autoburst fire are usually tightly restricted, in most cases limited to the military or law enforcement. Permits may be issued for civilian possession of automatic weapons, but applicants must have no criminal or mental health record and show a very strong cause for needing the arms. Industrial or mining continuous beam lasers are strictly regulated above certain power outputs, and any illegal use of an industrial or commercial laser is treated the same as an automatic weapon.

Explosives of all types are strictly regulated. Microtags in all industrial or military explosives make it easy to track the purchaser and company of manufacture in the event of illegal use. Illicitly manufactured weapons, such as those turned out by black market factories, are illegal to purchase or possess even if they would otherwise be allowed (under product safety regulations). It is illegal to carry lethal concealed weapons of any kind without a federal permit in areas under federal jurisdiction: independent worlds and colonies may set their own policies based on local conditions.

Fires of Heaven^{v1.0}

Federal laws on arms are strictly enforced everywhere in the United Worlds where there are marshals or other law enforcers around to carry them out. Many core worlds go beyond federal law, banning citizens from carrying armaments in public without a license. Some outlaw even private ownership of certain or all weapons. Visitors to these worlds are typically required to turn any illegal arms over to the planetary police for safekeeping until their departure. Frontier worlds, on the other hand, tend to take a different view of personal armament. The danger of hostile lifeforms, Vorn incursions, and other hazards (real or perceived) makes carrying a weapon good sense on some colonies. Of course, just about anything can be purchased on the black market, including restricted or illegal arms, for those willing to pay exorbitant prices and risk arrest.

Most forms of armor are far less regulated, though peace officers are naturally suspicious of anyone protectively garbed. Certain types of armor, such as combat helmets and other StarForces Marine Corps gear, are produced under exclusive contracts and aren't sold to the public. However, most of the time they are not illegal to own, provided their serial numbers are not removed and do not indicate the item was stolen. Most of the ones in circulation are actually in the hands of collectors and not actually used for combat purposes.

Starship Armaments: Civilian starships are armed out of necessity. Space is vast, and the StarForces Navy cannot be everywhere. Pirates and other hazards abound. If United Worlds law prohibited arming civilian craft, requests for armed escorts would strain Navy resources and curtail interstellar trade.

But good sense demands oversight of starship weaponry. Weapons considered primarily defensive in nature, such as short range laser cannons, can be purchased with little government interference beyond filing a few forms (but *using* them generates a virtual blizzard of paperwork). The degree of federation interest and scrutiny rises as more powerful weapons, such as long range missiles or high-powered particle beam cannons, are sought. Finally, some weapon systems are restricted to military use.

Psionics is like love. You cannot truly understand it unless you have experienced it.

Marcin Devon, 2221CE

▼ **PSIONICS** - The long-fabled power of the mind has emerged from fancy to scientific fact in the 23rd century. Some researchers date the first appearances of human psions far back in history, but the inability of scientists to confirm most claims of psi powers, not to mention the frequent outright fraud, did little to counteract the prevailing opinion of psionics as a dubious curiosity throughout most of human history.

But beginning in the mid-2180's, manifestations of recognizable, quantifiable psi powers rose precipitously among humans. Researchers soon linked the appearance of human psi powers to contact with the alien Ethereans. First encountered in 2172CE, the aquatic alien race possessed enormous psionic powers brought to the fore by symbiosis with a non-intelligent, microscopic spore native to its homeworld.

Surprisingly, a fraction of humans exposed to the spore also served as acceptable hosts for it, which likewise awakened their psionic potential. By the time it was discovered, the spore had spread throughout the United Worlds.

When questioned by human diplomats, the prescient Ethereans replied, with alien logic, that they had foreseen the inescapable awakening of human psi powers and therefore saw no reason to warn humanity about the existence of the symbiotic spore.

Psionics had abruptly progressed from fanciful tales to scientific reality, stirring considerable unrest as society, science, and the law struggled to catch up. While some reacted with fear or caution, most U.W. citizens greeted the astounding news with fascination - perhaps prepared by centuries of speculation on the existence of psychic phenomena. The public hungered for news of psi powers, psions, and the possibility of opening the powers of the mind in others.

After nearly half a century, psions are now an accepted part of United Worlds society. Psions, particularly operant ones, are still rare enough to be noteworthy but the clamor excited by early psions has faded. However, the entertainment industry continues to capitalize on public fascination with psionics. Several holovids, holocast series, and other productions focus on psions or psi powers, e.g., the "Psi Squad" series of big-budget holofilms detailing the adventures of a fictional squad of psionic intelligence operatives.

Still, primal fears of someone penetrating private thoughts or subjugating others to his will lurk behind the tolerant outlook of some United Worlds citizens. Outside mainstream society, certain fringe religions and radical groups preach hatred of human psions for reasons ranging from their exhibition of "devilish" powers to their "alien taint".

In the 23rd century, a sizable share of human psions possess latent powers, over which they have little to no control. In some cases, training and discipline can bring latent powers to operancy, but there is no reliable way to induce psi powers in a non-psion. Black market psi-boosting drugs, can temporarily enhance the power of existing psionics at some risk to the user.

Most operant psions can learn to manage their powers, although there are cases of uncontrolled telepaths incapable of shutting out the thoughts of others. Prior to fabrication of psi-dampening drugs, most of these cases ended in insanity or suicide. Other operant psions, however, can expand their capabilities with study and practice, bringing hitherto undiscovered latent talents to operancy, devising innovative applications for existing powers, and sharpening their control.

▼ **A Dark Secret** - Researchers at the Institute of Psionics have discovered that some human psions show signs of progressive neurological damage, apparently related to imperfect adaptation to the alien spore responsible for awakening their psionic potential. In the cases studied so far, this damage takes a number of forms, from memory loss to motor control damage. Some have also displayed an apparent link between the amount of damage and relative strength of the psion's powers. The institute has kept the frightening news quiet out of fear that it could reignite public suspicion of human psions.

DATA DUMP

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Psionics and the Law - The emergence of human psions has prompted a few changes to United Worlds law. Federal or planetary laws already cover most potential crimes involving psi powers. For example, psychokinetic beatings or pyrokinetic arsons are simply unorthodox violations of existing statutes. In most cases, psi powers that do damage are counted as a crime committed with a weapon or an aggravated version of a normal crime. So, a psionic mugging would be counted as armed robbery.

Other potential misuses of psi powers had less clear-cut ramifications, and some of the solutions first proposed threatened to compromise the civil liberties of federation citizens with psi powers.

In 2188CE, the worlds of the United Worlds ratified an amendment to the U.W. Charter addressing these twin concerns. The amendment noted that citizens have a right to be free from unwanted psionic intrusion, but also extended constitutional protections against discrimination to cover psions.

One of the most important laws subsequently enacted by the United Worlds Assembly, the Personal Privacy Act of 2190CE, outlaws use of telepathy, mind control, or other psi powers infringing on the right of every citizen to be secure in the inviolate privacy of their own mind. The act also enjoins law enforcers from any use of information obtained by psionic means from an unwilling subject. The courts, however, are still wrangling over standards of proof in such cases, along with the acceptability of evidence obtained by psychometry, prescience or other legal but highly unorthodox methods involving psi powers.



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Psions in Society - The social fabric of the United Worlds has had to stretch to adapt to the existence of psi powers. Extremists of various stripes may worship or hate psions, but most people display a tolerant attitude to psions who don't abuse their talents. Nonetheless, many psions choose to keep a low profile and are cautious about revealing their powers to others for fear of persecution.

Most human psions, particularly those with weak powers, hold ordinary jobs in a variety of fields, but numerous opportunities exist for operant psions with strong or useful powers, from security personnel able to sense imminent danger to lab assistants capable of heating or cooling test samples via the power of the mind.

The Psionic Crimes Division of the United Worlds Security Force employs marshals with psi powers to investigate violations of federal laws governing psionics. Planetary law enforcement agencies likewise rely on psi-using peace officers or trusted consultants.

The StarForces make use of psions wherever they can, most often in non-combat support roles. For example, a psion with clairsentience can scout an enemy position more safely and subtly than a recon squad. There are unconfirmed reports that the federal Intelligence Ministry recruits psions for espionage work.

Cutthroat corporations, crimelords, smuggling rings, and other representatives of the seedy side of life can find numerous underhanded uses for an unethical psion.

A pair of psi-based organizations pursuing disparate goals has arisen in the United Worlds. Although most individual psions do not belong to either faction, these entities constitute the dominant forces in psion society. The Institute of Psionics seeks to advance scientific understanding of psi powers, while the Order of the Mind cultivates the psi talents of its initiates from within a mystical framework. The difference in their individual philosophies gives rise to some tension between the two organizations, but they are not in open conflict.

Institute of Psionics: The non-profit Institute of Psionics, based on Eden, promotes scientific research into psi powers. Established in 2195CE, the institution rates as the pre-eminent center of scholarly inquiry into psionics.

Scientists, sociologists, psychologists, and experts in dozens of other fields work directly for the institute or carry out research under its grants. The institute employs both psions and non-psions. In particular, numerous psions serve as field agents, reporting on psi phenomena throughout the United Worlds.

A board of directors governs the foundation, while an administrative director hired by the board oversees day-to-day operations at the institute. In addition to its extensive headquarters on Eden, the Institute of Psionics has subsidiary facilities on several other federation worlds. Donations and government grants provide the bulk of the agency's income.

The Institute now harbors a terrible secret - the discovery that the Etherean spore credited with awakening psi powers apparently also causes progressive neurological damage to human psions. Directors worry that premature disclosure of the news could spark a backlash against human psions, and have elected to conceal the findings while medical researchers search for a cure. Field agents are also on the alert for independent discoveries of the link between the spores and neurological injuries, although institute directors have not yet formulated a policy for dealing with any such cases.

Order of the Mind: A private society open only to psions, the enigmatic Order of the Mind espouses a philosophy blending mysticism with self-discipline as the path to mastery of psionic arts. The order has a somewhat monastic structure, leading some to dub it a religious sect.

The society relies on the common ability of psions to detect use of psi powers to identify potential recruits, inviting them to join its hierarchical nine-circle organization. The first three circles are composed of initiates who are still learning to control their powers. Savants, striving for greater power and mastery over their psi talents, comprise the next three circles. The final three circles are reserved for the archons, psi masters who lead the Order of the Mind. Each of the inmost circles consists of nine archons.

Ascension to a higher circle involves increasingly rigorous tests of the candidate's psi abilities. Those seeking to join the highest circles must depose a sitting archon in a psi duel conducted under the rules of the order.

Initiates of the outer circles are taught that self-control and mental discipline are critical to unlocking their full psionic potential. Teachings of the inner circles are unknown to outsiders, beyond outlandish and contradictory reports by less-than-credible news agencies.

Most members are supported by the Order, giving up their outside lives to dwell within its retreats, perfecting their psi abilities and studying its teachings. Formed in 2206CE, the Order has substantial financial reserves owing to donations from new members and the wealth amassed by some of its founders, and operates secluded retreats on most core worlds as well as some space habitats populated solely by adherents.

The closed nature of the Order of the Mind, coupled with doubts as to its ultimate goals, if any, have led many non-psions to distrust the organization, an attitude its followers blame on envy or prejudice.

Some agents of the Institute of Psionics are privately raising questions about the mental stability of the archons, given the apparent link between the strength of a psion's powers and the degree of neurological damage caused by imperfect adaptation to the alien symbiont.

Alien Psions - Some alien races encountered by humanity also possess psi powers. The Ethereans are an entire race of *extremely* potent psions. Telepathy, psychokinesis, precognition, and a planet-wide mind link known as the Unity are among their vast powers. Their racial psi powers shape nearly every detail of Etherean psychology and culture.

The Vorn are psi-blind. Vorn never develop psi powers of any sort, but all Vorn possess an innate mental shield against psions of other races.

Jodoni psions are extremely rare, but are skilled psychic healers. Some are capable of mending physical wounds, while others restore damaged minds. Humans in need of healing beyond the abilities of 23rd-century medicine sometimes journey to the Jodoni Combine in search of these exceptional psions.

No cases of psi powers among the D'eira and Nutoa have been recorded.

"Someone once told me that any sufficiently advanced technology is indistinguishable from magic. Hell, it's all magic to me...."

Mack Hahmer, cargo specialist, 2202CE

▼ **SCIENCE & TECHNOLOGY** - The wonders of 23rd century science and technology are vast. Advances in fiber optics, holograms, microcircuitry, and optronics have revolutionized fields ranging from computers to communications. Cloning, exotic medicines, microsurgery, cybernetics, genetic engineering, and diagnostic aids have likewise changed medical science.

New alloys and energy sources abound, while the biological sciences prosper with dozens of new worlds to study. Robots are found in homes and businesses throughout the United Worlds. Computer datanets link entire planets together, accessed through devices small enough to be worn on a watchband.

Radical new technologies thought impossible by earlier generations of researchers have also emerged, interstellar jump drives and the still developing science of gravitics being two prime examples.

Biotechnology - Biotechnology involves making changes to living tissue on a cellular or smaller level using nanomachinery or organisms tailored to perform specific tasks. Cloning and genetic engineering are the two aspects of biotech of most concern to United Worlds citizens, although antigeria treatments and cybernetics are also forms of biotechnology.

In the aftermath of the Biotech Wars, Earth's governments imposed strict regulations on the biotechnology that produced targeted viral weapons and gene-tailored super-assassins. Despite this, public mistrust and draconian government oversight continue to retard progress in the field even in the 23rd century. Even with these misgivings, the promise offered by biotech guarantees its continued use, whether in tightly controlled research facilities or secret underworld biolabs. Fortunately, even the most antisocial individuals still seem to harbor a healthy aversion to recreating the worst horrors of the Biotech Wars, and tend to limit themselves to more mundane and profitable of scientific perversions.

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Cloning - Numerous applications have been found for cloning plants and animals in the United Worlds. In agriculture, cloned plants and livestock are commonplace. A champion bull or superior strain of corn can be reproduced en masse, foregoing the vagaries of heredity to produce a perfect duplicate time after time.

Other uses for cloning range from the trivial (some people choose to serially clone their favorite pets to give their beloved companions a form of immortality) to the decisive (frozen, cloned embryos of countless earthly species journey to distant worlds on colony ships to populate them with terrestrial plants and animals necessary for human survival).

But human cloning, possible since the mid-21st century, is still controversial. Individual organs can be cloned for use in transplant procedures to eliminate the risk of rejection - a new liver can easily be grown from cells taken from one in need of replacement. Certain advances envisioned by 20th-century futurists are still beyond reach of cloning science, however. Surgical limitations prevent brain transplants, nor does a method exist to replicate memories in a cloned body.

The United Worlds bans human whole-body cloning, chiefly due to the religious and ethical concerns of most federation citizens.

Numerous faiths condemn cloning, particularly of humans, as an effort by man to usurp the divine power to create life. Some theologians also view it as an affront to the basic dignity of each human as a unique being in the eyes of his creator. Ethicists likewise object to human cloning, primarily on the grounds that it is incompatible with the notion of individual freedom, in the sense that genetic identity should be inherently unpredictable and unplanned. Clones are typically given life not for their own benefit, but for the benefit of someone else, raising further moral questions.

Most faiths, while opposing the practice of cloning, consider human clones to be no different from any other human being; the nature of their conception does not preclude clones from possessing a soul or spirit. Some Islamic sects and fringe religions, however, view clones as soulless entities.

Barring use of forced-growth technology, human clones do not appear instantly, fully formed, and at the same age as the original. They are born and mature throughout the course of a normal lifespan. Newborn human clones are just like other babies, and they possess none of the original's memories or skills.

A clone has the same genetic potential as its original, but different environments, life experiences, nutrition, and other factors can make a clone radically different from the original. A human clone will generally be identical in appearance to its original, but possess unique fingerprints, palm prints, freckle patterns, and retina patterns unless these are modified through surgery.

Refinements in cloning science include the development of ancillary equipment, such as forced-growth tanks that suspend clones gene-coded for rapid maturation in a nutrient bath and enable production of adult clones in a matter of months rather than years, and hypno-learning techniques that infuse the newly adult clones with basic life skills normally acquired in childhood and adolescence.

Since human clones are already illegal, biolabs have little to lose by gene-tailoring them for desired traits or abilities. In addition, any radical genetic changes are more palatable if performed on a tank-grown clone rather than someone's future child.

Depending on their eventual purpose, clones may be bioengineered for enhanced reflexes, strength, or any of a hundred other traits. Common uses for clone slaves include bodyguards for crime figures, bioengineered for hyper-alert senses and inhumanly quick reflexes, and brainwashed for fanatic loyalty, and cloned duplicates of celebrities for pornography or high-priced prostitution rings. Cloned laborers are sometimes employed in jobs too complicated for robots, which are best at working in clean, controlled environments.

While cloned organs can be grown legally for transplant procedures, it is prohibitively expensive to grow and maintain a complete set of replacement organs in advance against future need. But when someone has need of a cloned organ they won't necessarily be able to wait months for one to be grown. Synthetic organs are normally used in emergencies, but for the ultra-rich illicit biolabs produce cloned, whole-body duplicates of their clients to get around this dilemma. The clones are kept in a catatonic state suspended in a nutrient bath to provide a perpetual, self-sustaining source of organs or other body parts.

Widespread use of DNA scans to verify identities makes clones useful in scams and conspiracies. A cloned double could be planted in the place of a government official, celebrity, or corporate executive, although training the double to mimic the original may be difficult. A clone could also be used to fake the death of an individual, perhaps someone sought by the authorities or in connection with an insurance fraud scheme. At the lowest level, a clone's DNA can be used to access a stolen credit chip.

A few individuals choose to reproduce through cloning, either because of infertility or egotism. In this case, eggs containing the cloned DNA are typically implanted in the womb of the mother or a surrogate, where they develop normally.

United Worlds law draws a clear distinction between human cloning and the actual clones. It isn't illegal for a human clone to exist. In fact, clones are considered by law to be full humans with all the rights of other United Worlds citizens. But much as owners of African slaves in Earth history rationalized their cruelty by labeling them subhuman, underworld biolabs, slavemasters, and bigots of the 23rd century contend that clones are somehow different from other humans and undeserving of consideration as people because they are man-made property, not naturally free individuals.

The Biogenic Crimes Division of the United Worlds Security Force enforces federation laws prohibiting human cloning, as well as abuse of clones. Marshals of the division track down illicit biolabs, slavers, and installations using clone slaves.

Genetic Engineering - In the 23rd century, sophisticated computers scan billions of lines of DNA to decipher the exact genetic coding of an organism. Bioengineers then manipulate the DNA to create whatever permitted genetic changes in an organism are desired. They may remove unwanted genes, splice in DNA from other organisms, or artificially construct DNA strands from computer models.

Genetic engineering can be used to produce limited changes in existing organisms, such as rewriting defective DNA to correct imbalances in enzyme production, but its most powerful applications involve creating permanent changes in an organism's offspring by altering the genetic coding of reproductive germ cells. These alterations range from the trivial, such as revising the DNA controlling physical appearance for enhanced beauty, to the radical, such as creating a winged (albeit flightless) horse.

Bioengineers most often insert the desired DNA in a fertilized egg cell using a nanovirus, a protein-based organic "robot" that passes harmlessly through cells to carry out its mission. The modified egg cell is then implanted in the womb of the mother or a surrogate to undergo normal gestation. Because the changes are at the genetic level, the engineered creature may be capable of passing its modified genes on to its offspring.

The ravages of the Biotech Wars of the early 21st century, in which gene-coded warriors, bioassassins, and manmade plagues put the entire Earth at peril, serve as a potent warning of the danger of unfettered genetic tinkering. In spite of the possible benefits, public fear of potential misuse continues to influence government policies toward biogenic research.

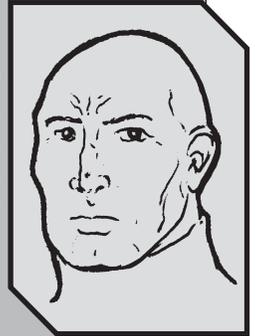
The government and public at large view all forms of genetic engineering with deep suspicion. Strict regulations govern its use, even those involving plants and animals. The greatest controversy and scrutiny are reserved for human genetic engineering, however. The United Worlds government outright bans human genetic engineering for reasons of both ethics and practicality. Scientific concern over the unforeseen consequences of genetic tampering, in the form of susceptibility to previously harmless pathogens, higher risk of birth defects, and creation of new hereditary diseases, provides ample reason to closely regulate human bioengineering.

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DATA DUMP

Peter Six

Strength 4d+1
 Agility 4d+0
 Awareness 2d+2
 Will 3d+2
 Health 3d+2
 Fate 1d+0



A cloned human freed from a life of gladiatorial combat, Peter Six now roams the stars in search of enlightenment. Born in a forced-growth tank at a rogue biolab, he emerged almost two years from conception with the body of a teenager and the mind of a child.

Sold by the biolab to a gambling ring on Nuadu, Six spent several years as a slave warrior battling other bioengineered clones in underworld pit-fighting matches. A raid by United Worlds Security Force marshals freed Six in 2228CE. Following some time at an education center preparing him to enter normal society, Six set out on a spiritual quest that has taken him across the federation.

A pacifist and believer in non-violence, Six strives to overcome his bloody past. Although he still possesses impressive martial skills and trains with a bo staff to keep himself fit, Six now seeks peaceful solutions to conflicts. He resorts to combat only as a last resort, in defense of himself or those unable to defend themselves.

Six recently returned to his traveling ways following a few years learning at a Buddhist monastery on Ryujin. While not a Buddhist, Six has great respect for the faith and has adopted many of its philosophical underpinnings.

A gene-engineered human of indeterminate ancestry, he is physically thirty years old but was born in 2222CE. He stands 183cm tall and has a muscular build. Six has brown eyes, dark complexion and no hair (clones destined for the slave trade are often engineered to be totally hairless; deactivating genes for hair growth not only makes clones easier to identify, protects against some escape ruses, and eases grooming logistics for slave owners). An aura of peace and serenity surrounds him. His designers provided Six with enhanced reflexes, strength, and stamina.

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Of course, passage of a law does not erase scientific know-how, and the prohibition has simply relegated human genetic engineering to the black market. For a stiff price, prospective parents can give their offspring a leg up through gene coding at an underworld biolab. Even if the parents are caught after the fact, the court is stuck with the choices of taking the child away from parents who apparently only want the best for their offspring, punishing the parents to a degree that harms the child's development (jailing a parent, financial hardship), or a slap-on-the-wrist penalty that isn't that much of a deterrent. Authorities instead put most of their efforts into shutting down the illegal genetic labs to nip the problem in the bud.

Some of the more common modifications include enhanced intelligence and physiology, boosted immunology, and low-pressure or heavy-metal adaptations. More radical modifications, such as creation of humans with functional gills, are technically feasible but rarely performed because they are blatantly obvious signs of gene tampering.

The U.W. Security Force Biogenic Crimes Division enforces anti-genetic engineering laws. Underworld biolabs are the chief targets of interstellar marshals, though clients also face prosecution. Individuals with modified DNA are generally not subject to prosecution, since the illegal genetic tampering took place, obviously, before they were even born.

Depending on the nature, degree, and visibility of the changes, gene-modified humans may face the curiosity, scorn, or envy of their peers. Parents who illegally gene-modified their children might not even tell them until they are well into adulthood, or never, leaving the children to find out by accident when some medical test or procedure comes up with anomalous results that can only be explained by altered DNA.

▼ **Note** - As a result of widespread black market genetic tampering, some jobs and most athletic competitions require applicants or participants to undergo genetic screening. Opponents to this practice have appealed to federal courts on the grounds that the tampering was done without the consent of the person involved, therefore they are not at fault, and disqualification based on genetics is a form of discrimination not allowed under UW law. The matter is currently awaiting appeal to the UW Supreme Court.

Communications - Most worlds and space habitats employ extensive networks of fiber optic cables for communications. Digitized speech, images, and text ride transmissions of modulated light through these glass tubes finer than human hairs. Fiber optic networks are patched into radios, comm lasers, and satellites to permit worldwide communication.

Vidphones are ubiquitous in United Worlds homes and offices. More expensive holophones, which display 3-D images, are status symbols on many core worlds. Either type of phone can be placed in voice-only mode for privacy's sake or for when the communication links cannot handle the advanced image traffic.

On frontier worlds, where even everyday tech can be difficult to buy or repair, radios are the standard form of long-range communication. The microcircuitry in tiny earpieces and throat mics make radio gear easy and inobvious to carry. Headsets are also popular among frontier colonists. Even small settlements typically have a radio repeater station, giving low-power headsets good carrying power around the settlement.

Holography - Holographic technology, using lasers to produce three-dimensional images, has become standard in 23rd-century visual communications.

Holopics are static images, while holovids have taken the place of films and television. Holovid projectors, found in nearly all core world homes, reproduce recorded or transmitted three-d images, taking the place of television sets. Transmitted images are known as holocasts. Holoplexes are modern cinemas, showing big-budget holostudio productions with state-of-the-art projection and sound systems.

Holovids are the medium of choice for news and entertainment throughout the United Worlds, but holographic technology can also be found in offices, military command posts, factories, starship bridges, and anywhere else visual images are used. For example, engineers and architects create three-d blueprints, while bridge holotanks keep StarForces Navy commanders abreast of changing battle conditions.

In a related field, encoded hologram imprints are commonly used on identicards and other forms of ID as a secondary form of security (DNA scan is the primary). Holocards are easily read by most authentication devices, but are fairly difficult to forge.

Interplanetary Communication - Within a star system, communications take the form of laser beams or radio waves. Comm lasers use digital encoding to convey data within the beam. As a very high-frequency form of electromagnetic radiation, lasers can carry far more data than radio waves.

Unlike radio signals, which radiate outward, comm lasers send data on a direct line that cannot be intercepted without being noticed (although interplanetary communications of a sensitive nature are normally encrypted in any case). Comm laser signals are also cleaner and clearer than radio.

The discrete nature of communications lasers requires precise calibration between sender and receiver, however, or the beam will miss the receiving array. This can be especially difficult to achieve for ships moving in space unless both vessels follow a predetermined course and speed. Laser beams can be "fuzzed out" to fill a narrow cone, improving the chance of hitting the target, but greatly diminishing the strength of the signal.

Time Lag: Radio signals and lasers beams travel at the speed of light, but communicating over the enormous distances of a star system still involves a time lag ranging from seconds to minutes or even hours, depending on how far the parties are apart.

Light takes 8.3 minutes to travel a distance of one Astronomical Unit, or AU (the distance from Sol to Earth - approximately 150 million km). This figure can be used to calculate the approximate time lag based on the distance between the parties.

For example, light takes 1.3 seconds to travel from the Earth to Luna. A conversation between Earth and Luna involves roughly a three-second lag: 1.3 seconds for the message to travel to Luna, and another 1.3 seconds for the reply to reach Earth. Communicating with the outer planets of a star system typically involves time lags of several hours, making real-time conversations impossible. In such cases, a video or audio message is recorded, compressed and then sent as an encoded burst. For most purposes, such lagged communications are the equivalent of early 20th century postal correspondence.

Fires of Heaven^{v1.0}

Interstellar Communication - A vitally important consideration in building an interstellar civilization, communicating over the mind-boggling distances between stars posed a severe problem in the early years of the United Worlds federation, as messages to even the nearby Eden colony in the Alpha Centauri system took over four years to arrive.

Courier ships carrying messages from system to system, outpacing radio waves and communication lasers by using the Rozhkov Drive to defy limitations on faster-than-light travel, proved costly and inefficient due to the sheer number of messages involved in keeping the far-flung arms of military forces, government, key corporations, and other organizations in touch with one another - not to mention the countless personal letters, banking records, entertainment programs, legal documents, and other communications needed to knit society together.

Before long, however, scientists solved the problem by adapting the theories of Yevgeni Rozhkov that had given humanity the power to instantaneously jump between stars. Instead of sending a starship through an artificial singularity to emerge outside another star system, they transmitted laser bursts conveying a vast amount of compressed data through the rip in space-time.

Communications arrays in most populated systems, located near the system's jumpgates, pick up incoming bursts and transmit the messages to the desired worlds and space habitats. Likewise, outgoing messages are beamed to the array for transmission to other star systems. The Fujihara-Mitsuya Corporation operates many of these arrays, which charge a premium price for their services. For this reason, dedicated courier ships are still in use as a slightly slower but less expensive option.

Those seeking an even lower price can arrange for a tramp freighter or corporate cargo hauler bound for the destination world to carry non-critical messages. Some freighters (particularly free traders perpetually on the lookout for another way to earn credits) even feature so-called dataholds (or data-cans or just "cans") designed specifically to carry this digital cargo. Customers typically post a notice on a datanet bulletin board seeking an outbound ship willing to convey the desired message for a nominal payment. But some corporate freight lines have institutionalized the practice, posting shipping schedules and comm prices on the datanets for potential customers to peruse.

Real-Time Interstellar Communication: In order for two people in different star systems to conduct a real-time conversation, each must be physically present at the communications array in his system to avoid light-speed lag as messages are beamed from the array to a planet or starship. A singularity must be kept open, through which comm laser bursts pass every few microseconds. The power demands and inconvenience make this option grossly expensive, and it is very rarely utilized.

Banking Communications: Before the advent of FTL communications, transfers of funds from one system to another had to wait for confirmation from the home system, which could take anywhere from weeks to months, depending on the frequency of local shipping. With FTL communications, things are significantly faster, but real-time transactions are still not possible because of the light-speed delays between the on-planet banks and the deep space FTL communication relays. But, people still expect their credit cards to work, and generally they do, with a little advanced preparation and financial sleight of hand.

Each day, a hyperwave transmission goes out from a bank's home system to all off-planet branches. This is not a full database, but does include everyone currently on a starship, or who has booked passage on one in the past week (the banks have data-sharing agreements with federal immigration authorities, who are automatically notified about outgoing travellers). In addition, all federally registered ships (which is most of them) have to carry a banking and law enforcement datacan. This is automatically uploaded to before that ship departs a system, and automatically downloaded when it docks. It is fully encrypted and completely isolated from interaction with ship's systems. Ship owners are *not* compensated for this, it is just a requirement for getting federal inspection and trade priviledges.

Bank encryption is uncrackable, using long random keys for encryption, and the same key for decryption, throwing away each key after it is used. The keys are physically moved to each destination by bank courier ships, bringing in massive datastores of code keys once every few weeks.

So, odds are that by the time you arrive in a new system, your financial history and bank balances are already waiting for you. *So is your criminal history and any warrants for your arrest...*

Computer Science - Superconducting alloys, optronics, microcircuitry, cryotechnology, and other technologies have enabled the creation of extremely fast computer processors, not to mention memory cores storing orders of magnitude more data than earlier designs. Software has kept pace with the incredible advances in hardware. The highly sophisticated programs required to operate modern computers continue to evolve to better meet existing needs and open new frontiers in computer capabilities. For example, Ashford-Cray Labs developed the first AI nearly fifty years ago. Unlike a standard computer, an AI can think for itself, initiate its own actions and act creatively in the same way a human or other sentient can.

Used throughout the United Worlds, optronic computers operate via pulses of modulated light, not electricity, processing calculations at the speed of light. Light-activated crystalline memory cores store data for long-term use, and terabytes are the standard measure of computer memory. A single terabyte contains the equivalent of *fifty thousand* fully illustrated encyclopedia volumes or a full month of continuous high quality flat video with sound.

Most computers are plugged into datanets, through which they can download programs or data as needed. If this is not feasible or advisable, crystal dataspikes provide portable memory to convey data between computer systems. Each dataspike carries up to one terabyte of data. Computers and microchips are a part of nearly every form of technology in the United Worlds. Home computers are used for communication, datanet links, virtual reality dreamscapes, online banking and shopping, home accounting, and just about every other aspect of everyday life. Computers are also indispensable in the classroom, workplace, and factory. Computer-controlled traffic grids speed travelers safely and efficiently through the streets of core-world cities. On starships, computers regulate a thousand systems from life support to minute drive fluctuations. Robots, of course, have computer brains. Computers come in all configurations, from room-sized supercomputers to handheld or watch-mounted versions capable of storing vast amounts of data and performing a variety of useful functions.

Quantal computers are a new technology that performs calculations using the possible positions of individual electrons as they orbit an atomic nucleus. Since the various quantum changes take place instantaneously, all the calculations are resolved simultaneously and all possible results are examined instantly. They are limited in speed only by the number of quantal states that can be examined and manipulated. Quantal computers are new and expensive, but do things like jump calculations extremely well.

Virtual Reality: VR programs create a simulated reality using computer-generated imagery and sensory input. The best virtual reality programs can be indistinguishable from the real thing. A VR user wears a lightweight, visored headset and a sensor-laden jumpsuit, allowing them to experience and interact with the computer-generated world. Those who make extensive use of VR often forego visors and sensor suits for cybernetic implants allowing them to experience imaginary worlds directly with all five senses. Most third- and many second-class starship berths have competent VR suites, along with electronic muscle stimulators. The combination allows passengers in cramped starship quarters to ignore both their confining surroundings and quite often, each other.

Studios on Eden in the Alpha Centauri A system are among the top producers of the wildly popular programs commonly called dreamscapes. Virtual arcades offer the hottest dreamscapes and virtual reality games to their patrons, while other customers prefer home versions purchased at a store or online. VR pornography is, of course, a booming business.

Applications in education, business, science, military training, manufacturing, engineering, and hundreds of other fields also exist for virtual reality simulations. The boundless possibilities opened by VR technology have not gone unnoticed by the federation's criminal element either. Illegal virtual reality torture and interrogation programs are available on the black market, and VR pornography involving unlicensed celebrity images is widely available. Datathieves often use virtual reality software to create a visual representation of cyberspace, enhancing their netrunning capabilities.

Fires of Heaven^{v1.0}

▼ **Datanets** - Worldwide computer networks called datanets (or just 'nets) are found on nearly every world with a sufficiently advanced technological base, connecting tens of millions of computers, with access provided to almost every individual on the planet. Datanets, however, are far more than collections of computer links. The nets are the foundation of a thriving cyberculture of online news services, message boards, chatrooms, databases, and live feeds. Through the nets, individuals have access to a deluge of information, news, advice, commentary, advertising, entertainment, catalogs, mail, pornography, financial services, and other digitized information.

DATA DUMP

Sophisticated interest and personality profiles filter the multitude of online news stories, opinion pieces and reports from professional journals to deliver a personalized digital newspaper on a daily or even hourly schedule. Most core world inhabitants conduct nearly all their day-to-day business online.

The nets are also a vital component in planetary commerce. Businesses communicate, transfer funds, advertise, and process consumer orders via the datanets. Datathieves, also called crackers, hackers, or netrunners depending on their specialty, use datanets to break into targeted computer systems. They typically steal information for clients: cutthroat rival corporations, underworld figures, political enemies, or anyone else who can come up with the cash.

Curriculum Soc3 - reference ds386733.129847.283919 - .00Cr

Virtual reality gear is a regulated industry. The levels of sensory input and its sophistication is capable of doing physical harm if abused, even if you are aware that it is not real (e.g. grabbing a VR high-voltage cable). As with most recreational devices or substances, VR gear can be (and is) abused. There is everything from VR torture gear to VR "fight clubs". These abuses are generally local crimes and are handled by local law enforcement. Normal VR gear has built-in energy and force limits that mean it is incapable of causing more than minor harm, even if its programming were somehow subverted.

DATA DUMP

Gabriela Cavaliere

Strength 2d+0
 Agility 2d+1
 Awareness 4d+0
 Will 2d+0
 Health 2d+0
 Fate 1d+0



A brilliant computer scientist with a hedonistic lifestyle, Gabriela Cavaliere defies the stereotype of the lab-bound researcher. She lives a flamboyant life of adventure, filled with luxuriant meals, fine wines, grand symphonies, and public attention.

Cavaliere has had as many high-profile affairs and marriages as some holo-vision stars, pairing herself with entertainment industry luminaries, political figures, sports professionals, and other important men too numerous to count, believing that her genius exempts her from propriety and entitles her to celebrity.

In spite of her wild personal life, she excels at computer science and invariably stands at the top of her field in surveys by scientific journals. Her research team at McAuliffe University is currently at work on a next-generation quantum computer.

A human of mixed Italian descent, Cavaliere, 48, undergoes regular rejuv treatments to retain her youth. Her hair color changes often, but she almost always has brown eyes. Cavaliere stands 165cm tall with a voluptuous build.

UW Who's Who 2237CE - reference er773438.737842.387723 - .05Cr

Energy Production - A technological civilization requires a power source. Various methods of power generation have been used in the United Worlds, but most are currently fission, solar, fusion or antimatter-based.

Fission power uses a controlled nuclear reaction to produce energy. Heavy elements, such as uranium or plutonium, are bombarded with neutrons to cause their nuclei to split and produce heat energy. Fission plants use this heat to create steam to drive turbines, producing electricity. Fission plants were rendered obsolete by the advent of clean fusion power in the mid-21st century and are now rarely encountered in surface installations, though some interplanetary and a few interstellar ships still use them, most often in the form of reliable thermal or particle backup generators that convert heat or particle flux directly to electricity. This is less efficient than using a turbine, but has the great advantage of zero moving parts and next to no maintenance requirements.

Solar power uses huge arrays of solar cells to convert sunlight into electricity. Solar's primary draws are its low cost (essentially free after the solar cells are paid for), low maintenance and pollution-free operation, but atmospheres that impede the solar rays reaching the panels, weather systems that further hinder energy collection or damage the cells, and the vast numbers of collector panels required to provide energy for a large population restrict their use. On many planets, fusion plants are far more practical. In space, however, solar arrays are perpetually bathed in sunlight and can be constructed without regard to size. Some space habitats continue to rely entirely on solar power, while others use it to supplement fusion or antimatter power plants.

Fusion reactors moved from theory to reality in 2048CE, putting the power of the stars at the disposal of humanity. In a fusion reactor, atoms of light elements, such as hydrogen or helium, are fused into heavier elements with part of the mass being converted into energy, mimicking the process that takes place inside stars. Modern fusion reactors use deuterium, a hydrogen isotope, and helium-3, an isotope of helium, for fuel. Found in water, in the atmospheres of gas giants, or on airless worlds bathed by solar winds, deuterium and helium-3 are fairly easily obtained and relatively inexpensive fuels. Although fusion power has been superseded in power-critical applications by antimatter power, the high cost and potential dangers of the newer technology continue to make fusion the most practical form of planetary power.

Developed in 2219CE, antimatter reactors are the most efficient form of power generation yet devised by humanity, using minuscule amounts of antimatter fuel to yield unparalleled amounts of energy. Antiparticles possess the same mass as other particles, but opposite values on most other properties. Matter and antimatter annihilate each other instantly upon coming into contact, converting into energy with a theoretical one hundred percent efficiency.

Antimatter reactors direct streams of matter and antimatter at each other to generate power. Magnetic fields contain the antimatter fuel, since any contact with matter would produce a violent explosion. Redundant safety systems are part of every reactor to prevent a disaster in case of a core breach, failure, or other problem. For example, antimatter drives aboard starships are designed to automatically eject the fuel core in an emergency.

Antimatter power plants are quite costly. No natural antimatter has ever been found, so the fuel must be artificially produced at considerable expense and *huge* inefficiencies. While deuterium can be separated out of normal water, and helium₃ mined from astronomical bodies like Luna, the only way to produce antimatter is by expending far more energy than you eventually get out of it. While military ships can afford this expense, it seldom makes sense for any use where the cost is a factor.

Key antimatter production sites are found on Mercury, and on Hell in the Alpha Centauri system, where solar panels provide the enormous amounts of energy necessary for the particle accelerators creating antimatter fuel. Less efficient antimatter accelerators are also found on Earth. The extreme destructive potential of antimatter mandates strict government oversight of its creation, sale, and use. Plants producing antimatter fuel operate under the highest security, and all sales are carefully tracked. A federal law requires all antimatter destined for transportation to be sealed in extremely sturdy containers, or fuel cores, each one holding such a minute amount of antimatter that an accidental release, while deadly to those in the immediate area, would not trigger the equivalent of a nuclear explosion. The law also restricts the number of fuel cores that can be shipped together at one time.

Scanners tuned to detect stray anti-particle annihilations are commonly employed by interstellar marshals and planetary peace officers to protect against possible terrorist use. Anti-particle scanners are highly restricted and regulated, to the point of being illegal for civilians to own.

Fires of Heaven^{v1.0}

Exosciences - Exosciences deal with study of worlds other than Earth. They cover the gamut of scientific disciplines, from exoarcheology to exozoology. The division of scientific disciplines into Earth-based fields and exosciences, dealing with other planets, dates back to the early days of interstellar exploration. In recent decades, however, the practice has come under increasing fire as an outdated and artificial distinction. Critics argue that the division between sciences and exosciences promotes a humanocentric, and Earth-centric, view inappropriate to impartial scientific inquiry. Proponents of change cite the example of biology, dealing with the study of life on a single planet, and exobiology, the study of life on dozens of worlds, as one case in which the exoscience label no longer makes sense. But tradition can be a powerful force, particularly in academia, and the exoscience label persists.

Animal life has been discovered on countless worlds, including several lifeforms dwarfing even the largest Earth species. Explorers or settlers name most alien lifeforms, typically deriving names from the creature's resemblance, real or imagined, to a real or mythological Earth animal. For example, the "dragons" of Eden have a reptilian appearance and fierce disposition.

Products of otherworldly evolution rarely conform to the phyla and order of Earth lifeforms, however, often possessing characteristics indicative of several classifications. The aforementioned dragons are actually warm-blooded, unlike Earth reptiles, for example.

Along with a multitude of creatures more or less biocompatible with Earth life, exozoologists study some truly alien forms of life such as the silicon-based lifeforms of Atropos in the Alpha Centauri B system and hydrogen-breathing life of some gas giants.

Many worlds are inhabited by lifeforms far removed from Earth-born life, and a few are truly bizarre, such as the chlorine-based ecosystem of Teljavelik or primitive silicon-based lifeforms of Atropos. But surprisingly, many alien forms of life have comparable chemical makeups to Earth life, relying on some form of DNA to store genetic information, for example. Alien plant and animal species on several worlds are so close to Earthly life that they are edible by terran lifeforms. Others produce organic chemicals effective in toxins, drugs, and medicines.

This widespread similarity among lifeforms of worlds in star systems light-years apart has baffled exobiologists since the early days of interstellar exploration. Some say carbon-based life, DNA and other hallmarks of Earth-born life are simply the most efficient and most likely to evolve features of life, regardless of planet of origin. Others speculate that the fundamental building blocks of life may have been present in the galactic dust from which stars and planets formed.

Another theory suggests life-bearing spores may have crossed the interstellar divide over millennia, taking root on many different worlds. A final hypothesis attributes compatibility of lifeforms light-years apart to the mysterious, vanished alien race of Progenitors, whose indecipherable ruins have been found on numerous worlds. Some proponents take this theory a step farther, crediting the Progenitors with shepherding the rise of intelligent life in the galaxy, including humanity itself.

Food Production - Farmers of the 23rd century are experts in agricultural science who must overcome countless technical challenges to provide food for billions of United Worlds citizens. Food exports are the major trade commodity of many U.W.-controlled colonies on planets specifically picked for colonization because of their agricultural potential.

Even on reasonably Earth-like worlds, raising livestock and growing crops can be complicated. Chemical additives are often necessary to coax Terran plants to grow in alien soils. Pastures must be planted for livestock, or if native vegetation can be used it must be supplemented with vitamins. Greenhouses or agriculture domes may be needed on worlds with variant atmospheric pressures, tainted air, or other hindrances.

But agricultural pursuits are not limited to Earthly planets. The billions of inhabitants of space habitats and hostile worlds unsuited to surface farming must also eat. Freighters can furnish some food supplies, but never enough to support an entire habitat population or colony indefinitely. On larger habitats crops can be cultivated in soil brought to the habitat, bathed in sunlight reflected by vast mirrors. Poultry farms and fishponds provide at least some meat, with soybeans and other plants supplying the bulk of protein necessary for good nutrition.

Small space habitats and colonies on hostile worlds rely on hydroponic gardens for food. Cultivation of plants without soil, hydroponics uses specially prepared solutions of mineral salts, nutrients, and water to nurture crops in artificial conditions. Plants can even be grown in zero gravity using a complicated system of tubing and porous membranes to supply water and nutrients.

Gravitics - Devices salvaged from a handful of crashed or wrecked Vorn starships helped United Worlds engineers deduce at least some of the secrets of artificially created gravity, something considered theoretically impossible before the Interstellar War.

Tsai Gravitics, a corporation based on Tawhirimatea in the Lalande 21 185 system, has emerged as the leader in the field of commercial gravitics. The first functional application, available commercially in the United Worlds, involves creating artificial gravity fields on starships and space habitats, enhancing efficiency, comfort, and safety. Artificial gravity also reduces or eliminates the need for medicines to prevent spacesickness or alleviate the deleterious health effects of prolonged exposure to zero gravity.

Unfortunately, the fields do not work where appreciable gravity already exists, and cannot be retuned quickly enough to counteract the rapidly changing g-forces of acceleration and combat maneuvering. United Worlds scientists are striving to duplicate other Vorn applications of gravitics, such as the gravity well drives and devastating gravity shear weapons employed by Vorn starships.

Manufacturing - Automation and computers have boosted the output of most manufacturing operations tremendously. The need for living workers has dropped precipitously, and those who remain are highly educated technicians who oversee the robots and automated equipment performing most of the work.

In addition, the spread of humanity into space and other star systems has opened new dimensions in the field of manufacturing, making possible zero-g factories, stronger materials, and new production techniques to name but a few advancements. Computer-aided design programs employ holographic or virtual reality technology, enabling creation of minutely detailed, highly accurate blueprints or design specs in three dimensions.

Industrial robots, both autonomous robots and massive, immobile constructs run by central computers, are essential to 23rd century factories. Robots operate machinery, assemble parts, perform routine maintenance, and carry out a multitude of other manufacturing tasks. Workers are still needed, though, to oversee operations and deal with any unexpected problems that the limited programs of most robots are ill equipped to handle. VR software coupled with fiber-optic networks allows remote operation of machinery by individuals anywhere from a few meters to a full hemisphere distant. Some factory workers need not even leave their homes to report to work. While not economical or practical, telepresence through a hyperwave link has been demonstrated as possible.

In core systems, many factories are placed aboard space habitats. Along with simplifying delivery of raw materials and shipping of finished products by eliminating the need to overcome a planetary gravity well, orbital factories can take advantage of freefall conditions to produce goods difficult or impossible to manufacture elsewhere. For example, many alloys can be created only in zero-g.

Metallurgy - The field of metallurgy benefited greatly from access to space. On Earth, interactions of heat and gravity create currents within molten metal that prevent some metals from alloying. In zero gravity, however, those currents do not exist, so previously impossible mixtures can be attempted. Zero-g research and refining have fostered the development of numerous new alloys, enhancing durability and reducing weight for ever-more useful materials for construction, superconductors, starships, manufacturing, body armor, and other uses.

Fires of Heaven^{v1.0}

Polymer alloys bind compounds of long-chain molecules to metals to enhance strength and flexibility. Crystalline alloys are tougher yet, altering the crystalline structure of atoms comprising a piece of metal to tighten the bonds between crystals and eliminate weak spots.

The Vorn are more advanced than humans in crystal-metal alloys, while Progenitor artifacts display a mastery of material science unsurpassed by any race yet encountered.

Nanowire: Monowire tech involves stretching individual carbon-composite molecules to produce super-strong materials useful in construction, science, and spaceflight. Nanofilaments are used for projects requiring incredibly durable materials, such as beanstalks. The super-sharp filaments are also used for cutting tools. Materials reinforced with a mesh of tightly woven nanowires are used in numerous applications, providing an exceptionally strong yet flexible and lightweight material.

Nanotechnology: Nanotechnology involves the manipulation of matter on the atomic level, in essence growing molecule-sized materials, tools, and just about anything else imaginable instead of building them. Microscopic machinery, electronics, and computers, sometimes called "nanites", are also part of nanotechnology. Initial predictions that nanotechnology would totally transform society ignored the conservative nature of humankind, however. The threats posed by nanotech, including the potential for molecular warfare and rogue or misprogramed nanoagents, equal its potential benefits.

A few mishaps involving early attempts at nanotechnology led to a deliberate slowdown in development of the emerging technology. Corporate and government backers of nanotech research are moving carefully to avoid further incidents and gradually introduce nanotechnology to wider use in the United Worlds. At the moment, only the most primitive forms of the technology exist, and are being explored as a way to catalyze otherwise difficult (read unprofitable) chemical processes.

Biotechnology, an offshoot of nanotech using microscopic devices, programmed viruses, and other tools to alter living tissue, blossomed in the early 21st century with applications in genetic engineering, cloning, health care, and other fields.

But use of these tools to produce biogenic assassins and other horrors of the Biotech Wars turned public opinion firmly against biotech. Even two centuries later, progress in the field remains stunted by regulations and a suspicious public.

Robotics: Robots are an irreplaceable part of 23rd-century life. Tireless industrial robots enhance productivity, while household bots keep homes neat and tidy. Robots are utilized in every environment, from deep-sea mining operations to space construction projects. Explorers rely on robot probes to gather data on new worlds, while scientists use them for hazardous-environment experiments otherwise too dangerous or costly to contemplate.

No longer are people shackled to boring, meaningless jobs on high-tech core worlds, where robots fill most simple or mundane posts. Even in fields far too demanding to be completely trusted to robots, they provide useful time-saving assistance. Robots do have limitations, however. Much like computers, they follow only the specific commands set by their software. While modern robot-control programs are far more flexible than those of their 21st century predecessors, 23rd century robots still have problems reacting to unexpected events, and the complexity of the tasks they are sometimes assigned may overwhelm their decision-making capabilities. United Worlds law prohibits mounting weapons on robots, and all robots are programmed not to harm sentients. Like many other UW laws, these are broken on occasion...

Beanstalks - An engineering marvel relying on nanowire tech, beanstalks are tethers that extend from an equatorial anchor to an orbital space station. High-speed elevators transport passengers and cargo from the ground into space, or vice-versa, generally taking one to three days for an ascent, depending on the depth of the gravity well. Beanstalks are a low-cost alternative to landings and takeoffs by aerodynamic starships and worlds with beanstalks keep them in use continuously for cargo purposes. The first beanstalk was constructed on Mars in 2053CE using the equatorial mountain of Mons Pavonis as an anchor. It was severed during the Mars rebellion, but later rebuilt. Earth's first beanstalk, based in Kenya in Africa, was constructed in 2058CE. Beanstalks have been built on several other worlds, including Luna, Eden, Hephaistos, Asgard, Ryujin, Tawhirimatea, and Brigit. The most recent, completed in 2236CE, serves Teljavelik in the 61 Cygni binary system. Construction of a beanstalk has also started on Yewel, the Nutoa homeworld.

One of the automated bores slipped and crashed into my brother, Jacques, while we set up to extract a titanium vein on an asteroid. I got Jacques back inside the ship before his e-suit depressurized completely, but his leg had been crushed. I stopped the bleeding with some plastiskin, doped him up, and set course for the clinic at Jagaubis.

After we got there a few days later, the doctors had to take off the leg. They offered to clone Jacques a new one, but we talked it over and agreed the price was too high. So we went with a cybernetic one.

Jacques insists that it's better than the real thing, anyway.

- Etienne Rocard, zero-g miner, 2230CE

▼ **MEDICINE** - The incredible strides in medical science of the past two centuries have dramatically enhanced the lives and happiness of United Worlds citizens. Researchers and public health physicians have succeeded in eradicating some diseases, while providing vaccines or cures for others. No single, definitive cure for cancer has been found, though most types of cancer are now wholly preventable, easily detectable, or eminently treatable with excellent prospects for full recovery.

Medicines derived from alien biochemistries help treat a wide variety of injuries and ailments, speeding recovery times and reducing side effects. Regen tanks, which stimulate cell regrowth to enhance healing and eliminate risk of infection, are one such derivation now in common use throughout the United Worlds.

Advances in ultrasonics and holography have drastically enhanced diagnostic technology. Sensor beds monitor vital signs and enable physicians to conduct a variety of scans without moving the patient. VR simulations are used extensively in medical schools, and even experienced surgeons use them to practice for upcoming procedures.

Surgical techniques are highly sophisticated, employing fiber-optic cables conveying miniature holocameras and precise surgical lasers for micro-surgery procedures far less invasive than 20th-century methods.

The science of cloning has allowed other advances in surgery. A damaged limb or other body part may be replaced by a cloned duplicate grown from the patient's own cells, for example. Cloned organs are commonly used in transplant surgery, eliminating risk of rejection by producing a perfect, healthy duplicate of the tissue in need of replacement. In emergency cases, synthetic organs can be implanted to safely and reliably replace just about any vital organ, either permanently or for the several months it takes for a cloned organ to be grown.

The field of cybernetic medicine, however, extends far beyond replacement organs. Bionic limbs, eyes, inner ears, and other cyberware can exceed rather than merely replicate natural tissues. The incredible advantages offered by cybernetics have fostered implantation of cyberware on an elective basis, rather than solely to replace lost or damaged tissues.

There are some limits to the wonders of modern medicine. The delicate microsurgery required for brain or spinal cord transplants still precludes these operations, although some peripheral spinal injuries are treatable using regen tanks. Likewise, the speculation that minds or consciousnesses might someday be transferred between bodies has yet to be realized. Cybernetic implants are often of assistance in treating neurological or spinal injuries, however, and the option of psionic healing to stimulate otherwise impossible neural regrowth also exists.

Even as age-old problems are conquered, physicians of the 23rd century face a never-ending battle against newly arisen health threats. Life in space and on hostile worlds presents all kinds of opportunity for accidents, injuries, and illness. Advances in weapons technology demand ever-more sophisticated medical procedures to treat the wounded, alien microbes and toxins must be recognized and then treated, and the long-term effects of living in variant gravities, atmospheres, and atmospheric pressures require continuing consideration.

Fires of Heaven^{v1.0}

While the practice of medicine has become intensely specialized on core worlds, the nearly vanished field of general practice has experienced a rebirth on frontier worlds. A single physician often serves an entire community of pioneer colonists, doing everything from treating injuries to delivering babies.

Antigeria Treatments - Advances in nutrition, disease prevention, fitness, and medical treatment mean most people can expect a longer natural lifespan than their 20th-century counterparts. A low- or zero-g environment, which can ease cardiovascular strain, can further prolong life. In the 23rd century, the average lifespan of a man is 114, and of a woman 126. The oldest living person whose age can be confirmed is Tatiana Obretsky, age 152, who resides in an orbital rest home near Luna.

Even so, some still pursue even longer lifespans out of a thirst to see what tomorrow holds, fear of death, or any of a hundred other reasons. Antigeria treatments, also known as "rejuv" or "regen", can extend life beyond the longer lifespan enjoyed by most people of the 23rd century, but at a high financial price. Most of the deleterious effects of aging are rooted in copying errors in DNA and RNA, which create faulty or inefficient cells. As a person grows older, more and more of his cells are likely to be defective as copying errors accumulate.

This natural process, known as senescence, can be reversed with treatments devised chiefly by Dr. Madeleine Desaix in 2114CE. Desaix engineered an artificial phagocyte, a cell designed to engulf and destroy foreign particles, that spots cells whose DNA is deficient in producing important proteins. The DNA in the defective cells is then repaired, allowing the patient to live longer and retain the flexibility, healing ability, and sensory acuity of someone far younger.

Antigeria treatments have the unusual side effect of turning the patient's hair a snowy white. Scientists have been unable to eradicate the effect, but many of those who undergo regen consider it a status symbol. Patients typically undergo their first antigeria treatments around age 40, at which time a baseline is established. After this, periodic booster treatments are required at several year intervals. Initial treatment usually takes about two weeks, with booster treatments lasting approximately a week. Antigeria treatments are the province of the very rich. The initial treatment costs about one million credits, with follow-up procedures priced at a hundred thousand credits and up per treatment.

Desaix Interstellaire, a transnat formed in 2120CE by Jean Desaix, son of Dr. Madeleine Desaix, remains the premier source of antigeria treatments. Refined by decades of research, its antigeria treatments are the most effective and expensive in this specialized market. Headed by Madeleine's granddaughter Marie, the company operates resort spas where patrons undergo treatments in utmost luxury.

Cybernetics - Cybertechnology has replaced passive prosthetics in the 23rd century, providing powered, technological replacements for virtually any part of the human body to restore or even exceed normal functions. Unfortunately, even the phenomenal effectiveness of regen tanks in treating injuries cannot cause lost organs or limbs to regenerate; they must be surgically replaced with cloned duplicates or cybernetics.

Cybernetic duplicates exist for most vital organs, limbs, and sensory organs. These can either simply mimic normal functions lost due to injury or illness, or provide enhanced abilities. Neural implants, also called brainware, can enable recipients to learn more, remember it longer and more accurately, and even download information directly into their brains. Some of the top manufacturers of cyberware include Bioware Ltd., CyTech Co., Hasekawa Cybernetics, and OmniCorp.

Black-market cyberware also exists, chiefly gear outlawed by the United Worlds for safety or health reasons.

Few United Worlds citizens would argue against the necessity of cybernetics in cases of traumatic injury, but some find *elective* implantation of cyber-tech repugnant, especially if it involves removal of perfectly good biological parts. They view it as wilful mutilation in the name of gaining an edge over normal humans or, in cases of religious objections, a rejection of the divinely inspired human form.

Others view cybernetic procedures as scarcely different from plastic surgery of the 20th century. In fact, some subcultures are infatuated with cyberware, whether as an act of rebellion against conventional values or a matter of mere practicality. Datathieves favor neural implants, while street soldiers and crime figures are big on combat enhancements, for example.

Exotic Medicine - Some of the most dangerous alien lifeforms are those visible only under a microscope. Exotic viruses, bacteria, fungi, and parasites present a continual challenge to physicians in the 23rd century. It took humanity centuries to defeat the diseases of Earth, and some continue to defy a cure. The potential threat posed by alien pathogens keeps modern physicians and researchers busy.

Fortunately, many exotic microorganisms are so alien as to be harmless to humankind or other Earth-born lifeforms. Others are more of a minor inconvenience, triggering allergies or short-term illnesses. But a few *do* pose serious health risks to humans, often attacking the body in unexpected ways. For example, Holman's disease, caused by a virus natural to the world of Hephaistos, decalcifies human bones similar to an accelerated form of osteoporosis, leading to death as the skeleton literally dissolves. Holman would gladly have foregone the fame of having something named after him...

▼ **PERSONAL TRANSPORT** - Most U.W. planetary vehicles rely on fuel cells for power. A fuel cell generates electricity by passing hydrogen atoms through a membrane coated with a catalyst that strips an electron from the atom, producing an electric charge used to power the motor. The ionized hydrogen joins with oxygen in the fuel cell to create water. More membranes can be added to generate more power. Easily processed from water or common compounds, hydrogen for fuel cells is far less expensive and simpler to obtain than deuterium or helium₃ fusion fuels.

Clean, safe, and pollution-free, fuel cells produce enough power to run most hovercraft, aircars, aircraft, and watercraft. High-speed vehicles employ special pressure tanks of metallic hydrogen to expand their fuel-carrying capacity, but most use less esoteric means of hydrogen storage. Most worlds, even colonies, will have a good hydrogen-distribution infrastructure.

Intercontinental aircraft, ocean-going vessels, and other forms of long-range transport typically use small fusion power plants, which are more economical for lengthy voyages, but far more expensive in initial purchase cost. Military vehicles, from tanks down to aircars, and top-end luxury cars can also utilize fusion power.

Air vehicles - Hypersonic aircraft travel at the edge of the atmosphere, where the air offers the least resistance, to attain truly mind-boggling speeds. Capable of reaching speeds of 12,000kph or more, hypersonic aircraft complete even the farthest of trips in a matter of hours.

On airless worlds, "hoppers" (limited-range spacecraft propelled by fusion engines), fill the role of aircraft by making low-altitude flights from point to point. Starports, space habitats, and non-aerodynamic starships rely on shuttles to carry supplies, personnel, trade goods, or other necessary cargoes from the ground to space and back again.

Ground Vehicles - Hovercars are a common form of ground vehicle in the United Worlds. A hovercar floats on a cushion of high-pressure air created by high-speed turbines underneath the vehicle, allowing it to pass over land or water without touching the surface, moving faster and more smoothly than a regular surface vehicle could.

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Hovercars are worse at traversing steep slopes than wheeled vehicles, and must remain within a few feet of a horizontal surface - they are *not* flying vehicles. Hovercars also require an atmosphere and are strongly affected by crosswinds. Most commercial hovercars must be configured to limit stray blasts of air, which could otherwise knock over nearby pedestrians or wreak other havoc as the vehicle passes by. Finally, hovercars are very fuel-inefficient because they must expend fuel just to suspend the vehicle, let alone move. For all these reasons, wheeled ground vehicles are a popular and economical alternative to hovercars on most worlds. In many societies, hovercars are luxury vehicles purchased as much for status as for utility.

Smooth surfaces are best for hovercraft and wheeled vehicles alike, so roads continue to be part of human settlements. In addition to increasing the speed and safety of ground travel, streets lend uniformity and order to communities.

Populous cities on core worlds usually employ computerized traffic control systems to speed travelers safely to their destinations. The driver simply tells the onboard computer their destination, then sits back as a citywide computer uses global positioning satellites, beacons, and transponders to steer the vehicle through city streets. An override allows the driver to take control in an emergency, though doing so for less than compelling reasons may violate local laws. In general, computerized traffic nets are known for their reliability and efficiency in reducing gridlock, inebriated or reckless driving, and other hazards.

Growing in popularity, aircars are not restricted to the ground. The powerful turbines in an aircar can lift it up to several thousand meters in altitude, depending on local air pressure, although aircars can also function as ordinary hovercraft. Emergency personnel, law enforcement agencies, and some branches of the government most often use aircars. Certain worlds license aircars for private use as well, giving corporations, planetary nobles, and the rich the opportunity to soar over the masses of ground-bound citizens. Aircars have almost completely supplanted the role once fulfilled by helicopters.

Rovers, multi-wheeled or tracked vehicles, are used on planets where lack of atmosphere or other conditions prohibit aircars. Slower but very rugged, rovers are also popular for use on young colonies with few roads or for teams exploring virgin worlds.

Maglev trains are another form of ground transportation. A magnetic-levitation train floats on a track lined with high-powered electromagnets carrying an opposite polarity to magnets on the underside of the train. Pulses of changing polarity in the track magnets propel the train at velocities of up to 8,000kph in a tube of partial or total vacuum.

On frontier worlds, where technology must often be imported at high cost, vehicles are rarer. Pioneer colonists are far more likely to use mounts or draft animals for transportation. A horse or ox, unlike a hovercraft, can feed itself by grazing and can be bred to create more horses or oxen.

Water Vehicles - Watercraft have undergone refinement in design, but few radical changes have been made to vessels plying the sealanes. Most small boats are powered by fuel cells, while ships and submarines tend to rely on fusion power plants. Not only are 23rd-century vessels faster than their 20th-century counterparts, they have far greater reliability, seaworthiness, and durability.

Hydrofoil designs, which use an underwater wing to provide lift, are common among surface craft. The hull rises out of the water as the ship skims along on the hydrofoils at a brisk pace. Hovercraft vessels are also often employed in ports or coastal waters. They are especially useful in regions where deep-water harbors have not been established.

Submersibles, once chiefly used by military forces, are quite commonly employed for cargo hauling, mining, and other undersea commercial ventures. They are particularly useful on worlds with stormy climates that make travel by surface ships risky. Super-strong alloy hulls allow subs to reach the ocean floor on most worlds - although abyssal chasms may still be impassable.

▼ **PERSONAL WEAPONRY** - The need for defense against an often-hostile universe, not to mention humanity's failure to overcome its own aggressive tendencies, require that arms and armor technology keep pace with scientific advances.

A wide variety of personal weapons are currently available in the United Worlds. Modern bladed weapons utilize advanced alloys or nano-wires for superior cutting power. Electrostatic stun rods, on the other hand, are a non-lethal option. Despite the emergence of other forms of weaponry, conventional firearms are still popular for their ruggedness and ease of repair, and they are now lighter and more reliable than in centuries past. Railguns use magnetic force to propel steel slivers at hypervelocity. Advancements in microcircuitry and superconducting alloys have fostered production of a variety of energy weapons: lasers that fire beams of coherent light, blasters and particle beam weapons that project charged atomic particles traveling at relativistic speeds, and ranged electrostatic stunners that discharge a non-lethal electrical charge tuned to incapacitate the target.

Personal Armor - The rising lethality of handheld weapons requires a corresponding increase in the quality of protective gear. A variety of materials are used for 23rd-century armors, from fabric-like synth-leather to polysteel. Most suits of armors have tough armor over vital areas and minimal to no armor elsewhere to reduce weight-imposed restrictions on movement and agility. The philosophy is that people cannot be replaced, but extremities can be. Arms, legs and hands are generally protected enough to stop fragments and secondary damage, while the head and torso are protected enough to stop most if not all of the weapons a soldier is expected to face. There are exceptions, of course. Heavy assault forces may have good armor overall, and armored e-suits generally have overall protection as well.

Of course, armor clearly indicates the wearer expects a fight. For StarForces Marines deploying on a boarding action or U.W. marshals raiding a black-market orbital factory this isn't a problem, but a civilian decked out in heavy armor in the center of New Detroit will likely pique the curiosity and concern of local police. For this reason, most civilians wearing armor tend to rely on concealed vests and secondary armors like synthleather that can be fashioned into normal garments.

*I must go down to the seas again,
to the lonely sea and the sky,
And all I ask is a tall ship
and a star to steer her by...*
John Masefield, poet, 1902CE

▼ **STARSHIPS** - Humanity has been sending vehicles into space for over 250 years. Over that time, tremendous strides have been made, ranging from the early development of reusable spacecraft to the construction of ships capable of crossing interstellar distances. Shipyards, designers, and researchers continue to refine existing technology and devise new systems for the starships that make interstellar civilization possible.

Artificial Gravity - Developed in the past decade from reconstructed Vorn technology, artificial gravity devices generate a gravitic field that can be tuned to remain at a constant level. They do not counteract gravity, and, in fact, are not yet precise enough to function properly where gravity already exists. While exceedingly useful in zero-g, artificial gravity devices aboard starships cannot be tuned quickly enough to counteract the g-forces of acceleration or rapid maneuvering.

In spite of these limitations, artificial gravity equipment has revolutionized starship and space habitat design. No longer must architects rely on spin hulls or rotating habitats to simulate gravity. All of the newest starships incorporate artificial gravity generators, and several worlds have launched construction of new starports to take advantage of the innovation.

Drives - A host of technologies have been used through the centuries to propel spaceships.

The liquid rocket fuels of the late 20th and early 21st centuries, typically a mix of hydrogen and oxygen that produced a chemical reaction providing thrust, are almost never employed in the 23rd century.

Fission drives use the energy gained by splitting uranium atoms to convert hydrogen into a plasma which is expelled to provide thrust, but have the drawback of producing radioactive waste, both in use and when their fuel cores are spent.

Solar-sail vessels employ the minuscule pressure of solar photons on vast sails to slowly accelerate to considerable speeds. Fuel costs are nil, save for a possible backup drive, but solar-sail ships are quite slow compared to other vessels and in the 23rd century are primarily in-system pleasure craft.

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Ion drives strip electrons from gaseous fuels like argon or xenon, giving the atoms a positive charge, and eject the resulting ionized particles at high velocities to produce thrust. Ion-drive vessels have a very low acceleration but are extremely fuel-efficient. They are energy hogs, but since interstellar vessels need large reactors to power their Rozkhov drives, this is not a liability, so many commercial vessels are equipped with low thrust ion drives as the most profitable option in the long run.

Fusion power plants were perfected in 2048CE, but it took years of refinements to make them viable ship drives. Fusion drives mimic the internal processes of the stars to fuse lighter elements into heavier ones, generating superhot plasma that is ejected to provide thrust. Fuel-efficient, fairly clean and safe, fusion drives are still the chief form of propulsion for medium-thrust human starships.

Antimatter drives, a recent technological advance, outstrip even fusion drives in efficiency and power. These drives direct streams of matter and antimatter at each other. The streams annihilate each other, converting completely into energy in the form of plasma used to propel the starship. Antimatter fuel must be artificially created, and is quite expensive. The fuel must also be kept separate from all matter via magnetic shields lest an uncontrolled, tremendously destructive explosion occur. The huge expense of building antimatter drives, fuel costs, and potential dangers offset their high efficiency.

All of these technologies are reaction drives, in that they use some force to propel the ship. Movement with reaction drives is inertial - a starship moving in one direction cannot instantaneously change course; inertia keeps it moving along its original path, until thrust is applied to counteract that momentum.

Reactionless drives allow ships to ignore the effects of inertia, allowing rapid course changes. The only known reactionless drives are the gravitic drives aboard Vorn starships, which somehow induce gravity wells ahead of the vessels that pulls them forward. The Vorn can apparently redirect the field at will, pulling vessels in new directions. Human scientists have failed to deduce the principles behind gravitic drives or duplicate the technology.

Starship Weapons - Most starship armaments are based on the same principles as hand weaponry. Lasers and particle beam weapons predominate, with rapid-fire railguns employed only as point-defense cannons. Plasma cannons fire a superhot plasma sphere contained in a self-generated metastable magnetic field. Based on particle-beam technology, variants of plasma weapons are also used as personal armaments (blasters), but the extreme heat they generate gives them a low rate of fire. Missiles are a vital component of starship arsenals. Their computer brains are often equipped with highly sophisticated targeting systems and counter-ECM routines.

The tremendous distances involved in space combat multiply the size and power demands of starship weapons enormously. A laser cannon may only triple the effective energy of a laser rifle, for example, yet be a hundred times larger (including focusing and targeting equipment).

The United Worlds has outlawed use of nuclear weapons in space (and elsewhere), due to the potential for escalation into orbital planetary bombardment. There are reports, however, that some StarForces Navy ships carry nuclear arms and that a top-secret procedure for authorization of their use by the federation president exists.

Starship Defenses - Starships expected to engage in combat rely on maneuverability, high-tech magnetic screens, and old-fashioned hull armor for protection. StarForces Navy ships are armored, as are many civilian vessels in dangerous frontier systems, but ship owners elsewhere tend to eschew armor as an unnecessary added expense. Polysteel, a polymer-steel alloy, makes up most starship armor, although older ships may have simple steel or cermet armor instead.

Some vessels are equipped with magnetic screens used to partially deflect metal projectiles, particle beams, and plasma bursts. They have no effect on lasers or other weapons unaffected by magnetic forces. A superconducting lattice built into the hull, when charged, creates an intense magnetic field a few centimeters from the hull's surface. The field can cause severe injury to any living thing that touches it, but fortunately, few people are likely to be on the outside hull during starship combat.

Space Travel - Space travel in the federation is much like naval travel on Earth in the late 19th century. Ports handle ships ranging from the last of the old sailing vessels to the most modern liners, generations-old tramp steamers whose owners are barely scraping by, and shiny new military vessels displaying national strength. One can book a passage to virtually anywhere, though it may take some time to find a ship headed where you want to go, or you may have to change ships somewhere along the way. Some passengers travel first class, with accommodations as luxurious as they would find at home, while others travel in the noisy (but far cheaper) bowels of the ship, segregated from "their betters" by bulkheads and maglocked doors.

And on the frontiers of civilization, shipping is generally more primitive, the maps are not as good, and there are pirates and other unsavory characters plying the shipping lanes.

Even with the best of ships, travel still has its risks. Not just pirates or errors in navigation, but the nature of the environment itself is hostile to human life. A storm, an accident, or hostile humanity can render even the largest ship helpless, and no one will know until it doesn't arrive in port on time, and it would be days or weeks more before anyone can find the stranded vessel, if it can be found at all.

Everything we have just said of the 19th century could be said equally well for the 23rd.

Without FTL, the vast distances between stars prevented exploration or colonization of all but the nearest star systems for early spacefarers. Even a hypothetical starship capable of attaining near-light-speed velocity would still spend years in flight before reaching another star. The Rozhkov Drive alone makes interstellar travel practical, creating a wrinkle in the fabric of the universe forcing two points in space dozens or even hundreds of light-years away to momentarily coexist.

The process requires precise navigation to avoid misjumps that could land a starship in an unfamiliar reach of interstellar space or within the heart of a star, or cause it to never emerge from the artificial singularity at all. Scientists speculate that novas and other stellar phenomena may play a role in such disasters, possibly upsetting the delicate calculations of magnetic and gravitic fields necessary for successful jumps. Unusual stellar phenomena are well mapped on the routes between core worlds, but less travelled routes may have unknown or transient phenomenon that result in a handful of ship disappearances each year, most of which end up being attributed to space piracy.

For these reasons, a Rozhkov Drive cannot be safely used within a prescribed distance of any gravity well, such as those created by stars or planets. Ships must travel to a point where stray gravitational effects can be overcome before jumping, and emerge at a similar safe point outside the destination star system.

A quirk of travel through a Rozhkov singularity is that an object loses almost all of its momentum in the transit, emerging from the jump at a dead stop relative to the largest gravitational body in the destination star system. Massless particles (such as the photons of communications array lasers) do not experience this velocity forfeiture. A handful of scientific experiments have been done with subatomic particles superslowed by passage through a singularity, but the ramifications of this research have yet to be seen.

More than a century of refinement has failed to overcome size restrictions on an object passing through singularities. No one has managed to move anything through a singularity in between the size of a photon and a 300-ton vessel. Carriers are therefore still required for fighter craft and message drones; missiles or other small objects cannot be fired through jump points. In the early days of interstellar travel, the staggering energy costs and extensive equipment required to create artificial singularities forced the United Worlds to construct gigantic jumpgates in space. Realigning the gates for new destinations took weeks at a time.

Over the years, miniaturization and design refinements allowed individual ships to be outfitted with Rozhkov Drives. Similar innovations in the computer field permitted shipboard navigators to set up jumps in considerably less time than their early counterparts.

Nearly all interstellar travelers suffer from disorientation and fatigue immediately after a jump, but this normally passes within moments. Some humans, Nutoa, and Jodoni experience the more debilitating jump sickness, suffering fatigue and mental confusion a day or more after a trip via the Rozhkov Drive. Neither Vorn nor Ethereans ever undergo jump sickness, and they have only mild jump shock experiences, while only a few D'eira suffer from jump sickness.

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Electronics are also affected by passage through a singularity. All electronics (including computers, cybernetics, and certain weapons and starship systems) cease to operate while transiting a jump point. Shipboard systems are designed to automatically reboot following a jump, but the process can take up to several minutes. Military ships are designed to have their most critical systems running within thirty seconds. Persons whose life depends on the functioning of advanced technology (like a bionic heart) are thus generally prohibited from interstellar travel unless they have a fully trained medical team with them. And even then, it can be a risky proposition. In addition, persons who for whatever reason have behavior-modification implants are usually prohibited by law from interstellar travel (what if it doesn't reboot after a jump?).

In addition, no matter what a ship's speed when it begins its jump, it emerges at a standstill relative to the system's primary (generally its largest gravitational source), requiring the ship to begin acceleration from a vulnerable zero velocity once its systems are on-line.

For these reasons, most core systems have established safe points for incoming ships to jump to where the StarForces maintain patrol ships that scare away those who would prey on temporarily disabled starships.

Jumpgates - The advent of ship-mounted Rozhkov Drives has altered but not eliminated the role of jumpgates. No longer the only path to other stars, the jumpgates found in core systems still see considerable traffic of vessels lacking Rozhkov Drives, whether because of hull size, power, or financial constraints.

The most heavily travelled jumpgates are permanently configured for a single destination, but others can be reprogrammed for the desired destination of each ship passing through the gate. A small staff administers each jumpgate to prevent mishaps or disputes over precedence.

Even vessels capable of initiating their own jumps sometimes transit jumpgates for the sake of convenience, simplifying the astrogational calculations required for a successful jump and saving the ship's own energies for use in the immediate future. Jumpgates charge a fee of 0.5 to 2 Credits per ton of the starship entering the gate, with the usual economic factors determining the price; an out-of-the-way gate, for example, typically charges less in order to attract customers. Jumpgates have the same limits on minimum mass as jump drives. Ships of less than 300 tons must dock inside a "carrier" to get the total up to the required amount, and unless they are willing to pay a premium, must wait until the carrier is reasonably full before jump transit is initiated.

Travel Time - Ironically, the longest leg of an interstellar journey can be completed nearly instantaneously. Traveling to a point where magnetic and gravitational forces created by proximity to a star or planet do not interfere with a jump constitutes the bulk of any interstellar trip.

The exact distance necessary for a safe jump depends on the spectral class of the star or mass of the planet, as more powerful stars create stronger gravitational and magnetic fields. It can take a week or more for a starship to reach a safe jump point.

Most starships accelerate to a certain velocity, measured in g forces, coast at that velocity until they near their destination and then decelerate by thrusting in the opposite direction to cancel their inertia. A ship planning to make a jump will typically bypass the deceleration phase, as the ship's momentum will be zeroed out at the destination by the passage through the singularity. For more information on travel times see the **Starships** chapter.

EXAMPLE: The *Lotus*, a tramp freighter, plans a jumpgate journey from Earthport in Sol system to Asgard in the Epsilon Eridani system. Sol, a yellow G-class star, has a Rozhkov Radius of 5 AU. Earth already lies 1 AU from Sol, so the *Lotus* must travel another 4 AU before jumping.

The *Lotus* could accelerate under a constant 1g thrust and reach that distance in four days, but would then pass the jumpgate at several thousand kilometers per second. It can also accelerate to the halfway point and then travel under a constant 1g deceleration to arrive at a jumpgate to Asgard in just under six days. Or, if it wants to conserve fuel, it can use a constant acceleration of less than 1g for the whole trip, or even coast at zero-g for part of the way, extending its travel time by any desired amount.

After transiting the jumpgate, the *Lotus* emerges at a distance over a little over 2 AU from Asgard, a gap it could cover in less than three days with constant 1g acceleration, or in four including deceleration time.

If the *Lotus* began its trip from orbit around Saturn (which lies 9.5 AU from Sol) instead of Earth, it would only have to escape the Rozhkov Radius of the gas giant, since the ship is already far outside the minimum safe distance from the star.

Exactly how the *Lotus* handles this or any other trip probably depends on the vagaries of what it is carrying as cargo, the urgency of delivery and the cost of fuel and engine maintenance vs. the cost of crew salaries. The ship's computer probably has a dedicated piece of software for just this ship model, designed to generate an optimal solution for any given scenario.

▼ **LIFE IN SPACE** - Most United Worlds citizens think of the federation as encompassing a number of worlds, but from starships to zero-g mining operations, starports to orbital space habitats, plenty of federation citizens live, work, and play in space.

Space Habitats - Millions of United Worlds citizens have made space their permanent home. All kinds of space habitats can be found in a populated star system: military outposts, industrial operations, universities, hospitals, laboratories, luxury resorts, family estates, and rest homes for the aged, among other applications.

In addition, some people move to space habitats to pursue fringe religions, theories of utopian society, spiritual contemplation, or other pursuits unmolested by outside forces. But most habitat residents just find life in space preferable to living on a planet for reasons as mundane as predictable weather or as serious as health problems necessitating a lower gravity or sterile environment.

Space habitats are found in orbit around planets, in asteroid belts, or at Lagrange points or other stable orbital positions. Most space habitats, constructed before the advent of artificial gravity technology, employ centrifugal force to simulate gravity. Typically, the outer rings or cylinder of the habitat rotate around a zero-g core that serves as a docking point for starships. Points midway between the core and the outer rim could have different gravity levels.

The need to rotate the habitat makes rings, cylinders, toruses, or dumbbells the most common design of old habitats, but newer constructions, using artificial gravity, may take any form. Solar power and nuclear fusion are the most common sources of energy for space habitats. Extensive farms, which may be kept separate from populated areas so conditions best suited to plant growth can be employed, provide fruits and vegetables. Livestock, which require vast amounts of land, are rarely found in space habitats. Poultry farms and fishponds partially address this lack, but meat remains an expensive luxury aboard many habitats. Most residents rely on tofu, soy, or other sources for protein, and many inhabitants are vegetarians for economic reasons.

Space habitats are rarely isolated structures. Nearby platforms often house factories, shipyards, cargo warehouses, and other operations - usually those favoring zero-gravity conditions or variant gravities.

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▼ Rozhkov Radius - The Rozhkov

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Radius is the minimum practical (and safe!) distance from a star or planet that a jump point can be opened. Jumps are extremely hazardous inside the Rozhkov Radius. The distance required to escape the critical gravity well varies depending on the mass of the star or planet.

A star with a mass equal to Sol has a Rozhkov Radius of 5 AUs. Stars with higher or lower masses have proportionately higher or lower Rozhkov Radii. The figures on the chart are averages for each spectral class.

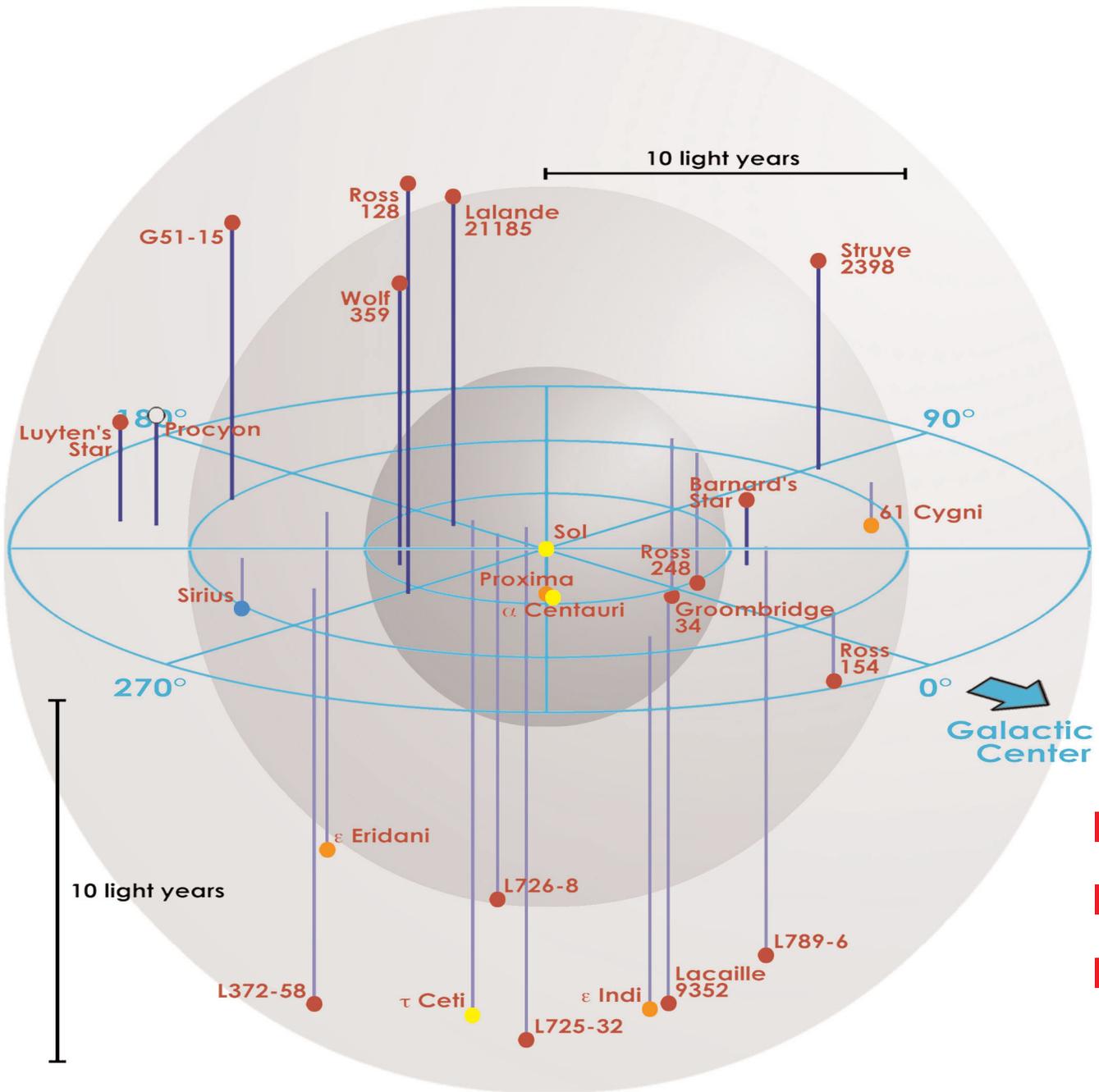
Spectral Class	Rozhkov Radius in AUs
A	11
F	8
G	5
K	3
M	1

Compared to stars, however, planetary masses are so small as to be insignificant. A terrestrial world, such as Earth, has a Rozhkov Radius of .00002 AU, or about 3,000 km. Even a gas giant, such as Jupiter, has a Rozhkov Radius of only .005 AU - roughly 750,000 km. If such a body existed without the presence of a nearby star, it could be jumped to or from quite closely. The Rozhkov Radius of a starship is less than a meter, so if one ship is attempting to close to boarding range with another, the defender can safely jump away until almost the last moment.

Physics Primer Edu 11 - reference ud239872.892389.893123 - .05Cr

Starports - Starports are in some ways the equivalent of 20th-century airports. While some of the smallest are on planetary surfaces, most orbit the planets they serve. The busiest feature not only embarkation and cargo transfer facilities, but also factories, refueling and repair stations, StarForces Navy bases, and numerous ancillary businesses, from dealers selling new and used starships to the support services needed for the hundreds of employees who work in the port and live in attached or nearby habitats.

Stars within 12.5 light years of Sol



Based on data provided by Richard Powell

"Interstellar distances are vast beyond our ability to truly comprehend them. Anything beyond the depth perception of our eyes is simply "way out there", whether it is a dozen kilometers or a dozen light years away. Most of the distance between here and anywhere is dreadfully boring, since the universe is over 99.999% full of absolutely nothing. Cadets, it is a measure of your intelligence that the StarForces will spend the next four years teaching you how to avoid running into that other .001%."

Cpt. Ben Adshaw, Astrogation 101, 2214CE

▼ **INTRODUCTION** - More than seventy stars lie within twenty light-years of Sol. There are dim red dwarfs, hot white stars, binary and trinary systems, and even a few startlingly Sol-like stars. Planets, some as lifeless as Luna and others as verdant as Earth, circle many of these distant suns. Ringed gas giants, asteroid belts, comets, and other products of planetary system formation are also present throughout the cosmos. Humans have colonized a dozen star systems in this sea of night and united with alien civilizations native to two more.

▼ **REALITY CHECK** - Recently astronomers have detected several extrasolar planets by studying their gravitational effects on stars. All of the worlds discovered so far are gas giants - as yet, terrestrial worlds are too small to be detected by this method. Some theories predict that habitable terrestrial worlds will be quite rare, especially those larger than Earth.

Other scientists have recently discovered new moons of Jupiter and Saturn by carefully studying data from passing robot probes, and it's possible still more could be discovered around the outer planets of the solar system in the next two centuries.

Every effort has been made to make the planetary and star systems in **Fires of Heaven** consistent with the latest astronomical data (although some concessions to playability have to be made), but new discoveries will no doubt supercede some of the projections made here.

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Astronomical Classification - The stars in the U.W. federation were named centuries ago by astronomers populating star charts, usually for the constellations in which they appear (Alpha Centauri). The inhabitants of each star system often ignore their star's official designation, giving it either a name from the same mythological system as the planets of the system, or simply calling it "the sun". The Nutoa and D'eira call their primaries Tiika and V'ren respectively, names which are slowly replacing Procyon A and 70 Ophiuchi A in federation-wide usage.

The spectral class of the star, given as a letter and numeral, is the star's scientific classification, categorized by color and temperature:

Class	Color	Surface Temperature
O	Blue-Violet	more than 25,000°C
B	Bluish	11,000°C to 25,000°C
A	Blue-White	7,500°C to 11,000°C
F	White	6,000°C to 7,500°C
G	Yellow	5,000°C to 6,000°C
K	Orange	3,500°C to 5,000°C
M	Red	less than 3,500°C

A numeral (from 0 to 9) following the letter indicates where in each temperature range the star rests. On this scale, 0 comes after 9, and higher numbers indicate higher temperatures. Sol is a G2 star, a fairly bright, medium-sized, yellowish star.

No planets orbit O- and B-class stars, and few are found around A-class stars. Other stars may have planets, but worlds suitable for human habitation are most common around G- and K-class stars. Over 90% of all stars (including all that have planets inhabitable by humans) fall into this main-sequence classification scheme.

Size - Stellar sizes are given in solar radii. One solar radii (the radius of Sol) is about 7 million km.

Surface Temperature - Surface temperatures for stars are measured in degrees Celsius.

Distance from Sol - Interstellar distances are measured in light-years, or ly - the distance traveled by light in one year. One light-year equals 9.46 trillion kilometers.

▼ Glossary of requested terms

Binary Stars - An estimated half

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of all star systems are binary, or double stars. The two stars, often of different spectral classes, revolve around one another with each revolution taking as little as a few days to years or even centuries to complete. Many binaries have elliptical orbits, bringing the two stars closer together at times.

Widely separated binaries, in which the two stars are more than 100 AUs apart, may feature normal planetary systems around one or both stars. In close binary pairs, smaller planetary systems can sometimes form. Binaries with elliptical orbits may create periodic climatic changes on worlds as the two stars draw closer together.

Binary stars share the same name, with the individual stars labeled A and B.

Tidelock - The gravitational pull of stars on close-orbit planets, or planets on their moons, can create a condition known as tidelock. The rotation of a tidelocked world or moon precisely matches its orbit, forcing it to continuously present the same hemisphere to its primary, as occurs with Luna. Some tidelocked planets have fractional rotations, such as Mercury, which rotates exactly two times on its own axis in the time it takes to make three orbits around the sun. Tidlocked worlds feature extreme temperature variations between day and night hemispheres. In theory, native life could exist in a narrow twilight band between the two hemispheres.

Trinary Stars - Some stars systems are trinaries, in which three stars are linked. A trinary usually consists of two stars in a binary relationship and a distant companion. Trinary stars share the same name, with A, B, and C designations given to the individual stars.

Juno 3 public encyclopedia - reference cq239816.228463.910977 - .00Cr

▼ **REALITY CHECK** - The potential for habitable planets orbiting binary or trinary stars is considered low. If planets can even form around stars with companions, they are likely to have radical orbits with wildly changing climates that would seem to preclude native life or easy habitability by humans.

World Classification - Worlds are named by their discoverers, explorers, or colonists. In the United Worlds federation, all official planetary names come from mythology, legends, and religious beliefs. World names in a particular star system are drawn from the same theme, for example, Norse myths. Each world is also designated by its star name and a numeral denoting its position outward from the system's center. For example, Gobniu is also referred to as Epsilon Indi I, the first planet out from the star Epsilon Indi.

Orbit - The distance from the planet to its star is measured in astronomical units, or AU. One AU equals the distance from Earth to Sol, approximately 150 million kilometers. Orbits that are irregular will have two numbers, one for closest approach to its primary, and one for the most distant part of its orbit.

World Type - There are two major classes of worlds, terrestrial and jovian.

Terrestrial worlds are small to moderate in size, consisting of varying densities of rock, metal, and sometimes ice. These worlds are not necessarily Earth-like - terrestrial worlds come in all varieties, and many are quite inhospitable to human habitation.

Jovian worlds, or gas giants, are huge planets with dense atmospheres of hydrogen, methane, helium, and other gases. They have solid cores of ice or rock. No jovian world is inhabitable by humans, but some have moons suitable for colonization. The largest jovian worlds radiate heat and may be either failed stars or protostars. Brown dwarfs are enormous gas giants, anywhere from 13 to 80 times the size of Jupiter, with just insufficient mass to achieve fusion in their cores. These failed stars have been discovered in several uninhabited systems.

Small gas giants, such as Uranus and Neptune, are sometimes called subjovian worlds. Huge gas giants outstripping even Jupiter in size can be called superjovian worlds. As gas giants have no solid surface for humans to make landfall on, jovian planets have no listed surface gravity, atmosphere, or temperature.

Gravity - Surface gravity is measured in Earth gravities, or g's. On this scale, Earth has 1g, while a world where the gravity is half as strong has 0.5g. A world with "microgravity" has less than 0.05g (Earth's moon has a gravity of about .17g).

Atmosphere - Atmospheres are grouped in five categories.

"None" indicates that a world has negligible atmosphere, most often because its gravitational pull is too weak to retain one.

A world with a "normal" atmosphere has a nitrogen-oxygen mix breathable by humans under normal conditions. Humans can breathe safely in pressures between .8 and 1.2 Earth's sea-level atmospheric pressure. Below .8 atmospheres humans need respirators to avoid long-term health problems or to do any heavy work. If a human is thrust into an air pressure above 1.2 atmospheres without sufficient time to acclimate to the change, there is a chance that they could suffer the bends (see the **Adventuring** chapter). Some alien races have different atmospheric pressure tolerances.

"Tainted" atmospheres are nitrogen-oxygen mixes, but with contaminants such as ash, alien microbes, or traces of noxious gases. These pollutants range from irritating to deadly, and may necessitate filters or other breathing equipment.

"Exotic" atmospheres are either unbreathable or actually poisonous to humans. A vast array of gases are found in exotic atmospheres in varying combinations and percentages; ammonia, chlorine, and sulfur compounds are just a few possibilities. Some Exotic atmospheres are corrosive, containing acids that weaken metal and damage equipment. Others are extremely flammable or drastically impede visibility.

Humans require life support equipment to survive on worlds with Exotic atmospheres, and in corrosive atmospheres special armored equipment must be used.

"Reducing" atmospheres are unbreathable by humans, consisting of hydrogen, methane, or carbon dioxide. Life support equipment is required on these worlds.

Surface Temperature - This is the average of the highest and lowest extremes on the world, measured in degrees Celsius. Actual temperatures may vary wildly from the average, depending on latitude, orbital eccentricity, time of day, cloud cover, and other factors.

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U.W. Status - Ten classes denote the status of United Worlds activity on each world. Each status may have descriptives that may provide more detail on that status, such as "Military Outpost".

"Uncharted" worlds are known to exist but have never been investigated.

An "unexplored" world has been mapped from orbit, but no expeditions have landed on its surface.

"Active" exploration means survey teams are cataloging the planet's lifeforms, resources, and other features. This status seldom lasts more than a few months to a year. It also means that there is currently someone there, even if only a small scientific outpost.

"Explored" worlds have been extensively if not exhaustively analyzed, but colonization has not started.

"Failed" denotes a place where an attempt to set up an outpost or to colonize the world collapsed. Most of the colonists have left, but a few may remain out of stubbornness, poverty, or because their existence on the planet is unknown.

"Outpost" describes a military base, federation installation, or research station that has been established on the planet. Outposts are heavily subsidized and almost never self-supporting. They rarely house more than a few thousand people, and are almost always restricted to necessary personnel.

A "Pioneer Colony" is usually heavily subsidized, typically requiring massive importation of equipment and sometimes even food or water until the fledgling colony can exploit native resources.

"Active Colonization" describes a colony in the midst of a population boom as droves of new settlers arrive to seek their fortunes.

"Colony" indicates a stable, prosperous colony on its way to becoming independent, but not yet self-sufficient. Colonies are overseen by the U.W. Ministry of Colonial Affairs, in conjunction with a local government.

"Independent" means the world is a member of the United Worlds federation. It is self-supporting, and may even be an interstellar economic power.

Population - Population figures are based on the latest census, and may not be completely accurate, particularly for worlds with very few inhabitants or planets believed to be unpopulated. The total includes space habitats in near orbit.

Starport - Starports are rated in four categories based on the sophistication of the facilities and available services. Some planets may have multiple starports, but only the most advanced is listed. Occasional derisive references to Epsilon-class starports are a joke - no such class exists.

Alpha-class(α) starports are orbital facilities with antimatter and fusion fuels always available. Shipyards capable of repairing all damage and constructing new vessels are present. Many used starships and components can be found. A center of United Worlds authority, Alpha-class starports are well stocked with customs officials, administrators, marshals, and security officers.

Beta-class(β) orbital starports always have fusion fuels, and antimatter fuels may be available. Yards capable of repairing all starship damage are present. Some used vessels and parts are for sale. A sizable force of federal personnel oversees operations.

Gamma-class(γ) orbital starports have fusion fuels available (sometimes at inflated prices), and facilities for repairing light damage to starships. A handful of used starships and components may be for sale. Light contingents of federal personnel administer Gamma-class starports.

Delta-class(Δ) starports are landing strips on the surface, with no orbital facilities. Starships must be streamlined to land at delta-class starports on planets with atmospheres. Otherwise, shuttles must be used to transport cargo or passengers from orbit to the starport and back again. Fusion fuels are available in small quantity from local refineries, and there are no repair facilities. There are no U.W. security forces (though there may be local security) and only a handful of administrative personnel.

Moons - Worlds may have satellites of various sizes and/or rings. Some planets, particularly gas giants, have numerous moons. While moons are always smaller than the planets they orbit, some moons are larger than other planets in the star system; a few even have atmospheres and are capable of sustaining life. Jovian moons are favored by pirates, smugglers, and other unsavory types for hidden bases and fuel dumps.

Asteroid Belts - Asteroid belts are loose bands of small rock or ice planetoids of varying sizes. The largest asteroids are typically no more than a thousand kilometers in diameter while the belt also contains clouds of orbiting dust specks. Asteroids are widely scattered over millions of kilometers, and the larger the asteroid the more stable its orbit usually is. Asteroids have no atmospheres, but may contain valuable metals, minerals, or water. Outside of the solar system, only the largest asteroids are named, and then usually only if the belt has been colonized. Asteroids are typically named after minor figures in the same mythological tradition as the major planets of a system.

Most stellar systems with inhabitable planets are also surrounded at a great distance by a great number of small ice and rock asteroids in an Oort cloud (named for its discoverer), the source of most of the system's comets. Sol's Oort cloud begins beyond the orbit of Pluto and extends for more than 100AU. Because of the small average size of the asteroids, the large average distance between them, and their remoteness from industrial centers Oort cloud mining is rarely profitable.

Orbit: The distance from the star to the inner edge of the asteroid belt, measured in astronomical units. The **orbital width** is the width of the asteroid belt, measured in AUs.

Type: Belts are classified by the composition of most of their asteroids. Icy asteroids are primarily composed of water ice and ices from gases such as methane. Carbonaceous asteroids are chiefly carbon, metallic asteroids are rich in nickel and iron, and silicate asteroids are primarily silicon. Every belt contains asteroids of all four types, but typically one predominates. Belts with a high percentage of metallic asteroids are the most profitable for mining.

U.W. Status: The same classifications are used as for worlds, except that the scattered nature of settlements in asteroid belts usually precludes formation of cohesive independent states. The remoteness of most belt habitats, coupled with the sparsity of government personnel, often breed a fierce sense of autonomy among belt inhabitants, however.

Population: An asteroid belt's inhabitants may be spread across hundreds of millions of kilometers. In some belts, space habitats may be clustered around supply points, ore-processing plants, and factories.

Interstellar Distances - This chart presents the stellar coordinates of the inhabited systems of the federation along with the distances between the stars. The chapter opening illustration displays much of this information in graphical form.

Binary and trinary stars are listed as a single system; in interstellar terms, even stars hundreds of AUs apart are so close as to be indistinguishable for astrogation purposes.

	Sol	Alpha Centauri	Lalande 21185	Epsilon Eridani	61 Cygni	Epsilon Indi	Procyon	Tau Ceti	Omicron Eridani	70 Ophiuchi	Sigma Draconis	Delta Pavonis
Sol	-	4.4	8.1	10.7	11.2	11.2	11.4	11.9	15.9	16.7	18.5	18.6
Alpha Centauri	4.4	-	10.2	12.8	14.2	9.1	13.0	13.5	17.9	16.0	21.9	15.1
Lalande 21185	8.1	10.2	-	15.8	14.9	18.9	9.4	18.7	19.5	19.9	17.0	25.3
Epsilon Eridani	10.7	12.8	15.8	-	16.9	13.7	11.6	5.4	5.7	25.9	24.1	21.3
61 Cygni	11.2	14.2	14.9	16.9	-	16.7	20.6	15.5	22.1	13.7	10.9	24.1
Epsilon Indi	11.2	9.1	18.9	13.7	16.7	-	19.6	11.1	18.6	17.7	27.0	8.4
Procyon	11.4	13.0	9.4	11.6	20.6	19.6	-	16.5	12.8	27.4	24.0	26.0
Tau Ceti	11.9	13.5	18.7	5.4	15.5	11.1	16.5	-	9.8	24.1	24.5	18.9
Omicron Eridani	15.9	17.9	19.5	5.7	22.1	18.6	12.8	9.8	-	31.6	28.2	25.5
70 Ophiuchi	16.7	16.0	19.9	25.9	13.7	17.7	27.4	24.1	31.6	-	19.9	20.7
Sigma Draconis	18.5	21.9	17.0	24.1	10.9	27.0	24.0	24.5	28.2	19.9	-	34.3
Delta Pavonis	18.6	15.1	25.3	21.3	24.1	8.4	26.0	18.9	25.2	20.7	34.3	-

If I was offered a senior post at one of the frontier offices, even a vice presidency, I'd turn it down without thinking twice. Sure, you can be a big fish in a small pond out on the frontier, but if you want to really make something of your career the core is the place to be. Yeah, the company's biggest profit margins are on the new worlds, but all the real action takes place on the core worlds.

- Jasvinder Randhawa, Amex junior executive, 2237CE

THE CORE SYSTEMS - As humanity expanded outward from Sol, colonists first targeted the nearest star systems with habitable planets. Now mostly mature, technologically advanced states, they constitute the core worlds of the U.W. federation.

Sol
Spectral Class: G2-Yellow
Size: 1.0 solar radii
Surface Temperature: 5,567°C

The only sun known to humanity for millennia. Nine planets and two asteroid belts orbit Sol. Earth, Luna, and Mars are highly developed core worlds housing the seat of the United Worlds government and StarForces headquarters. The asteroid belt is also populated. A center of commerce, Sol attracts trade from throughout the federation.

Fires of Heaven^{v1.0}

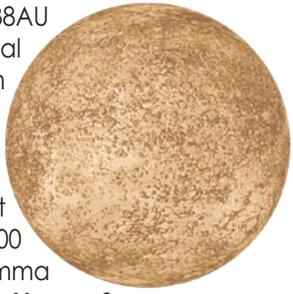
Cross-indexing vertical and horizontal columns gives the distances between the stars in light-years.

EXAMPLE: The distance between Sol and Tau Ceti is 11.9 light years, while the distance between Tau Ceti and Procyon is 16.5 light years.

Scientists at Hyperion Station, a space habitat just inside Mercury's orbit (named for a Greek titan associated with the sun), glean insights about Sol from their close-up study of the sun. Disposable robot probes fired into the star provide much of their data.

Numerous jumpgates and communications arrays are found in the Sol system, including high-security government and military facilities.

Mercury (Sol I)
Orbit: 0.38AU
World Type: Terrestrial
Equatorial Radius: 2,439 km
Gravity: 0.4g
Atmosphere: None
Surface Temperature: 165°C
U.W. Status: Outpost
Population: 100
Starport: Gamma
Moons: 0



Bathed in deadly radiation, the sun-scorched wastelands of Mercury are home to enormous particle accelerators and solar cell arrays constructed to produce antimatter fuel.

While not truly tidelocked, the airless, lifeless world turns very slowly on its axis. The dayside temperatures can reach 450°C, while on the nightside they drop to -180°C. A series of scarps, hundreds of kilometers long and up to 3 kilometers high, split the heavily cratered plains.

Enormous fields of solar cells are arrayed along the equator, providing a constant flow of power to the particle accelerators producing antimatter even when some cells are placed in darkness by Mercury's slow rotation. A skeleton crew works in an underground base protected from radiation by heavy shielding and heated or cooled as necessary by power from the solar cells. The facility, completed in 2229CE, is operated by Tiamat Chemical Co.

Venus (Sol II)

Orbit: 0.72AU

World Type: Terrestrial

Equatorial Radius: 6,052km

Gravity: 0.9g

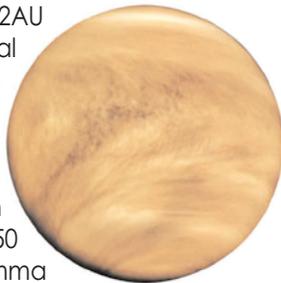
Atmosphere: Reducing

Surface Temperature: 477°C

U.W. Status: Active Exploration

Population: 750

Starport: Gamma



Moons: 0

Blanketed by endless clouds, Venus remains a mysterious world superficially much like Earth save for the runaway greenhouse effect rendering it inhospitable to life.

Primarily composed of carbon dioxide, the dense atmosphere of Venus has a surface pressure more than 90 times that of Earth. The thick cloud cover constitutes a heat trap, sending temperatures soaring on the stony desert landscapes. Volcanic activity is intense, and lava flows, deep chasms, and craters mark the terrain. No water is known to exist on Venus.

No humans have ever visited the hostile surface. Several orbital habitats have been constructed to facilitate research of the planet. Scientists have also explored Venus using robotic probes, focusing on the complex cloud layers almost as much as the surface.

Earth (Sol III)

Orbit: 1AU

World Type: Terrestrial

Equatorial Radius: 6,378km

Gravity: 1g

Atmosphere: Normal

Surface Temperature: 15°C

U.W. Status: Independent

Population: 10 billion

Starport: Alpha



Moons: 1

A pale blue dot against the eternal night of space, Earth stirs the souls of humans everywhere, even those who have never visited it, as the verdant homeworld of humanity. Now capital of the United Worlds federation, Earth has been transformed into an ecological utopia.

High technology has allowed humanity to redress some of the wrongs done to its homeworld over the centuries. Extensive long-range reclamation projects have restored much of the lost natural beauty of Earth, cleansing polluted waterways, replanting rainforests, and ending global warming. Most heavy industry has moved to orbital factories, and space habitats house millions of people. The clean, uncrowded cities of Earth are filled with parks, gardens, and other greenspaces, mixed with soaring office towers, corporate headquarters, and architectural marvels of every description.

Government, education, tourism, agriculture, manufacturing, and research underpin the economy. Historical landmarks of the diverse cultures of Earth are extremely popular with visitors, as are nature preserves spotlighting the bountiful natural heritage of the planet (considerably more varied than the few species transplanted to new colonies).

Luna (Earth I)

Primary: Earth

Orbit: .0025AU

Equatorial Radius: 1,738km

Gravity: 0.2g

Atmosphere: None

Surface Temperature: -35°C

U.W. Status: Independent

Population: 1.3 billion

Starport: Alpha



Humanity's first stop on its trek to the stars, Luna is a core world of the first order. Over a billion inhabitants dwell in underground cities below its barren, cratered surface, and the moon houses the headquarters of the StarForces military.

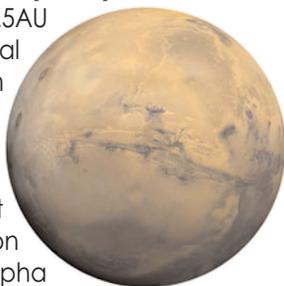
Luna possesses no appreciable atmosphere, creating extreme surface temperatures ranging from -180°C to 110°C . The stark landscape consists of countless craters, eroded mountains, and vast, flat maria, or "seas", of hardened basaltic rock. Eons of infall by meteoric particles have turned the regolith covering the lunar surface into a fine powder strewn with worn rocks and boulders. Luna has no surface water, but underground pockets of ice are relatively common.

Tidelocked to Earth, Luna constantly presents the same face to the planet but does not have a true "dark side." It still revolves in relation to the sun, the lunar day lasting approximately 28 Earth days, with each hemisphere experiencing 14 days of daylight and 14 days of night.

Colonized in 2036CE, Luna saw some of the first fighting in the so-called Mars Rebellion and gained its independence in the Lunar Accord of 2078CE. Most lunar cities are constructed primarily below ground, providing inexpensive, natural shielding against the intense radiation of the surface, and consist of a number of levels extending down into the bedrock. Hydroponic farming tunnels and ice-mining ventures branch out from these cities, also called warrens.

Mining, manufacturing, science, and tourism are key to Luna's economy. Open pit mines on the surface reap the rich mineral resources and fusion fuels of the regolith, which are transformed into finished products in underground factories or zero-g orbital facilities. The StarForces headquarters is on Luna, and the prestigious StarForces Academy station orbits the moon.

Mars (Sol IV)
Orbit: 1.5AU
World Type: Terrestrial
Equatorial Radius: 3,393 km
Gravity: 0.4g
Atmosphere: Reducing
Surface Temperature: -55°C
U.W. Status: Independent
Population: 4.8 billion
Starport: Alpha
Moons: 2



The chill, rust-red deserts of Mars enthralled humanity long before spaceflight brought them to its alien vistas. Home to billions, it now stands as a political and economic force in its own right.

Fires of Heaven^{v1.0}

A very thin carbon dioxide atmosphere clings to Mars at less than a tenth of Earth pressure, and clouds or fog are not uncommon. Enormous dust storms, which can engulf the entire planet, are frequent. Far from the warmth of Sol, Martian temperatures rarely climb above 0°C even at the equator, and can drop below -140°C just before dawn at the poles. Despite the presence of polar icecaps, no liquid water exists.

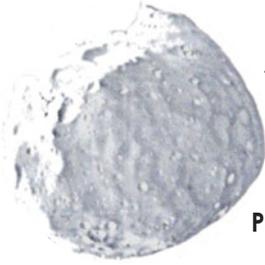
The red world, lent its distinctive hue by oxidation of iron-rich rocks, contains some of the most spectacular terrain in the United Worlds. The highest mountain, Olympus Mons, rises 26 kilometers from a 600 kilometer diameter base. Valles Marineris, stretching 4,500 kilometers long and up to 700 kilometers across, plunges 7 kilometers deep in some spots. The starkly beautiful landscape supports no native life.

Colonized in 2045CE, Mars led the revolt that established the United Worlds federation. Fiercely independent, Mars has become a prosperous yet unpretentious world.

The cities of Mars are covered by gigantic domes to trap heat and air pressure, though solar radiation means that most dwellings are actually underground. The surface levels within these domes are usually devoted to agrarian pursuits, allowing Mars to feed itself and export foodstuffs, as well as providing life support for the dome dwellers. High in orbit, the StarForces Naval Shipyards and several commercial yards turn out new starships for humanity.

Early colonists on Mars found the first traces of the mysterious alien race dubbed the Progenitors. The bizarre ruins are a federally protected research site, off-limits to tourists. Two tiny moons, Phobos and Deimos, orbit Mars.

EABA



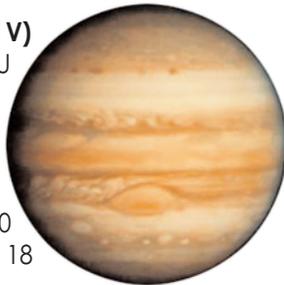
Asteroid Belt
Orbit: 1.7AU
Orbital Width: 2.3AU
Asteroid Type: Carbonaceous
U.W. Status: Independent
Population: 450 million

Hundreds of thousands of asteroids orbit Sol between the orbits of Mars and Jupiter. Rich in metals, the belt has been mined since the early days of space colonization yet continues to yield iron, nickel, and other valuable ores.

The belt contains a mix of carbonaceous and metallic asteroids of all sizes. Most are irregularly shaped, and none support atmospheres. Ceres, the largest, has a diameter of 933 kilometers. The asteroids have regular orbits, making navigation through the belt only slightly trickier than in open space.

Today the asteroids are home to hundreds of thriving space habitats. Some sell fuel, food, and equipment to the myriad zero-g prospectors who search for new claims, while others process ores for shipment to the factories of Mars, Luna, and Earth. The belt gained its independence as a result of the Lunar Accord of 2078CE.

Jupiter (Sol V)
Orbit: 5.2AU
World Type: Jovian
Equatorial Radius: 71,492 km
U.W. Status: Outpost (moons)
Population: 5,000
Moons: 18



Jupiter reigns supreme as the largest planet in the Sol system. Attended by more than a dozen moons, the storm-covered gas giant has long fascinated scientists.

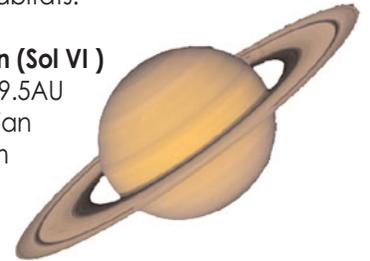
The superdense atmosphere, composed primarily of hydrogen and helium, blankets a rocky core twenty times the size of Earth. Vast seas of liquid hydrogen thousands of kilometers deep, created by intense atmospheric pressure, surround the core. Numerous cloud layers are found in the 1,000 kilometer deep gaseous atmosphere, and violent storms are frequent. Jupiter emits extreme amounts of radiation, making nearer satellites dangerous for long-term habitation and rendering close orbits inadvisable.

Jupiter has 18 moons, the largest four of which are planet-sized, and were discovered by the early astronomer Galileo. Others went undiscovered until manned expeditions reached the gas giant. Io, the closest Galilean moon to Jupiter, features the greatest volcanic activity of any planet in the Sol system due to gravitational stresses caused by its orbit around the gas giant. The other three, Europa, Ganymede, and Callisto, are covered by kilometers of frozen ice or, in some cases, deep liquid oceans below an icy surface. None are suitable for colonization, and even if they were someday terraformed they would be totally covered by water. All the moons are tidelocked.

Exploration of Europa revealed protozoan life near volcanic vents on the seafloor. A science outpost on that moon studies the primitive lifeforms and seeks other forms of life, sending submersibles into the dark oceans beneath Europa's icy crust to uncover its mysteries.

The jovian moons are also a vital source of water ice for space habitats in the asteroid belt. Ice miners on Callisto and Europa employ mass drivers (essentially high-powered catapults) to hurl ice carved from the frozen moons into orbit where it can be conveyed to the habitats.

Saturn (Sol VI)
Orbit: 9.5AU
World Type: Jovian
Equatorial Radius: 60,268km
U.W. Status: Explored
Moons: 24

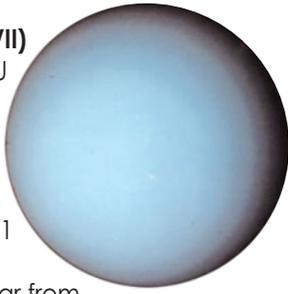


The jewel of the system, ringed Saturn stands second only to Jupiter in size. Saturn has a superdense hydrogen and helium atmosphere that surrounds an Earth-sized, rocky core. Like Jupiter, the crushing pressure creates oceans of liquid hydrogen in the lower atmosphere. Thousands of tiny ringlets containing minuscule particles of rock coated with ice surround the planet. Some scientists theorize the rings are the remnants of a moon obliterated by brutal tidal forces after venturing too close to Saturn. Only 2 kilometers deep, the rings occur in several distinct bands that extend hundreds of thousands of kilometers into space around Saturn.

In addition to its spectacular rings, Saturn has 24 moons, some of which remained unknown to humanity until revealed by manned expeditions. Most are heavily cratered planetoids of ice with some rock. Titan, the largest, consists of ice and rock in equal shares and has a 2,575 kilometer radius. Frigid oceans of ethane, methane, and nitrogen cover the moon, which has a viscous, smoggy nitrogen atmosphere.

Uranus (Sol VII)**Orbit:** 19AU**World Type:** Jovian**Equatorial Radius:** 25,559km**U.W. Status:** Active

Exploration

Moons: 21

Blue-green Uranus orbits far from the warming rays of the sun. Clouds of methane and ammonia scud across its featureless, dense atmosphere of hydrogen, helium, and methane, enveloping an Earth-sized core of iron and silicon. Thin, faint rings of carbonaceous particles girdle Uranus, as do 21 small moons formed chiefly of ice and rock. None have atmospheres, and all are dark, reflecting little light.

Unique among Sol's planets, Uranus has an axial tilt of 98° - its north pole points almost directly at the sun. Its moons and rings have orbits perpendicular to the plane of the ecliptic.

**Neptune (Sol VIII)****Orbit:** 30AU**World Type:** Jovian**Equatorial Radius:** 25,269km**U.W. Status:** Active

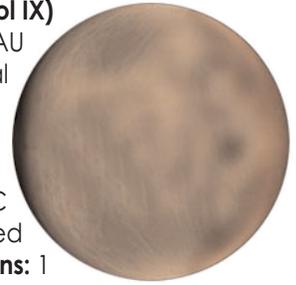
Exploration

Moons: 8

The cold, gaseous world of Neptune mirrors Uranus in many respects. Neptune has a dense atmosphere of helium, hydrogen, methane, and other gases, with occasional clouds of methane ice crystals. The world has four diffuse rings of dark particles and eight moons. Triton, the largest, has a tenuous nitrogen atmosphere. Nitrogen geysers 8 kilometers high erupt from the cratered terrain, which also features immense cracks up to 80 kilometers wide.

Edgeworth-Kuiper Belt**Orbit:** 30AU**Orbital Width:** 170AU**Asteroid Type:** Icy**U.W. Status:** Active Exploration**Population:** 5,000

The Edgeworth-Kuiper asteroid belt, or E-K Belt, consists of billions of icy bodies beyond the orbit of Neptune. Most have circular orbits, however some have highly inclined elliptical orbits taking them as far as 200AU from Sol. More than 100,000 of the icy bodies have diameters greater than 100 kilometers, but most are smaller than a single kilometer in diameter. Comprised chiefly of water and gas ices, such as methane, these bodies possess no useful resources.

Fires of Heaven^{v1.0}**Pluto (Sol IX)****Orbit:** 39AU**World Type:** Terrestrial**Equatorial Radius:** 1,160km**Gravity:** <0.1g**Atmosphere:** None**Surface Temperature:** -250°C**U.W. Status:** Unexplored**Moons:** 1

From the bitterly cold surface of Pluto, on the outer edge of the solar system, Sol appears as a distant star only slightly brighter than the rest. A low-density world covered in methane ice, Pluto has no appreciable atmosphere save for a faint methane haze on its sunward face. No native life seems possible on a planet so cold that most elements are liquefied or frozen solid.

Robot probes have landed on the forbidding surface of Pluto, but there seems to be little justification for extensive exploration.

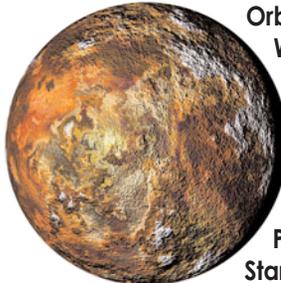
Pluto's sole satellite, Charon, has an equatorial radius of 593 km, making it the largest moon in relation to its planet in the Sol system. These tiny worlds are sometimes considered simply the largest members of the E-K Belt.

Alpha Centauri A**Spectral Class:** G2-Yellow**Size:** 1.2 solar radii**Surface Temperature:** 5,570°C**Distance from Sol:** 4.4 light years

Slightly larger and brighter than Sol, Alpha Centauri A shares a trinary star system with Alpha Centauri B, an orange star, and Proxima Centauri, a distant red star. The two closer stars have elliptical orbits, bringing them as close as 11AU and as far as 35 AU over an 80-year period. The secondary brightens in the sky as the two stars approach each other, but it has little to no climatological effect on the planets. Planetary orbits are found only within 2AU of Alpha Centauri A, due to gravitational perturbations caused by its sister star. The primary star has four worlds and an outer asteroid belt.

As the closest Sol-like star to Earth, Alpha Centauri A was the first star system targeted for exploration by humans, initially by robotic probes launched early in the 21st century. In 2096CE, colonists arrived aboard a slower-than-light vessel to settle Eden, third planet around the star.

An economic hub of several star systems, Alpha Centauri A trades most heavily with Sol, Alpha Centauri B, and Epsilon Indi. Several jumpgates and communications arrays are found in the star system.

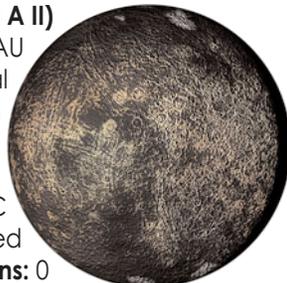


Hell (Alpha Centauri A I)
Orbit: 0.32AU
World Type: Terrestrial
Equatorial Radius: 3,691km
Gravity: 0.6g
Atmosphere: None
Surface Temperature: 226°C
U.W. Status: Outpost
Population: 110
Starport: Gamma
Moons: 0

A scorched wasteland, the aptly named world of Hell houses antimatter generation facilities that provide fuel for antimatter reactors throughout the United Worlds.

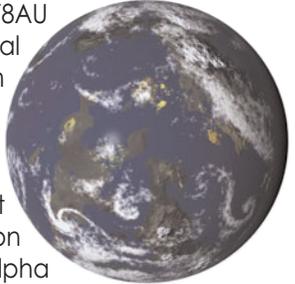
The heat-blasted world has no atmosphere, and no liquid water can exist anywhere on it. Seared, rocky plains pocked by craters and intercut by huge volcanoes constitute most of the terrain. Planetologists believe Hell has a dense iron core, accounting for its respectable gravity despite its small size. The horrific conditions on Hell prevented evolution of native life.

Banks of solar arrays placed around Hell provide constant power to the particle accelerators that generate antimatter. Personnel assigned to the OmniCorp-owned facility, completed in 2235CE, live in a shielded underground base.



Purgatory (Alpha Centauri A II)
Orbit: 0.58AU
World Type: Terrestrial
Equatorial Radius: 3,138km
Gravity: 0.5g
Atmosphere: None
Surface Temperature: 101°C
U.W. Status: Unexplored
Moons: 0

Only barely less inhospitable than Hell, the furnace-like world of Purgatory likewise remains uninviting to human exploration or habitation. The airless, lifeless, and waterless landscape of Purgatory consists mostly of endless flatlands marred by craters and dark basins of hardened basalt from ancient lava flows.



Eden (Alpha Centauri A III)
Orbit: 0.78AU
World Type: Terrestrial
Equatorial Radius: 5,740km
Gravity: 1g
Atmosphere: Normal
Surface Temperature: 20°C
U.W. Status: Independent
Population: 2.1 billion
Starport: Alpha
Moons: 2

A pastoral garden world of croplands and grazing livestock, Eden earned an indelible place in history as the first extrasolar planet colonized by humans. A core world of the first order, Eden serves as the breadbasket to numerous colonies on less hospitable worlds.

Eden has a balmy climate, with temperatures ranging from a low of -11°C in the icy polar regions to a high of 55°C in the steamy equatorial jungles. Saltwater seas separate five continents and several island chains. Huge forests dominate some of the continents. Aside from the land vegetation, most life on Eden evolved in the warm oceans. Colorful lacefish and immense, dangerous krakens are two examples of native sealife. Some of the few native species of land animals on Eden now face extinction due to competition with imported terran lifeforms.

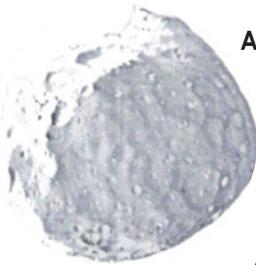
The first humans came to Eden in cryogenic freeze aboard the historic colony vessels *UWS Argo* and *UWS Odyssey*. With the discovery of interstellar jump technology, Eden experienced a population boom that, coupled with extensive natural resources, enabled Eden to quickly achieve self-sufficiency. The world gained independence in 2126CE, and has a reputation as a stable, friendly society valuing security and economic prosperity. Food exports underpin the economy. While several large cities exist, most of Eden's populace dwells in scattered agrarian communities growing crops and raising livestock for export. The world also has become a leader in the fields of virtual-reality entertainment and medicine.

The numerous hospitals on Eden date back to the early 22nd century, when medical rescue ships were dispatched to aid colonists who had suffered brain damage in the flawed cryo-sleep chambers of the slower-than-light colony ships. Now Eden has a reputation for cutting-edge medical care, and Angel of Mercy Medical Station is considered the finest orbital hospital in the federation.

Eden has two small moons, named Adam and Eve. The StarForces Navy operates a military-vessels-only antimatter refueling station on Adam.

Limbo (Alpha Centauri A IV)**Orbit:** 1.2AU**World Type:** Terrestrial**Equatorial Radius:** 2,200km**Gravity:** 0.3g**Atmosphere:** None**Surface Temperature:** -19°C**U.W. Status:** Outpost**Population:** 4,500**Starport:** Delta**Moons:** 0

An airless, low-gravity planet covered by craters and hardened basaltic flows, Limbo possesses no water or native life. The inner fires of Limbo died still-born, and with no volcanism to separate the ores in its crust the planet has no minable metal or mineral deposits.

**Asteroid Belt****Orbit:** 1.96AU**Orbital Width:** 2.8AU**Asteroid Type:** Silicate**U.W. Status:** Active Exploration**Population:** 200

A ring of asteroids around the outer limit of the Alpha Centauri A system, the belt drew considerable interest from mining corporations in the early days of exploration, but has now been abandoned by all but a few diehard prospectors.

Asteroids in the belt range from chunks a few meters around to rocky planetoids. The largest asteroid charted, named Gabriel, is 12 kilometers in diameter.

The asteroids are predominantly low-density silicate with few metals or minerals, earning the belt the derisive moniker "the Sandbox". Countless get-rich-quick schemes have slammed into reality in the belt, which rarely yields ores of enough value to recoup the expense of finding them, let alone mining them.

The StarForces Navy, wary of smugglers and pirates using the asteroids for cover, patrols the belt regularly. StarForces Marines from nearby bases sometimes use the field for zero-g training exercises - in local parlance, "playing in the Sandbox".

Fires of Heaven ^{v1.0}▼ **The Wine Trade**

DATA DUMP

Fine wines are some of the more illustrious exports from Eden. The precise convergence of soils, sunlight, and other growing conditions in Earth's wine-producing regions has never been equaled, but Eden wineries are renowned for vintages rivaling, if not duplicating, those of Earth.

The emergence of offworld wines on the market has split connoisseurs, with traditionalists favoring Earth-grown vintages and modernists promoting Eden wines. Some critics feel there is also a simple snobbery factor of having vintages imported across interstellar distances...

The rising prominence of Eden wineries has also provoked deep enmity between vintners of the two worlds. Some age-old winemaking families on Earth decry the offworld rivals as upstart betrayers of tradition, while Eden growers tend to consider homeworld vintners slaves to the past.

API culture brief - reference gc238787.934283.144147 - .05Cr

Alpha Centauri B**Spectral Class:** K1-Orange**Size:** 0.87 solar radii**Surface Temperature:** 4,630°C**Distance from Sol:** 4.4 light years

Alpha Centauri B is part of a trinary star system with Proxima Centauri, a distant red star, and Alpha Centauri A, a yellow star. The two closer stars pass from 11AUs to 35AU apart in the course of their 80-year orbits. The primary brightens in the sky as the two stars makes their closest approaches to each other, but that has little to no climatological effect on planets.

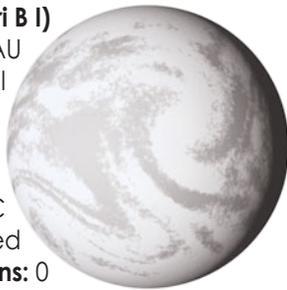
Planetary orbits are found only within 2AU of Alpha Centauri B, due to the gravitational influence of its sister star. The star has five planets.

Robotic probes launched by the Eden colony ship *UWS Argo* relayed data about the planets orbiting the orange star, and Earth leaders quickly laid plans to colonize a second extrasolar star system.

A locus of interstellar commerce, Alpha Centauri B trades heavily with Alpha Centauri A, Sol, and Epsilon Indi. Several jumpgates and communication arrays operate in the system.

Herakles (Alpha Centauri B I)

Orbit: 0.2AU
World Type: Terrestrial
Equatorial Radius: 11,315km
Gravity: 1.8g
Atmosphere: Reducing
Surface Temperature: 255°C
U.W. Status: Unexplored
Moons: 0



A huge hothouse world of crushing gravity and brutal atmospheric pressures, Herakles takes its name from the Greek hero renowned for his strength.

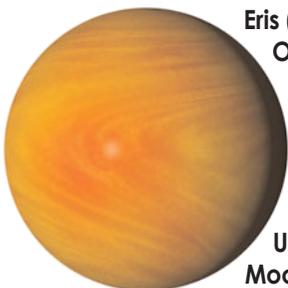
The dense carbon dioxide atmosphere, with a surface pressure nearly 140 times that of Earth, traps heat on the tidelocked world. Dayside temperatures exceed 348°C beneath the roiling, lightning-charged cloud cover blanketing Herakles. Only a few rays of sunlight dimly light the cracked, desiccated plains and irradiated mountain ranges of the world, which long ago lost all its water to photodissociation, a process by which ultraviolet light in the upper atmosphere splits water molecules into oxygen and hydrogen atoms, allowing the hydrogen atoms to escape into space. No life exists on Herakles.

The size of Herakles, one of the larger terrestrial worlds yet discovered, and its close orbit to Alpha Centauri B intrigue astronomers, since most inner worlds tend to be small.

Robotic probes have penetrated the cloudy atmosphere, sending back a few images before apparently breaking down in the incredibly hostile surface conditions. There are indications that Herakles may possess fair amounts of radioactives and precious metals.

Eris (Alpha Centauri B II)

Orbit: 0.3AU
World Type: Terrestrial
Equatorial Radius: 7,115km
Gravity: 0.9g
Atmosphere: Reducing
Surface Temperature: 130°C
U.W. Status: Unexplored
Moons: 0



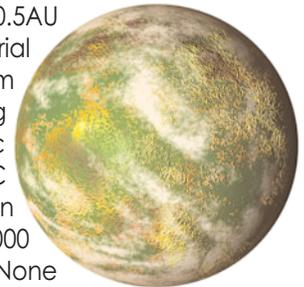
A witch's brew of carbon dioxide, sulfuric acid clouds, extreme winds and violent storms shrouds Eris, named for the Greek goddess of discord.

Tidelocked to Alpha Centauri B, Eris has a complex cloud structure in its upper atmosphere that conceals its surface and traps heat from the star. Atmospheric pressures are 90 times those on Earth, and dayside surface temperatures soar to 250°C. The desiccated landscape, lashed by acid rain, consists of rock-strewn deserts marked by a few plateaus and high volcanoes. Eris possesses no water or life.

A few scientific expeditions have surveyed Eris from orbit and sent down robotic probes, but the world seems to hold little of interest to warrant further exploration.

Atropos (Alpha Centauri B III)

Orbit: 0.5AU
World Type: Terrestrial
Equatorial Radius: 5,438 km
Gravity: 1.0g
Atmosphere: Exotic
Surface Temperature: 25°C
U.W. Status: Active Exploration
Population: 2,000
Starport: None
Moons: 0



An acid world of corrosive seas and alien, crystal landscapes, Atropos is named for one of the three Fates of Greek mythology. Its unlikely planetology has made Atropos a flashpoint in the endless tug-of-war between scientific exploration and commercial exploitation.

The planet has an oxygen-rich atmosphere at 0.8 Earth pressure. A hot world with temperatures ranging from an equatorial high of 46°C to a polar low of 5°C, Atropos features a bizarre chemical makeup. Oceans of sulfuric acid, created by oxidation of the sulfur-rich crust, cover 70% of the planet. Clay-like soils rich in quartz constitute most of the terrain, which exhibits intense chemical weathering. Scored by acid rivers, barrens marked by huge crystalline growths and quartz outcroppings create a distinctly alien landscape. Metal ores are exceedingly scarce, but Atropos has rich deposits of corundums and sulfates rare on more Earth-like worlds. Several varieties of gems, including brilliant nova sapphires popular in jewelry, are found only on Atropos.

This strange environment has given rise to microscopic silicon-based life combining organic biochemicals with silicones, long chains of silicon and oxygen molecules, to form the building blocks of life. Some of these one-celled eukaryotes produce oxygen via photosynthesis, replenishing the oxygen-rich atmosphere. Scientists think complex, multicellular silicon-based organisms might someday evolve on Atropos.

Mining companies initiated several ventures on Atropos following colonization of the Alpha Centauri binaries. The unexpected discovery of silicon-based life in 2232CE prompted the federation, under strong pressure from scientific and environmental circles, to restrict access to Atropos to protect its possibly unique ecosystem. The mines were closed and only registered scientific expeditions are now permitted on the acid world. Nonetheless, a few daring smugglers defy U.W. regulations to acquire nova sapphires for the black market as legal supplies of the valuable gems dwindle.

Rising public demand for rare jewels from Atropos, not to mention lobbying by mining interests, continue to entangle the United Worlds Assembly in debate.



Named for the Greek god of blacksmiths, the resource-rich, independent world of Hephaistos is a first-class industrial powerhouse.

Some humans find the atmosphere, with a pressure 1.3 times that of Earth, hard to breathe. Hephaistos has a cool, mild climate. Saltwater oceans cover nearly three-quarters of the planet, and three sizable continents exist. Wide rivers with extensive deltas, low mountain ranges and flat, rolling plains illustrate the ceaseless wear of heavy gravity on the landscape. Hephaistos also boasts a plentiful biosphere, with countless species of plants and animals.

Fires of Heaven^{v1.0}

Abundant heavy metals poison the Hephaistean environment, at least for non-native lifeforms. Native plants and animals are inedible to humans, and colonists undergo regular medical treatments to fend off progressive heavy metal poisoning from the air, water, and even Earth plants grown in Hephaistean soil.

Colonized in 2116CE, Hephaistos rapidly earned independence. Mines, refineries, processing plants, and factories now turn the resources of Hephaistos into starships, computers, robots, and thousands of other products. Corporate headquarters towers fill Hephaistean cities. The star-spanning OmniCorp conglomerate calls the world home.

Dense, highly industrialized cities are the norm, the largest being the capital, New Detroit. Numerous orbital factories, refineries, shipyards, and cargo ports crowd the Hephaistean sky.

Nominally a democracy, Hephaistos has fallen under the grip of the interstellar corporations based there. They dominate world politics, rendering Hephaistos, for all intents and purposes, a corporate state.

Hephaistos possesses a single, minuscule moon named Erichthonos after the son of Hephaistos and Athena in Greek mythology. A small, rocky chunk, Erichthonos possesses no air, water, or valuable minerals.



A mantle of permanently frozen ice, composed chiefly of water and ammonia, surrounds the rocky core of this low-density world, which lacks the gravity to retain an atmosphere. Temperatures fall to -260°C on Hypnos, and never rise higher than -75°C. Craters of concentric rings created by ancient asteroid strikes mar the icy surface.

In 2130CE, scientists established an outpost on Hypnos to investigate hints of the existence of liquid oceans below the ice. No proof of these seas could be found, and the outpost was abandoned in 2148CE following a tragic disaster. A scientist blew the atmospheric seals on the base habitat in an apparent fit of insanity, killing herself and most of the personnel. Ships from Hephaistos rescued the few survivors and the facility was never reopened. A recently released novel inspired by the incident, now nearly a century past, attributes the tragedy to the malign influence of ghosts haunting the lonely outpost.

Lalande 21185

Spectral Class: M2-Red

Size: 0.35 solar radii

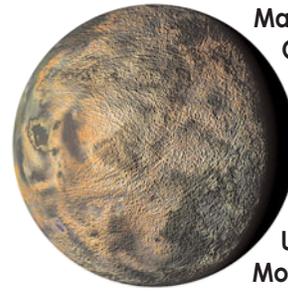
Surface Temperature: 2,930°C

Distance from Sol: 8.1 light years

A cool, dim red star named for a French astronomer, Lalande 21185 is the only such star to be colonized by humans, its proximity to Sol offsetting its shortcomings. The star has four worlds. The planets orbiting Lalande 21185 were among the first extrasolar planets to be discovered in the late 20th century. Deep-space probes, followed by crewed exploration vessels, investigated the star system and paved the way for colonization.

Curiously, the star seems to have fewer worlds than projected by most theories of planetary formation. The anomalous, but stable, orbits of the planets around Lalande 21185 have stirred debate in astronomical circles.

While close to Sol, Lalande 21185 (which most people refer to as simply Lalande or Tanemahuta after the Polynesian god of light) defines the edge of United Worlds expansion in its vicinity due to the profusion of nearby red dwarf stars unsuited for colonization. The StarForces Navy maintains a strong presence there. Aside from Sol, Alpha Centauri, and Procyon are the two nearest U.W.-colonized systems and key trading partners with Lalande 21185. A jumpgate and communication array operate at the outer edge of the tiny star system.



Makuizez (Lalande 21185 I)

Orbit: 0.1AU

World Type: Terrestrial

Equatorial Radius: 2,202km

Gravity: 0.5g

Atmosphere: None

Surface Temperature: 126°C

U.W. Status: Unexplored

Moons: 0

Named for the Polynesian deity of fire and earthquakes, tidelocked Makuizez orbits close to its dim red primary. The planet is highly irradiated and inimical to human habitation. Dayside temperatures soar to 144°C, while the nightside averages a frigid -73°C. Makuizez has no atmosphere, no water, and no native life. Cratered wastelands form most of the terrain. Robot probes are the only visitors of Earthly origin to Makuizez.

Tawhirimatea (Lalande 21185 II)

Orbit: 0.2AU

World Type: Terrestrial

Equatorial Radius: 3,744km

Gravity: 0.6g

Atmosphere: None

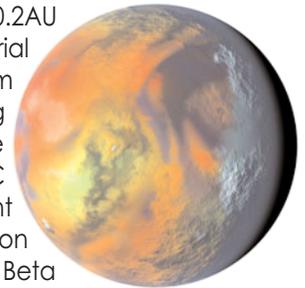
Surface Temperature: -78°C

U.W. Status: Independent

Population: 520 million

Starport: Beta

Moons: 0



A twilight world of stark contrasts, Tawhirimatea sustains a thriving independent state based chiefly on mining, manufacturing, and exports of raw materials. The tidelocked world draws its name from the Polynesian goddess of weather.

Tawhirimatea has no atmosphere, and dayside temperatures reach -48°C at the equator, while the nightside reaches a frigid -155°C at the poles. Dusty, desolate plains marred by craters form most of the terrain. Dry ice, actually the frozen carbon dioxide atmosphere, covers the chill nightside. Pockets of water ice exist below the bleak surface of Tawhirimatea, and the world sustains no native life. The sun, which never sets on the dayside, provides a gloomy illumination half as bright as that provided by Sol to Earth.

The barely tolerable dayside, moderately rich in metals, was colonized in 2130CE under charter to China and earned its independence in 2161CE. Inhabitants live, work, and play primarily in arcologies, entire cities enclosed in vast buildings connected by transit tubes carrying high-speed maglev trains. While the population of Tawhirimatea has diversified over the decades, people of Asian descent predominate, and the world's culture retains a distinctly Chinese flavor. The StarForces Navy has an orbital base over Tawhirimatea.

Avatea (Lalande 21185 III)

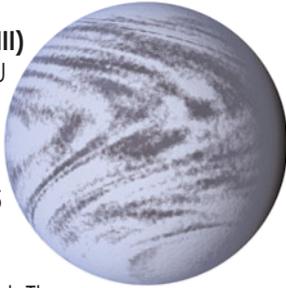
Orbit: 2AU

World Type: Jovian

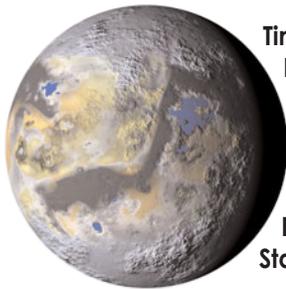
Equatorial Radius: 64,342km

U.W. Status: Outpost (moons)

Moons: 5



Avatea derives its name from the Polynesian moon god. The jovian world has a rock-iron core surrounded by a blue-tinged atmosphere of hydrogen, helium, and other gases so dense that atmospheric pressures create seas of liquid hydrogen deep within the gas giant. Five moons, named for the siblings of the deity Avatea (Tinirau, Tango, Tumutean-aoa, Raka, and Tu-Metua) attend the planet. All consist of a mantle of permanently frozen water and ammonia ice wrapped around a rocky core. The low-density moonlets possess slight gravity and only trace atmospheres. Geysers of liquid methane driven by tidal flexing periodically erupt on the inner moons. All five moons are tidelocked to Avatea. Tinirau, the largest moon, houses an ultra-secure United Worlds prison facility. Survey missions and a handful of visits by explorers have turned up no sign of valuable metals or other minerals on the moons.



Tinirau (Avatea I)

Equatorial Radius: 8,546km

Gravity: 0.2 g

Atmosphere: Exotic

Surface Temperature: -202°C

U.W. Status: Outpost(prison)

Population: 3,000

Starport: Delta

The largest satellite of Avatea, frozen Tinirau is famous throughout the United Worlds as the site of the ultimate prison, housing the most dangerous criminals in the federation. It is said that no one has ever escaped from Tinirau, and it seems likely no one ever will. The moon is named for a Polynesian fishing god and sibling of Avatea. Tinirau possesses a vaporous nitrogen atmosphere. Endless poisoned icefields cover most of the moon, marked by a handful of radiate craters and, near the marginally warmer equatorial regions, lakes of liquid ethane.

Fires of Heaven^{v1.0}

Light from its dim red star barely illuminates Tinirau even during the day, and enormous Avatea looms in the sky over one hemisphere of the tide-locked moon. Its isolation and unremittingly hostile surface conditions made Tinirau an ideal choice for an ultra-secure penitentiary. Opened in 2199CE, the underground facility was soon filled with the worst of the worst: terrorists, crimelords, escape artists, mass murderers, pirates, and various other high-risk prisoners. Extensive security systems, surveillance satellites, and regular patrols by StarForces Navy ships discourage escape attempts or rescues.

▼ **Dr. Clive Malcolm** - A brilliant but unbalanced biochemist and geneticist, Dr. Clive Malcolm may be the most dangerous man in the United Worlds. Luna-born, Malcolm benefited from gene-coding for enhanced intelligence. The source of his superior intellect a well-kept secret, Malcolm excelled in school before starting a brilliant career in biochemistry.

DATA DUMP



As the years passed, his behavior became erratic as neurochemical imbalances introduced by the revisions to his DNA emerged. His obsession with forbidden avenues of research grew until Malcolm found himself jobless, blacklisted across the federation for his unauthorized experiments. Readily recruited by the Angels of the Apocalypse, Malcolm quickly became the Angels' top scientist, producing an arsenal of viral agents, flesh-destroying bacteria, and poison gases for cult attacks.

Captured in a U.W. Security Force raid on his Eden-orbiting secret laboratory, Malcolm was tried and sentenced to life imprisonment without hope of parole in 2232CE, doubts regarding his sanity having spared him the death penalty. His horrific crimes and the possibility of rescue efforts by the cult prompted his incarceration in the ultra-secure Tinirau Federal Prison in the Lalande 21185 system.

A human of Jamaican descent, Malcolm, 73, has a dark complexion with grizzled white hair and beard. His eyes are brown, and he has a heavy 170 cm frame. Psychologists at his trial disagreed as to whether Malcolm truly believed in the cult teachings or merely saw serving the Angels as a way to continue his experiments.

UW Who's Who 2237CE - reference er773414.737612.387453 - .05Cr

Tangaroa (Lalande 21185 IV)

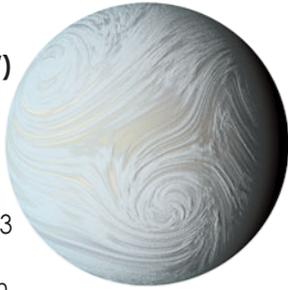
Orbit: 9.7AU

World Type: Jovian

Equatorial Radius: 114,387km

U.W. Status: Explored

Moons: 13



An enormous super-jovian world, placid bluish-green Tangaroa takes its name from a Polynesian sea god. A dense atmosphere of hydrogen, helium, methane, and other gases crushes the rocky core of the gas giant under extreme pressure.

Thirteen moons and a series of rings orbit this largest planet in federation-settled space. Methane snow and ice cover the bitterly cold moons, all of which lack atmospheres or valuable minerals.

Epsilon Eridani

Spectral Class: K2-Orange

Size: 0.9 solar radii

Surface Temperature: 4,320°C

Distance from Sol: 10.7 light years

A large family of worlds orbits cool Epsilon Eridani. The star system contains 10 planets, including three gas giants. Most are cold worlds, far from the warmth of their sun.

A vast dust cloud of icy particles and cometary bodies surrounds Epsilon Eridani, with most of the dust forming a ring nearly 6 billion kilometers wide just past the orbit of Ymir. Even the inner part of the system contains a thousandfold more dust than exists around Sol. Nightly meteor showers are the norm for the worlds of Epsilon Eridani, and meteor strikes are not uncommon. Ships that have their homeport in this system pay 10% more than usual for upkeep because of the increased damage done to them by micrometeorites.

Astronomical observations at the start of the 21st century revealed the existence of the dust ring and a sizable gas giant orbiting Epsilon Eridani, although early calculations of the gas giant's orbit proved inaccurate.

One of the early systems to be charted and colonized after the advent of jump technology, Epsilon Eridani is now a core system, home to a major independent state as well as an enigmatic jungle planet with a bizarre ecosystem.

Epsilon Eridani lies closer to outlying systems, such as Omicron Eridani and Tau Ceti, than to most other core systems. Sometimes called the "gateway to the frontier", it has become a crossroads of sorts for trade between frontier and core worlds. Pirates and smugglers also favor Epsilon Eridani, not least because the extensive dust cloud impedes long-distance sensors. A jumpgate and several communications arrays are found in the star system.

Surtr (Epsilon Eridani I)

Orbit: 0.31AU

World Type: Terrestrial

Equatorial Radius: 1,827km

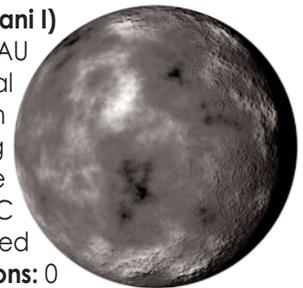
Gravity: 0.3g

Atmosphere: None

Surface Temperature: 90°C

U.W. Status: Unexplored

Moons: 0



A heat-scorching world named for a fire demon of Norse mythology, Surtr burns under its relentless sun. Craters and dark basins of hardened basaltic flows cover the surface. The world lacks any atmosphere or water, and temperatures rise as high as 200°C. Surtr has no native life. Explorers have mapped the hellish world from orbit, but no landings have been attempted.

Loki (Epsilon Eridani II)

Orbit: 0.44AU

World Type: Terrestrial

Equatorial Radius: 4,837km

Gravity: 0.7g

Atmosphere: Normal

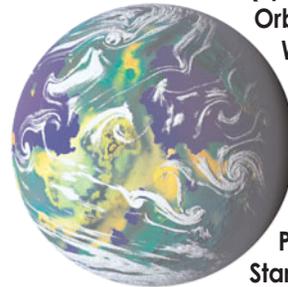
Surface Temperature: 27°C

U.W. Status: Failed

Population: 0

Starport: Delta

Moons: 0



Loki has become infamous as one of the most hostile worlds yet colonized. Named for the Norse god of trickery, Loki appears to be a reasonable candidate for colonization, but nurtures some of the deadliest lifeforms known to humanity.

Loki has a breathable atmosphere just slightly below Earth pressure, and a warm, active climate with frequent rainstorms. Natural resources, particularly organic chemicals useful in drugs and medicines, are plentiful. Barren equatorial deserts give way to extensive rainforests in somewhat cooler climes, and saltwater seas cover 60% of the planet. There are signs that Loki has been hit by many sizable meteors in the past - many lakes and ocean bays are circular, for example.

A wealth of hostile lifeforms inhabit Loki, exhibiting an ever-changing array of lethal dangers. The extensive native life on Loki seems to exist in a state of hyper-evolution. Mutation rates for all forms of life are extremely high, allowing new generations to adapt rapidly to changing conditions. For example, gluevines are carnivorous plants with a sticky sap that entraps the unwary. They apparently did not exist on the planet prior to the colonization attempt. Many plants also produce psychoactive toxins, some effective on humans, designed to disorient prey.

Extensive Progenitor ruins are scattered across Loki, and some scientists speculate the mysterious aliens may have been responsible for the unusual conditions on the world, from the accelerated evolutionary rate, to a somewhat thicker atmosphere than seems normal for Loki's size and gravity.

A coalition of Latin American nations founded a colony on Loki in 2138CE. The settlements thrived initially, but after a few years began to experience mounting problems with hostile animals and dangerous plant life, including several species previously thought harmless. Each new set of precautions kept the increasingly deadly native lifeforms in check for a time, then failed: poisonous plants became resistant to herbicides and infiltrated croplands, reptilian winged razorclaws appeared, flying over electrified security fences. Some reported it seemed as if they were fighting the whole planet. In 2155CE, United Worlds officials ordered Loki evacuated over the objections of many proud colonists.

Scientific expeditions continue to visit Loki to examine the unusual ecosystem and Progenitor ruins, but there are believed to be no permanent residents. The U.W. has declared Loki a hazardous world and requires all landing parties to obtain permits (and sign waivers) at the Asgard starport.

Fires of Heaven^{v1.0}



Wintry Asgard, locked in a perpetual ice age, is a successful independent state that relies on mining and manufacturing for its economic base. The world takes its name from the home of the Norse gods. Asgard has a thin atmosphere at .5 Earth pressure and a bitterly cold climate. Temperatures peak at -25°C, and fall as low as -112°C on polar nights. Frigid winds howl through jagged peaks rising from the snowy plains, and blizzards often reduce visibility to zero. The glacier-covered terrain has numerous rifts and treacherous crevasses. Towering mountain ranges split the chill snowscapes, as do countless frost-covered plateaus and uplands. Ice, kilometers thick in spots, covers the oceans of Asgard, and Asgardians are fond of sailing across the smooth expanses on iceboats. Numerous native lifeforms are found on Asgard. Snowbeasts, huge, shaggy carnivores equally adept on land or ice, are one of the more notable species.

A pan-European expedition settled Asgard in 2124CE. The rich mineral resources of the world enabled Asgard to rapidly become an economic hub and earn its independence. The hard-working, hard-playing populace dwells chiefly in large cities found on the coastlines of frozen seas, such as the capital Ny Oslo. Insulated and sealed buildings are connected to each other by underground tunnels, but plans to cover cities with domes to trap heat and air, were abandoned because of the likelihood of meteorite punctures. Asgard has established a strong trading partnership with several agrarian frontier colonies, exchanging finished goods from its factories for needed foodstuffs.

Many evacuees from Loki settled on nearby Asgard. The handful of surviving colonists and many of their descendants continue to lobby the Colonial Affairs Ministry for permission to return. Asgard has no moon, but the glittering Bifrost ring circles the world. Ice-covered particles of rock comprise the ring, which may have been a moon obliterated by a comet strike within the past million years.

Heimdall (Epsilon Eridani IV)

Orbit: 1.3AU

World Type: Terrestrial

Equatorial Radius: 3,287km

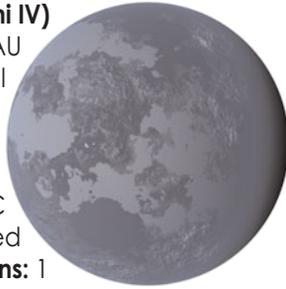
Gravity: 0.5g

Atmosphere: Exotic

Surface Temperature: -117°C

U.W. Status: Explored

Moons: 1



Named for the Norse deity who protected Asgard, Heimdall orbits outside the life zone of Epsilon Eridani. A toxic world, Heimdall possesses a vaporous, smoggy atmosphere of nitric oxide and nitrogen dioxide at less than a tenth of Earth pressure. Nitric acid, frozen into ice and slush, covers most of the barren flatlands. A few craters mar the poisoned landscape, and the world has no native life. Explorers from Asgard have surveyed Heimdall for resources but the violently corrosive environment has rendered its crust extremely metal poor.

Gjallar, the world's moon, is named for the mythic Heimdall's horn. The small, highly cratered moon has no atmosphere or valuable resources.

Thor (Epsilon Eridani V)

Orbit: 1.7AU

World Type: Terrestrial

Equatorial Radius: 9,916km

Gravity: 1.6g

Atmosphere: Exotic

Surface Temperature: -92°C

U.W. Status: Unexplored

Moons: 1



High gravity, a thick atmosphere, and a frigid climate render Thor an uninhabitable yet intriguing world. One of the larger terrestrial worlds yet discovered, Thor derives its name from the Norse god of storms and the sky.

The methane atmosphere has a pressure more than 20 times that of Earth. A dense world with a hot core, Thor seems to have an active volcano system buried beneath the kilometers of water ice covering the entire planet. Planetologists surmise Thor has liquid oceans beneath the global icecap, heated by numerous volcanic vents. Thor has one moon, Mjollnir, named for the god's warhammer. A sizable moon with an equatorial radius of 991 km, Mjollnir has no atmosphere or water. The federation Defense Ministry operates a top-secret military weapons proving ground on the moon.

Frigga (Epsilon Eridani VI)

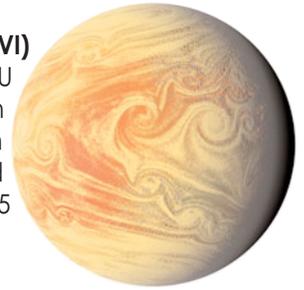
Orbit: 3.6AU

World Type: Jovian

Equatorial Radius: 40,343km

U.W. Status: Explored

Moons: 15



Frigga, named for the consort of Othin known as the queen of heaven, has a superdense atmosphere of hydrogen and helium that coalesces around the gas giant's rocky core. Extreme winds and storms have been detected in the complex upper atmosphere. Dozens of bright rings composed of ice and ice-covered rocky particles encircle Frigga. The gas giant also has fifteen airless, low-density ice and rock moons.

Tyr (Epsilon Eridani VII)

Orbit: 6.3AU

World Type: Terrestrial

Equatorial Radius: 7,635km

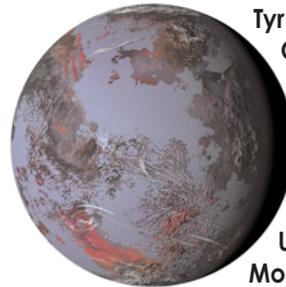
Gravity: 0.5g

Atmosphere: Exotic

Surface Temperature: -193°C

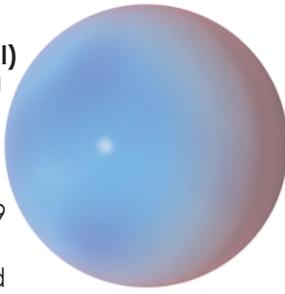
U.W. Status: Unexplored

Moons: 0

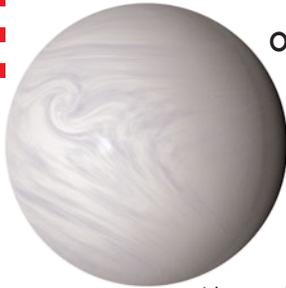


Tyr draws its name from a Norse war god. Frozen slabs of methane ice cover nearly half the cratered surface, occasionally warming enough to release a thin haze of methane gas to form a tenuous atmosphere. No life or liquid water exists on the low-density conglomeration of ice and rock.

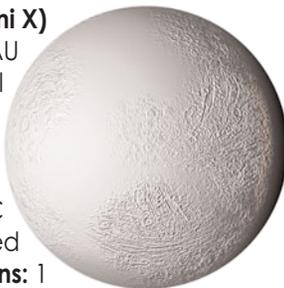
Astronomers calculate that the comet Thiassi, a large comet with a period of 120 years named for a giant of Norse myth, could strike Tyr on its next pass through the Epsilon Eridani system in five years. Its orbital position a precarious one balanced between the gravitational pulls of two gas giants, scientists are divided on the possible effects of a cometary collision. Observational satellites are now deployed to relay data about the predicted impact. The first of these satellites, which entered orbit in 2236CE, inadvertently detected hidden pirate bases on the planet, prompting a raid by federal marshals, backed up by StarForces Navy ships, that apparently broke the backs of several pirate operations.

Aegir (Epsilon Eridani VIII)**Orbit:** 8.9AU**World Type:** Jovian**Equatorial Radius:** 27,854km**U.W. Status:** Explored**Moons:** 9

A placid subjovian world with a nearly featureless, blue-tinged appearance, Aegir is named for the Norse god of the oceans. A dense hydrogen-methane atmosphere surrounds a rock-iron core. Nine airless moons, composed of ice blanketing rocky cores, attend Aegir. Despite Aegir's great distance from Epsilon Eridani's Rozhkov Radius, these low-albedo planetoids are home to several hidden pirate bases, refugees from the raids on Tyr.

**Othin (Epsilon Eridani IX)****Orbit:** 14AU**World Type:** Jovian**Equatorial Radius:** 61,594km**U.W. Status:** Active Exploration**Moons:** 28

Named for the supreme Norse deity, Othin is the largest world in the Epsilon Eridani system. A dense atmosphere of hydrogen and helium, with pressure so intense the hydrogen forms liquid oceans at lower depths, surrounds a rock-iron core. Water ice, along with strong storm activity, are found in the upper atmosphere. In 2138CE, survey teams discovered hydrogen-breathing lifeforms in the gas giant's atmosphere. Exozoologists have since catalogued two main forms of life: balloon-like, floating harvesters of chemical nutrients found in the cloudy skies, and manta-like gliders that prey on the harvesters. Similar lifeforms have since been found in a handful of other jovian worlds throughout the United Worlds. Othin has 28 moons, five of them sizable worlds covered in ice, some with atmospheres of reducing or exotic gases. The remainder are low-density, icy planetoids with no air or useful resources.

Ymir (Epsilon Eridani X)**Orbit:** 35AU**World Type:** Terrestrial**Equatorial Radius:** 5,398km**Gravity:** 0.3g**Atmosphere:** None**Surface Temperature:** -239°C**U.W. Status:** Unexplored**Moons:** 1

The most distant of Epsilon Eridani's worlds, the terribly cold planet Ymir derives its name from a primeval frost giant in Norse mythology. Methane ice covers the entire low-density world. Radiate cracks in the ice sheet indicate past meteor strikes.

Fires of Heaven^{v1.0}

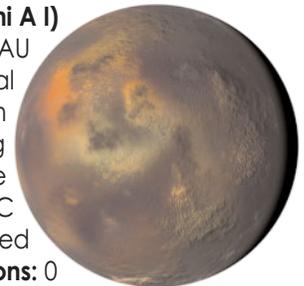
61 Cygni A**Spectral Class:** K5-Orange**Size:** 0.7 solar radii**Surface Temperature:** 3,860C**Distance from Sol:** 11.2 light years

This star shares a binary star system with 61 Cygni B, also an orange star. The two stars average 83AU distance, and complete one orbit every 650 years. Eight worlds orbit 61 Cygni A, including several mammoth, low-density terrestrial worlds with thick atmospheres.

Explorers targeted the 61 Cygni binaries early in humanity's trek to the stars, followed by colonists bound for the second world orbiting 61 Cygni A. The discovery of valuable biochemicals on the system's hostile sixth world brought a second wave of colonists.

A handful of engagements with Vorn warships were fought in the 61 Cygni A system during the Interstellar War nine years ago.

Relatively close to Sol and Sigma Draconis in the United Worlds, 61 Cygni A is also one of the federation stars nearest to Eta Cassiopeia A, home system of the alien Etherean civilization. The 61 Cygni binaries share a jumpgate and communications array that operate outside the gravity well of both stars.

Hi-No-Kagu-Tsuchi (61 Cygni A I)**Orbit:** 0.28AU**World Type:** Terrestrial**Equatorial Radius:** 2,136km**Gravity:** 0.3g**Atmosphere:** None**Surface Temperature:** 32°C**U.W. Status:** Explored**Moons:** 0

A radiation-scorching world, Hi-No-Kagu-Tsuchi takes its name from a Shinto fire kami. The tidelocked planet has no atmosphere. Dayside temperatures exceed 100°C and the frigid nightside reaches temperatures as low as -30°C. Dusty plains cover the dayside, which has no water or native life, while the chill nightside terrain consists of barren wastelands of craters and ragged cliffs.

Explorers have visited the nightside of Hi-No-Kagu-Tsuchi, but the cost of shielding against 61 Cygni A's radiation outweighs the value of the planet's mineral resources.



Ryujin (61 Cygni A II)
Orbit: 0.42AU
World Type: Terrestrial
Equatorial Radius: 3,823km
Gravity: 0.6g
Atmosphere: Tainted
Surface Temperature: -24°C
U.W. Status: Independent
Population: 785 million
Starport: Alpha
Moons: 0

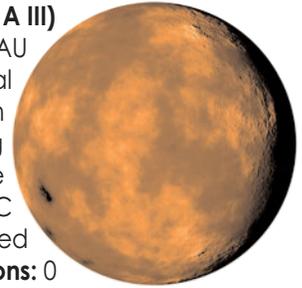
A frosty world of fiery volcanoes and iceberg-strewn oceans, Ryujin is a thriving independent state known as a center of technological innovation. The world draws its name from the Shinto dragon kami and thunder deity.

The nitrogen-oxygen atmosphere, contaminated by sulfur fumes from extensive volcanic activity, has a pressure half that of Earth. Ryujin has a chill climate with mildly acidic rain. Temperatures range from an equatorial high of 12°C to a polar low of -55°C. Oceans cover 78% of the world, with large polar icecaps and numerous volcanic islands, some reasonably large, forming the rest. Mountainous terrain predominates, and extensive lava beds give some regions of the world an almost lunar landscape. The rich soils of the remainder support extensive native plant life, and the seas are home to a plentiful array of lifeforms.

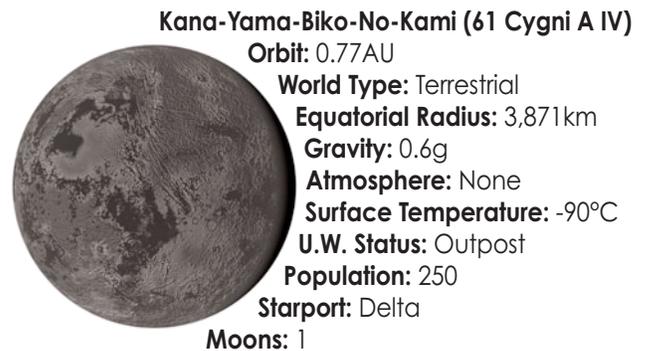
Intensely active tectonically, Ryujin has frequent earthquakes and countless active volcanoes. Endless eruptions fill the atmosphere with sulfur fumes. Native lifeforms have adapted to the tainted air, but humans must use filters and all buildings have filtration systems.

Colonists from Japan established a permanent presence on Ryujin in 2142CE, and the world earned independence in 2168CE. Ryujin boasts a strong industrial base, but has become better known for the new technologies devised by its research laboratories. The world's culture remains strongly Japanese despite the diversification of its populace, and the yakuza syndicates operating below the surface of Ryujin society are second in federation-wide influence only to those of Earth. Numerous Shinto shrines and Buddhist temples are among Ryujin's chief tourist attractions.

Ishi-Kori-Dome (61 Cygni A III)
Orbit: 0.5AU
World Type: Terrestrial
Equatorial Radius: 1,297km
Gravity: 0.2g
Atmosphere: None
Surface Temperature: -43°C
U.W. Status: Explored
Moons: 0



Named for the Shinto kami of stonecutters, Ishi-Kori-Dome is a rocky, barren world with no atmosphere or water. The lack of vulcanism to separate ores in its crust means Ishi-Kori-Dome possesses no useful metal or mineral deposits.

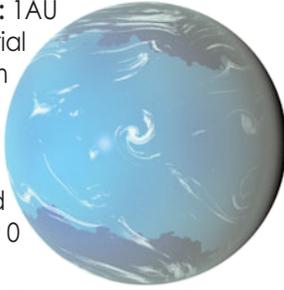


Kana-Yama-Biko-No-Kami (61 Cygni A IV)
Orbit: 0.77AU
World Type: Terrestrial
Equatorial Radius: 3,871km
Gravity: 0.6g
Atmosphere: None
Surface Temperature: -90°C
U.W. Status: Outpost
Population: 250
Starport: Delta
Moons: 1

Ryujin-based Tsukawaki Corp. has established a toehold on Kana-Yama-Biko-No-Kami, named for a Shinto kami of mining, in the form of a fledgling excavation site on the equator of the rocky planet.

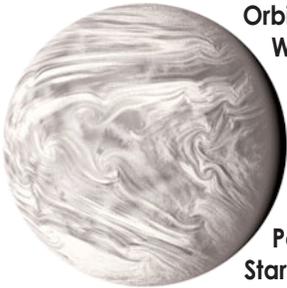
The airless world is devoid of water or life, but below the crater-pocked surface Kana-Yama-Biko-No-Kami boasts rich deposits of metals including iron, titanium, and aluminum.

Tsukawaki's mining outpost was constructed in 2235CE as a pilot project, hoping to offset the high cost of importing nearly all necessities for life by recovering metal ores rare on Ryujin. The Tsukawaki corporation's ultimate intent may be to develop a ship-building industry using raw materials from this world. The bitterly cold world has a single moon, an airless chunk of rock barely 35km in diameter.

Take-Mika-Dzuchi-No-Kami (61 Cygni A V)**Orbit:** 1AU**World Type:** Terrestrial**Equatorial Radius:** 5,442km**Gravity:** 0.8g**Atmosphere:** Exotic**Surface Temperature:** -135°C**U.W. Status:** Unexplored**Moons:** 0

An unpleasant world with a carbon-rich crust and seas of liquid hydrocarbons, Take-Mika-Dzuchi-No-Kami derives its name from a Shinto thunder kami. The world has a thin atmosphere rich in nitrogen, at about half Earth pressure. Vast seas of liquid ethane cover Take-Mika-Dzuchi-No-Kami, freezing into polar icecaps in winter. No water, oxygen, or life have been found on the planet.

Explorers tried to set down in the hydrocarbon seas covering Take-Mika-Dzuchi-No-Kami using a custom-built lander in 2182CE, but the craft and entire crew were lost for reasons still unclear.

Hachiman (61 Cygni A VI)**Orbit:** 1.6AU**World Type:** Terrestrial**Equatorial Radius:** 12,113km**Gravity:** 0.8g**Atmosphere:** Reducing**Surface Temperature:** -138°C**U.W. Status:** Independent**Population:** 320 million**Starport:** Gamma**Moons:** 0

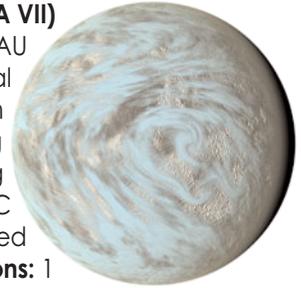
Perhaps the most implacably hostile world yet colonized by humanity, Hachiman takes its name from a Shinto kami of war. A proud, independent state with a struggling economy has taken root on the dangerous planet.

A dense methane atmosphere crushes this failed gas giant under 11 Earth atmospheres. Violent storms and shearing winds wrack the atmosphere, demanding expert piloting skills and special landing craft to avoid disaster during shuttle landings and takeoffs. A kilometers-deep shell of permanently frozen water ice surrounds the rocky core of the gigantic, low-density world. Endless icefields split by deep crevasses, frozen spires carved by methane winds and jumbled ice blocks comprise the surface landscape. The only known form of native life on the world is a scarlet lichen that grows on the ice covering Hachiman. An organic chemical in the lichen provides a crucial ingredient in the healing gel used in regeneration tanks. All efforts to replicate the chemical synthetically or transplant scarlet lichen to a less inhospitable world have failed.

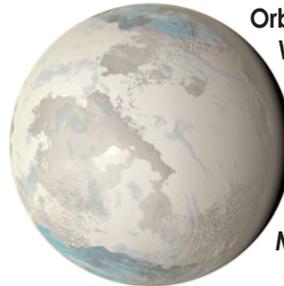
Fires of Heaven^{v1.0}

An Israeli-led expedition settled Hachiman in 2170CE. The world gained its independence in 2204CE and retains a strong Israeli culture with Judaism as the chief religion. Most settlements on Hachiman are subsurface complexes carved from the ice by civil engineers expert at building stable, well-insulated structures encased in ice.

Harvesting Hachiman's scarlet lichen, while extremely hazardous, keeps the world financially afloat. Even so, most Hachiman families struggle to make ends meet and many citizens find offworld work to send needed money home. Enlistment in the StarForces has proven to be a very popular option, and families without young people away on active duty or a few veterans around the dinner table are rare.

Mizu-Ha-No-Me (61 Cygni A VII)**Orbit:** 2AU**World Type:** Terrestrial**Equatorial Radius:** 9,546km**Gravity:** 0.6g**Atmosphere:** Reducing**Surface Temperature:** -159°C**U.W. Status:** Unexplored**Moons:** 1

A huge, miserably cold orb, Mizu-Ha-No-Me derives its name from a Shinto water kami. Mizu-Ha-No-Me has a thick methane atmosphere at twice Earth pressure. A light-density world of rock and ice, the planet has a metal-poor crust covered by extensive icefields. Craters and radiate cracks in the ice illustrate the power of meteor impacts on Mizu-Ha-No-Me, which has no liquid water or native life.

Kura-Okami-No-Kami (61 Cygni A VIII)**Orbit:** 2.5AU**World Type:** Terrestrial**Equatorial Radius:** 8,688km**Gravity:** 0.6g**Atmosphere:** Reducing**Surface Temperature:** -173°C**U.W. Status:** Unexplored**Moons:** 0

A world of endless frost and ice, Kura-Okami-No-Kami takes its name from a Shinto kami of rain and snow. Methane gas cloaks Kura-Okami-No-Kami at 1.1 Earth atmospheres, falling from the sky as rain at colder latitudes and forming methane icecaps at the poles. Water ice, also a component of the low-density world's inner makeup, covers two-thirds of the surface. Kura-Okami-No-Kami possesses no liquid water or native life.

61 Cygni B

Spectral Class: K7-Orange

Size: 0.8 solar radii

Surface Temperature: 3,600°C

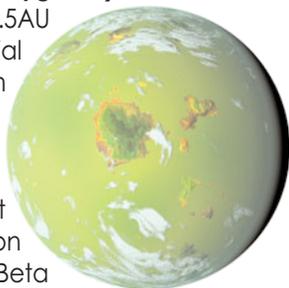
Distance from Sol: 11.2 light years

61 Cygni B shares a binary star system with 61 Cygni A. The two average 83AU distance, and complete one orbit every 650 years. A single planet and an asteroid belt comprise the 61 Cygni B system. The star is sometimes called Saule after the Lithuanian sun deity.

While explorers surveyed the two stars of 61 Cygni at roughly the same time, colony backers initially had scant interest in the sparse 61 Cygni B system. The discovery of precious metals useful in electronics on the single, unusual world circling the star a decade later opened the door to Teljavelik's settlement, and the discovery of riches in its asteroid belt still later sent interest and immigration in the system soaring. Ores from the asteroids go to factories orbiting Teljavelik, while finished goods from the world flow out to the belt.

Close to Sol and Sigma Draconis, 61 Cygni B also sees some trade with the alien Ethereans from Eta Cassiopeia A. The 61 Cygni binaries share a jumpgate and communications array operating outside the system's gravity well.

Teljavelik (61 Cygni B I)
Orbit: 0.5AU
World Type: Terrestrial
Equatorial Radius: 6,841km
Gravity: 1g
Atmosphere: Exotic
Surface Temperature: 15°C
U.W. Status: Independent
Population: 435 million
Starport: Beta
Moons: 1



Named for a Lithuanian creation god known as the smith of heaven, Teljavelik boasts a prosperous independent state incorporating two disparate settlements built on high plateaus rising from the world's deadly lower atmosphere.

The tidelocked world has an atmosphere of chlorine, oxygen, carbon dioxide, nitrogen, and other gases at 1.3 Earth atmospheres at sea level. Visibility is extremely low in the sickly yellowish-green clouds blanketing much of the world. Oceans of dilute hydrochloric acid cover 56% of Teljavelik, separating four major continents. Acid-weathered mountains and huge mesas thrust up from the poisonous murk of lower altitudes. Islands of habitability in a noxious sky, these highlands extend high enough into the atmosphere to possess breathable air free of heavy chlorine. All human settlements are built on the plateaus and peaks scattered across the warm dayside of Teljavelik, where average temperatures range from 38°C at the equator to 11°C at the poles. On the nightside, temperatures average below -13°C. Storms sometimes roil the chlorinated lower atmosphere, blanketing highland cities in mildly acidic fogs and requiring those venturing outside to wear airmasks.

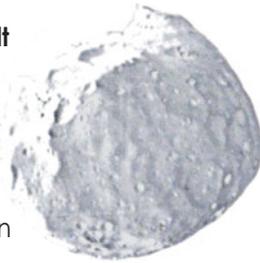
Surprisingly, Teljavelik has plentiful native plant life, mostly oxygen-producing vegetation with black leaves and plasticized wood found in the lower altitudes. Native animal life, with bones and teeth closely resembling natural plastics has also been found. Numerous Progenitor ruins are believed to exist, hidden beneath the poisonous chlorine clouds surrounding the highlands.

Two bands of colonists took up the challenge of settling Teljavelik in 2150CE. A large expedition with a Russian charter claimed the plateaus, while a small Tibetan effort centered on a mountain range near the poles. Teljavelik gained independence within a few decades and has thrived as a center of industry, particularly in the field of electronics. Modest metal deposits are found on the plateaus, while corrosion-resistant precious metals are plentiful at lower altitudes. Most factories and cities, including the capital of Ekaterina, are found on the mesas, where the culture retains a Russian flavor. The mountains of the former Tibetan colony contain small villages dotting the rounded peaks that rise from the poison mists, while countless Buddhist monasteries and temples are found on remote summits.

The stampede to 61 Cygni B's asteroid belt has sparked an economic boom in Teljavelik's more industrialized Russian state, driving pressure for expansion into the sparsely populated mountainous regions held by the Tibetans. The Tibetan state has rebuffed these efforts, and tensions between the two former colonies are rising. The world has a single satellite, Menulis, named after a Lithuanian moon god. Menulis, a sun-scorched, cratered moon, has a very thin carbon dioxide atmosphere and no appreciable resources.

Asteroid Belt**Orbit:** 0.8AU**Orbital Width:** 0.1AU**Asteroid Type:** Metallic**U.W. Status:** Active

Colonization

Population: 54 million

A rich asteroid belt, thronged by starry-eyed treasure-hunters, profiteering merchants, and the unsavory elements that prey on both girdles the 61 Cygni B star system.

Nickel-iron asteroids predominate in the belt, which has a relatively thick scattering of planetoids across its 15-million-kilometer width. The largest asteroid, Jagaubis (after the Lithuanian fire deity) is 738 km in diameter.

The discovery of extensive mineral resources in 2158CE ignited a stampede that continues to lure hopeful prospectors and zero-g miners to 61 Cygni B. OmniCorp, TCI, and other top corporate mining operations have a strong presence in the asteroid belt, competing with hundreds of thousands of freelance enterprises ranging from solo endeavors to fledgling corporate concerns.

A boomtown culture resembling the California Gold Rush has arisen, with crafty entrepreneurs making their fortunes selling supplies at inflated prices and hordes seeking to plunder the riches of the belt directly. The asteroids are a rough-and-tumble place, without sufficient numbers of Security Force marshals to keep order in its far-flung reaches.

The largest permanent space habitats are found near Jagaubis, a handy navigation point, and include commercial shops, ship repair facilities, ore processors, factories, a medical clinic, and a federal administration center housing the local U.W. Security Force headquarters.

Fires of Heaven ^{v1.0}**Epsilon Indi****Spectral Class:** K5-Orange**Size:** 1 solar radii**Surface Temperature:** 3,860°C**Distance from Sol:** 11.2 light years

Epsilon Indi is considered the last of the U.W. core systems. Ten worlds orbit Epsilon Indi, including two colonized by humanity in the initial push to the stars. One, Nuadu, has become a famous resort world but also has a reputation for crime and corruption.

Epsilon Indi lies nearest to Alpha Centauri, Delta Pavonis, and Tau Ceti in the federation. Its proximity to several Jodoni systems makes the star a key point for trade with that interstellar alien civilization. Two jumpgates and a communications array are found at Epsilon Indi.

**Gobniu (Epsilon Indi I)****Orbit:** 0.29AU**World Type:** Terrestrial**Equatorial Radius:** 2,411km**Gravity:** 0.4g**Atmosphere:** None**Surface Temperature:** 65°C**U.W. Status:** Failed**Moons:** 0

Seared by radiation, Gobniu derives its name from the Celtic god of smiths. Airless craters and scarps form the broiling surface of the planet, which has no water or native life but possesses a metal-rich crust.

A 2198CE effort to establish an automated mining operation near the tolerable north pole of Gobniu folded after the robots proved incapable of operating for extended periods without human supervision. The extensive radiation shielding and other necessities for permanent human habitation proved cost-prohibitive, and the mines were abandoned in 2204CE.

Brigit (Epsilon Indi II)

Orbit: 0.44AU

World Type: Terrestrial

Equatorial Radius: 3,714km

Gravity: 0.6g

Atmosphere: Normal

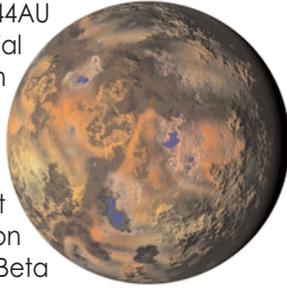
Surface Temperature: 1°C

U.W. Status: Independent

Population: 200 million

Starport: Beta

Moons: 0



A dead world of dried-out seabeds and fossilized life, arid Brigit has become home to a thriving independent state known almost as much for its scientific riches as for the products of its many factories. The world is named for a Celtic pastoral deity later adopted as a Catholic saint.

Eons ago, a devastating meteor strike stripped Brigit, once a life-bearing world of vast oceans and green continents, of much of its water and atmosphere. A few small bodies of water persist in what had been the oceans' deepest regions.

Brigit now has a thin nitrogen-oxygen atmosphere. Atmospheric pressures peak at half that of Earth on the former seafloor, thinning to almost nothing on continental plateaus. Average temperatures vary from an equatorial high of 28°C to a polar low of -26°C. Vast mountain ranges give way to rock-strewn flatlands and deep chasms on what had been Brigit's five continents. Signs of the water that once gave life to Brigit are everywhere, from dusty river valleys to vast, parched seabeds stretching from horizon to horizon.

No native life now exists on Brigit, but fossilized remains of its lost biosphere are plentiful. Exopaleontologists have found imprints of thousands of species of plants and animals, including large marine and land animals, on the dead world. Brigit continues to attract considerable attention in scientific circles, and planetary officials have their hands full granting permits for new digs.

Colonization of Brigit began in 2164CE under two charters, one granted to the Roman Catholic Church and the other to a smaller Martian expedition. The world developed a strong industrial base and earned independence in 2193CE. Each former colony retains some internal control, much like the states of the USA, but the world government has ultimate authority. The ex-colonies have a strong and friendly relationship.

Catholicism continues to dominate the world's religious scene, but in accordance with United Worlds law, followers of other beliefs face no discrimination or prejudice. Most of the domed cities of Brigit are found on the former seafloor. The capital is Pax. Other major cities include Concordia, Salus, and Beneficentia.

Several schemes for terraforming Brigit have been advanced, including the notion of diverting an icy comet to hit the planet, jumpstarting the reformation of oceans and an atmosphere. Scientists are weighing a variety of less-destructive options.

Morrigan (Epsilon Indi III)

Orbit: 0.63AU

World Type: Terrestrial

Equatorial Radius: 2,068km

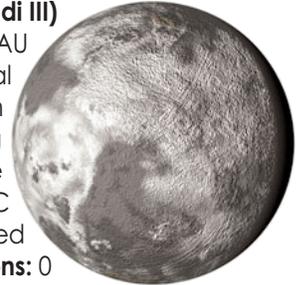
Gravity: 0.3g

Atmosphere: None

Surface Temperature: -41°C

U.W. Status: Explored

Moons: 0



Named for a Celtic war goddess, Morrigan is a small, cold world whose scant gravity prevents it from retaining an atmosphere. Craters and regolith comprise most of the barren terrain. Morrigan has no water or native life.

Nuadu (Epsilon Indi IV)

Orbit: 0.87AU

World Type: Terrestrial

Equatorial Radius: 6,056km

Gravity: 0.9g

Atmosphere: Normal

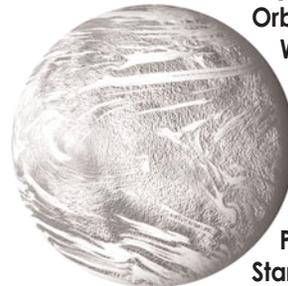
Surface Temperature: -94°C

U.W. Status: Independent

Population: 75 million

Starport: Beta

Moons: 2



A pit of crime and iniquity, the independent world of Nuadu belies its honorable namesake, a Celtic war god. Nuadu has breathable atmosphere at 1.1 Earth pressure. Temperatures on the bitterly cold planet range from an equatorial high of -59°C to a polar low of -127°C. Icestorms, blizzards, and other climatic conditions make any outdoor activity extremely hazardous. Thick slabs of ice, floating on buried seas warmed by volcanic vents, cover Nuadu's entire surface. The icesheets provide a simulacrum of tectonic activity, creating mountain-like regions of jumbled ice where they push together and bands of thin, newly frozen ice where they pull apart.

DATA DUMP

Rayne Whitecloud

Strength 2d+0

Agility 2d+2

Awareness 4d+0

Will 2d+0

Health 2d+2

Fate 1d+0



A teenager growing up in the slums of Nuadu, Rayne Whitecloud has a wild streak a kilometer wide. Her talent for hacking earns her the admiration of her fellow netrunners, the ire of her overprotective uncle, and the eye of compsec personnel, but she knows she can handle anything that comes her way. *But, everything Rayne knows is a lie.*

Her real name is Rayne Lancaster. Her "uncle", Ben Whitecloud, is a former federal marshal gone rogue. And her fate is intertwined with that of the most powerful, and most dangerous, corporation in the United Worlds. Lancaster's parents, Jason and Amalia Reyes Lancaster, owned more than 40% of the stock in OmniCorp. When she was just an infant, her father became OmniCorp's president and her parents vowed to clean up the corruption-riddled conglomerate. A suspicious accident on Ryuji in 2221CE cut short their crusade, killing Jason, Amalia, and, so authorities believed, their infant daughter.

In truth, Ben Whitecloud, a UW marshal investigating OmniCorp and a friend to her parents, took the infant survivor of the crash into hiding. But one of his fellow marshals turned out to be in OmniCorp's pay, and Ben Whitecloud was forced to kill her to save Rayne. Now a fugitive, he vanished into the human cesspool of Nuadu to safely raise Rayne until she was old enough to reclaim her birthright.

Top OmniCorp officials, particularly its CEO, are desperate to find Rayne Lancaster. Her right to the stock owned by her parents could enable her to take control of the corporation and bring their private empires to an end. A bounty hunter is *en route* to Nuadu to investigate rumors placing the girl there - secretly followed by OmniCorp assassins with orders to kill the girl, the bounty hunter, and anyone else nearby when Lancaster is found.

The girl calling herself Rayne Whitecloud runs with a band of teenage hackers on the perpetually snow-covered streets of the Maze. Rayne, 16, a human of English-Filipino descent, has brown eyes and brown hair cut in a ragged style currently popular with Nuadan youngsters. She is skinny and stands 167cm tall.

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Fires of Heaven^{v1.0}

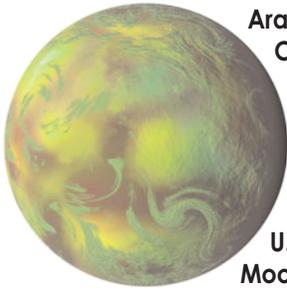
Vast rifts and treacherous crevasses also mark the terrain, while extensive ice caverns honeycomb the icesheets. A handful of extremely hardy native plant and animal species have been discovered on Nuadu, surprising planetologists. Daring expeditions to the chill oceans beneath the icecap have revealed ruins left by the mysterious Progenitors on the seafloor. Some researchers attribute the breathable atmosphere and native life of Nuadu, highly unusual for a world so far from its sun's warmth, to some unknown influence of these ruins.

Founded by a corporate expedition in 2193CE, the colony of Nuadu earned independence in 2218CE but faltered in economic competition with richer worlds. Planetary leaders turned to tourism, promoting construction of luxury resorts, casinos, and other entertainment venues under the heat-trapping domes enclosing Nuadu's cities. A world catering to decadent whims and hedonistic delights, Nuadu drew the attention of crime figures eager to supply less licit forms of entertainment and in time fell wholly into the grip of its criminal element. Gangs rule the streets, while wealthy crimelords control the major resorts.

Lax extradition laws and rampant bribery have brought refugees and criminals from throughout the federation to Nuadu - not to mention countless bounty hunters. Those too poor to afford space in the comfort of cartel-controlled domes dwell in sordid shantytowns nearby. Constructed of discarded cargo containers, grounded starships, and other castoffs, these maze-like warrens are filled with desperation and lawlessness.

Rife with corruption, the ostensibly democratic government obeys the every whim of the crime cartels. Fear and graft render planetary law enforcement authorities helpless. The U.W. Assembly is reluctant to authorize the kind of wholesale federal intervention required to clean up Nuadu, for fear that it would set a precedent for intrusions into the local affairs of other worlds.

Two minuscule chunks of rock with no air, water, or valuable resources orbit Nuadu. They are named Fir Bolg and Fomorian, after ancient enemies fought by the Celtic gods.

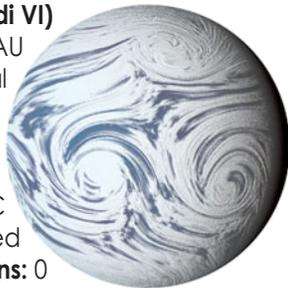


Arawn (Epsilon Indi V)
Orbit: 1AU
World Type: Terrestrial
Equatorial Radius: 3,850km
Gravity: 0.6g
Atmosphere: Exotic
Surface Temperature: -126°C
U.W. Status: Unexplored
Moons: 0

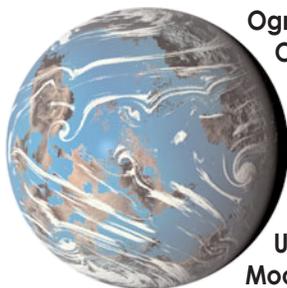
A vaporous atmosphere of corrosive gases shrouds icefields on the bleak, deadly world of Arawn. Named for a Celtic god of death, Arawn has an atmosphere composed chiefly of highly acidic chlorine gas at less than 0.1 Earth atmosphere. Hydrogen chloride frozen into ice covers more than 86% of the barren surface. No water or native life exists on Arawn.

Midir (Epsilon Indi VI)

Orbit: 2AU
World Type: Terrestrial
Equatorial Radius: 14,112km
Gravity: 1g
Atmosphere: Reducing
Surface Temperature: -119°C
U.W. Status: Unexplored
Moons: 0

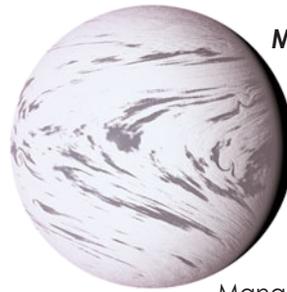


An enormous world named for a Celtic god of the underworld, Midir is a failed gas giant, a low density composite of ice and rock blanketed by a crushing atmosphere. Chiefly methane, the atmosphere has a surface pressure 27 times that of Earth. Ice covers Midir's surface in its entirety, and the frigid world possesses no liquid water or native life.



Ogmios (Epsilon Indi VII)
Orbit: 2.9AU
World Type: Terrestrial
Equatorial Radius: 6,305km
Gravity: 0.4g
Atmosphere: Reducing
Surface Temperature: -170°C
U.W. Status: Unexplored
Moons: 0

Seas of boiling liquid methane cover the raw, forbidding world of Ogmios. Named for a Celtic god of poetry, the world has a thin methane atmosphere at 0.2 Earth pressure created by evaporation from its chill oceans. Cratered wastes and high mountains comprise most of the terrain on its six continents, and Ogmios has large polar icecaps of frozen methane. No liquid water or native life exists here.

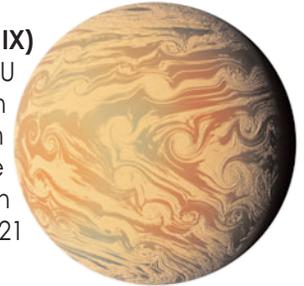


Manannan (Epsilon Indi VIII)
Orbit: 4.6AU
World Type: Jovian
Equatorial Radius: 19,692km
U.W. Status: Unexplored
Moons: 11

The subjovian world of Manannan derives its name from a Celtic sea god. Methane in its dense hydrogen atmosphere gives the world a bluish tint, and 11 moons attend the gas giant. All are low-density worldlets composed primarily of ice surrounding rocky cores, and several are believed to house concealed pirate bases. Four dark rings of carbonaceous particles also encircle Manannan.

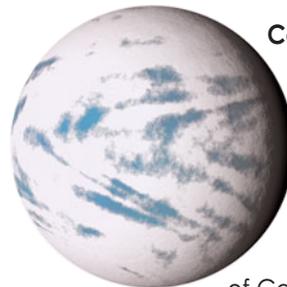
Dagda (Epsilon Indi IX)

Orbit: 8.1AU
World Type: Jovian
Equatorial Radius: 44,146km
U.W. Status: Active
 Exploration
Moons: 21



Dagda, named for a deity regarded as a father figure to the Celtic gods, rules as the largest world in the Epsilon Indi system. A jovian world with a superdense, storm-tossed atmosphere of hydrogen and helium, Dagda has 21 moons. Two are sizable worlds of moderate density, while the remainder are small chunks of ice-covered rock.

Signs of hydrogen-breathing lifeforms similar to those discovered in a handful of other jovian worlds have been uncovered in the roiling upper atmosphere of Dagda. A scientific outpost has been established on the moon Aengus, named for a son of Dagda, to observe the creatures.



Cailleach Bheur (Epsilon Indi X)
Orbit: 14AU
World Type: Jovian
Equatorial Radius: 18,048km
U.W. Status: Unexplored
Moons: 10

Named for the winter hag of Celtic mythology banished by Brigit, Cailleach Bheur orbits in eternal wintry slumber. A placid subjovian world, the gas giant has 10 frigid moons of low-density ice and rock.

We started finding patches of this strange blue mold here and there in the hold. We scrubbed the spots down with disinfectant and opened the hold to vacuum. No help. We kept finding new patches, and pretty soon it started showing up in the crew quarters, the galley, everywhere.

The ship ended up being quarantined at the Teljavelik starport until it could be decontaminated. Near as we can tell, we must have accidentally brought some spores aboard when we landed on Shen Nung in Sigma Draconis a few months back. Too bad it couldn't have turned out to be a cure for cancer or something.

- Ngwazi Tembo, bridge crew, 2235CE

▼ **FRONTIER SYSTEMS** - Ongoing expansion of the United Worlds has opened new stars to exploration and colonization. Those farther away from Sol are known as frontier or rim systems. Independent states are rarer, and there are several pioneer colonies where high technology is scarce and unknown dangers are great.

Tiika (Procyon A)

Spectral Class: F5-White

Size: 1.7 solar radii

Surface Temperature: 6,330°C

Distance from Sol: 11.4 light years

A hot white star, Procyon A shares a binary system with Procyon B, a white dwarf star with no planets. The two stars are 14AU apart and complete one orbit every 41 years. Five worlds orbit Procyon A. The United Worlds has adopted the names given to the worlds by the natives of the third planet, which refer to the planets' colors in the night sky. They call their primary star Tiika - Nutoan for sun.

Procyon A was the site of humanity's first contact with an intelligent alien race. A survey expedition discovered the Nutoa in 2162CE. In 2170CE, the Nutoa joined the United Worlds and their homeworld, Yewel, became an independent state in the federation.

Procyon A lies closest to Lalande 21185, but is also reasonably near Sol, Epsilon Eridani, and Alpha Centauri. A jumpgate and communications array are found outside the gravity well of the system.

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Ugude (Procyon A I)

Orbit: 0.5AU

World Type: Terrestrial

Equatorial Radius: 1,365km

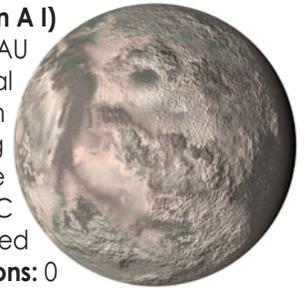
Gravity: 0.2g

Atmosphere: None

Surface Temperature: 213°C

U.W. Status: Unexplored

Moons: 0



Sun-baked wastelands burn under the relentless gaze of Procyon A on the scorched dayside of Ugude, a small, rocky world tidelocked to the white star. Surface conditions vary wildly on Ugude, which is incapable of retaining an atmosphere. On the dayside, temperatures soar to nearly 400°C, while on the starlit nightside they drop to -175°C or lower. The irradiated world possesses no water or native life of any sort. Survey teams have charted the surface of Ugude from orbit but no landings have been made.

Jubai (Procyon A II)

Orbit: 0.8AU

World Type: Terrestrial

Equatorial Radius: 2,919km

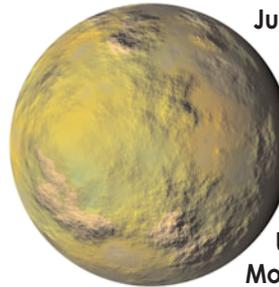
Gravity: 0.4g

Atmosphere: None

Surface Temperature: 120°C

U.W. Status: Unexplored

Moons: 0



A harsh, cratered world of blazing heat, Jubai orbits second around Procyon A. Airless, desiccated flatlands roast in the blistering heat of day, becoming barely tolerable at night. A string of active volcanoes rise over the barren plains, occasionally belching forth molten rock and ash. Hardened basaltic flows mark the paths of past eruptions. The world has no water or native life. Jubai has been mapped from orbit, and survey teams have landed on the world at night but found no valuable resources.

Yewel (Procyon A III)

Orbit: 1.3AU

World Type: Terrestrial

Equatorial Radius: 7,527km

Gravity: 0.9g

Atmosphere: Normal

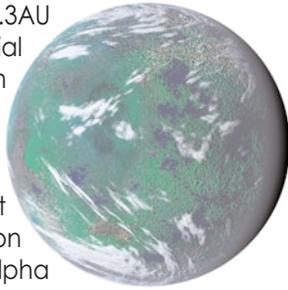
Surface Temperature: 23°C

U.W. Status: Independent

Population: 1.1 billion

Starport: Alpha

Moons: 1



Homeworld to the Nutoa, the jungle world of Yewel is an independent state in the United Worlds. Yewel has a thick atmosphere at 1.3 Earth pressure and a sultry, humid climate. Daytime temperatures on the equator peak at 54°C in summer, while polar winters reach a chilly -33°C. Thick clouds blanket Yewel much of the time, and intense rainstorms occur almost daily in most regions. Yewel lacks the deep ocean basins found on most other planets; water covers nearly 80% of the planet in the form of extensive freshwater swamps, lakes, and rivers, along with a few deep saltwater oceans.

The soaring rainforests of the equator are among Yewel's most fascinating features. Rising 150 meters or more from misty bogs, immense trees support a plenitude of ecosystems thriving at various heights above the ground. Many plants and creatures spend their entire lifetimes high in the trees, never once setting foot on the planet's surface. The world has an extensive biosphere that includes many varieties of beautiful flowering plants prized by horticulturists throughout the federation.

The Nutoa, an intelligent extraterrestrial race that has joined the United Worlds, build their treetop villages in the rainforests. In the years since contact with humans, some settlements have grown into enormous cities in the trees incorporating a blend of advanced technology and age-old Nutoan construction techniques. Most Nutoa welcome human visitors, and many humans have come to live on Yewel, while numerous Nutoa have now ventured into space.

A human survey vessel made contact with the Nutoa in 2162CE, and in 2170CE Yewel joined the federation. An elected world council of Nutoa governs Yewel, but it leaves most decisions to individual villages. A few villages have entered joint partnerships with off-world corporations to mine nearby mineral resources. Artwork, handicrafts, and organic chemicals useful in medicines constitute the bulk of exports from Yewel.

A single large moon, Yewelai, orbits the world. Craters, regolith, and hardened basalt constitute most of the terrain of the airless, waterless body. An expedition to establish a mining colony on Yewelai is planned for 2238CE.

Rhilo (Procyon A IV)

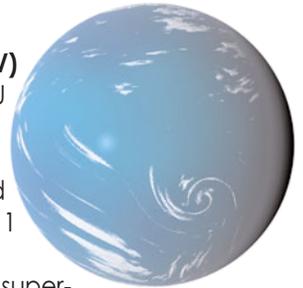
Orbit: 2.7AU

World Type: Jovian

Equatorial Radius: 23,621km

U.W. Status: Unexplored

Moons: 11



A subjovian world with a superdense atmosphere of hydrogen, helium, methane, and other gases, Rhilo has a placid, blue-green appearance marred by occasional clouds of ammonia-ice crystals. Eleven moons circle Rhilo. Three are rocky, geologically dead worldlets, while the remainder consist of a low-density mix of rock and methane ice. All are airless, frozen planetoids with no native life.

Faol (Procyon A V)

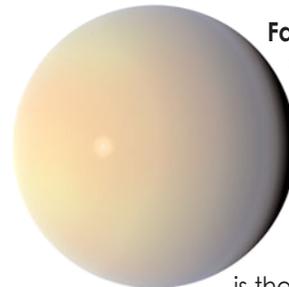
Orbit: 5.7AU

World Type: Jovian

Equatorial Radius: 39,745km

U.W. Status: Unexplored

Moons: 15

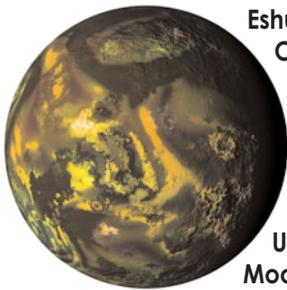


A mammoth gas giant, Faol is the largest planet in the Procyon A system. A superdense atmosphere, composed chiefly of hydrogen, crushes the iron-rock core of Faol under pressure so intense the gas becomes a kilometers-thick ocean. The 15 moons orbiting Faol are lifeless, airless worldlets of dead rock or ice-rock mixtures.

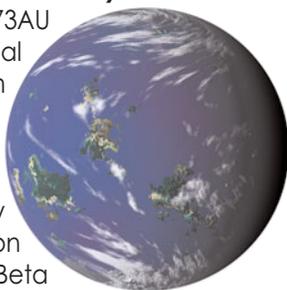
Tau Ceti**Spectral Class:** G8-Yellow**Size:** 1.67 solar radii**Surface Temperature:** 4,880°C**Distance from Sol:** 11.9 light years

Brighter but slightly cooler than Sol, Tau Ceti caught the eye of scientists and other forward-looking theorists early on as a prime candidate for habitable worlds. Nine worlds orbit Tau Ceti, including the ocean-covered colony world of Nai. The most distant system surveyed on the historic first mission of the *UWS Calypso*, Tau Ceti was home only to a science outpost on Nai for several decades until the ever-expanding wave of colonization brought settlers to the blue planet in 2210CE.

Closest to Epsilon Eridani and Omicron Eridani, Tau Ceti is also near Sol, Alpha Centauri, and Epsilon Indi. A jumpgate and newly constructed communications array lie outside the star's gravity well. Naian colonists are quite proud of the array, as it validates their efforts to create a self-sufficient world.

**Eshu (Tau Ceti I)****Orbit:** 0.35AU**World Type:** Terrestrial**Equatorial Radius:** 3,818km**Gravity:** 0.6g**Atmosphere:** None**Surface Temperature:** 108°C**U.W. Status:** Unexplored**Moons:** 0

A small, scorched world completing one orbit around its sun every 85 days, Eshu takes its name from a messenger god of the Yoruba. An airless world, Eshu bears countless craters and long, high cliffs. The extreme temperature precludes liquid water and Eshu has no native life. An orbital survey has been conducted, but no further exploration of the world has taken place.

Nai (Tau Ceti II)**Orbit:** 0.73AU**World Type:** Terrestrial**Equatorial Radius:** 6,868km**Gravity:** 1g**Atmosphere:** Normal**Surface Temperature:** 15°C**U.W. Status:** Colony**Population:** 28 million**Starport:** Beta**Moons:** 1**Fires of Heaven^{v1.0}**

A world of endless ocean, Nai is home to a prosperous colony of humans and cetaceans working together to uncover the secrets of its azure seas. The world derives its name from an ocean god worshipped in West Africa.

Nai has a breathable atmosphere, but its pressure of 1.9 Earth atmospheres can be very uncomfortable for humans. Nai has a temperate climate with frequent brief, intense cloudbursts. Saltwater oceans broken only by widely scattered archipelagos cover 95% of Nai. Diverse undersea terrain includes continental shelves, mountains, deep basins, and abyssal chasms plunging kilometers below the surrounding seafloor.

The vast seas contain uncounted species of native plants and animals. Nourishing violet kelp and dangerous sea serpents are but two examples. Transplanted sealife from Earth also thrives beneath the waves.

Colonization of Nai, chartered by a coalition of Pacific Ocean nations and a separate French expedition, began in 2210CE. Along with the human settlers came many whales and dolphins. A diverse economy of aquaculture and industry has made Nai a highly successful colony on the verge of achieving independence. The smaller French colony concentrated primarily on constructing a handful of underwater cities to wrest metals and other mineral resources from the seafloor. The largest settlements, including the capital of Cousteau, are all found underwater. New Riviera resorts, built by the French on a string of atolls formed by a native coral-like organism, are a popular tourist destination. The more numerous Pacific Islander colonists established scattered floating sea-towns and nomadic fishing fleets to harvest the bounty of the world-spanning ocean.

Near-sentient cetaceans dwell on Nai in great numbers, some living far from populated regions and others working in harmony with humans using technology that allows limited communication between the species. Exploration of the undersea world continues, with new discoveries being made constantly. While Nai has a diverse population, people of Polynesian descent predominate and the world's culture has a distinctly Polynesian cast.

Nai has a single moon, Ashiacle, named for the daughter of the African ocean deity. Plans to establish a mining outpost on Ashiacle are now in the works, but are several years from fruition.

Ndaula (Tau Ceti III)

Orbit: 1.5AU

World Type: Terrestrial

Equatorial Radius: 2,536km

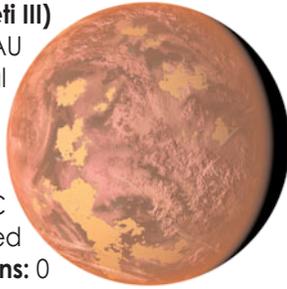
Gravity: 0.4g

Atmosphere: Exotic

Surface Temperature: -107°C

U.W. Status: Unexplored

Moons: 0



Ndaula, a small, cold world blanketed by a smoggy haze, takes its name from an East African plague deity. The world has a tenuous atmosphere of nitrogen oxides, giving Ndaula an orange tint when viewed from space. Poisonous ice covers more than half the world, with barrens and scattered volcanoes comprising the remainder. Ndaula has no liquid water or native life.

Kalisia (Tau Ceti IV)

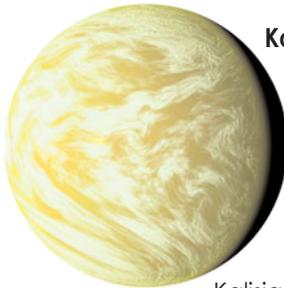
Orbit: 2AU

World Type: Jovian

Equatorial Radius: 19,676km

U.W. Status: Unexplored

Moons: 9



The subjovian world of Kalisia, named for a creator god of the Pygmy tribes, has a superdense atmosphere composed principally of hydrogen, helium, and methane with occasional clouds of ammonia ice crystals. The complex, storm-torn atmosphere surrounds a rock-iron core at extreme pressure. Kalisia has nine moons, mostly airless, low-density planetoids of rock and ice. The largest moon has a 1,200km radius, with a vaporous atmosphere of methane and nitrogen. Named Mugasa for the Pygmy sky god, the moon contains at least one set of Progenitor ruins.

Inkanyamba (Tau Ceti V)

Orbit: 3.6AU

World Type: Jovian

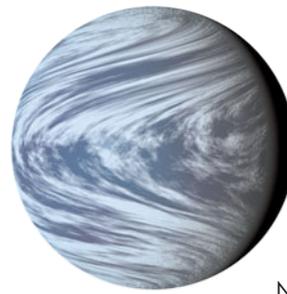
Equatorial Radius: 45,194km

U.W. Status: Unexplored

Moons: 14



Inkanyamba derives its name from the Zulu storm deity in recognition of the violent, endless tempests wracking the world's upper atmosphere. The wild weather creates a banding effect in the crushing atmosphere of hydrogen, helium, and other gases. The gas giant has 14 moons, mostly low-density conglomerations of rock and ice, and four bright rings of ice-covered particles.



Ogun (Tau Ceti VI)

Orbit: 9AU

World Type: Jovian

Equatorial Radius: 69,181km

U.W. Status: Unexplored

Moons: 18

Named for a West African war god, Ogun is the largest planet to orbit Tau Ceti. The gas giant has a dense atmosphere of hydrogen, helium, and methane around a dense, rocky core. Most of Ogun's 18 satellites are tiny ice-rock lumps.

Aje (Tau Ceti VII)

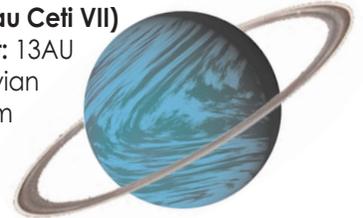
Orbit: 13AU

World Type: Jovian

Equatorial Radius: 42,338km

U.W. Status: Unexplored

Moons: 21



A spectacular set of rings encircles jewel-like Aje, named for the Yoruba deity of wealth. A dense atmosphere of hydrogen, helium, and other gases compresses the world's rock-iron core under intense pressure. The rings, wide bands of ice-coated rock, sparkle in the light of Tau Ceti as a glittering circlet around the greenish-blue world.

Sese (Tau Ceti VIII)

Orbit: 18AU

World Type: Terrestrial

Equatorial Radius: 4,562km

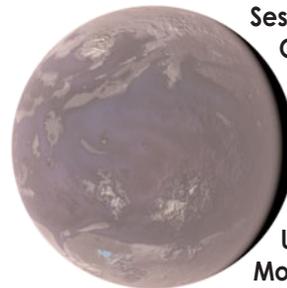
Gravity: 0.3g

Atmosphere: None

Surface Temperature: -219°C

U.W. Status: Unexplored

Moons: 0



Bitterly cold, Sese draws its name from a Central African underworld deity. A low-density world of methane ice and rock, Sese has no atmosphere. Patches of ice interspersed with cratered wastes cover the surface. It lacks liquid water and native life, and no manned expeditions have explored it.

Osande (Tau Ceti IX)

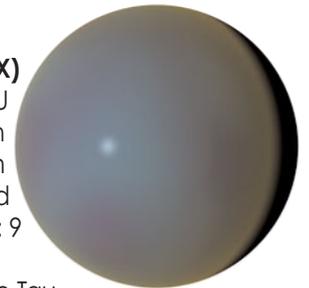
Orbit: 36AU

World Type: Jovian

Equatorial Radius: 16,584km

U.W. Status: Unexplored

Moons: 9



On the outer edge of the Tau Ceti system, Osande is named for a guardian deity of southwest Africa. Hydrogen, helium, and other gases sit over a cold, rocky core. Far from Tau Ceti, Osande has little heat to roil its bluish atmosphere.

Omicron Eridani A**Spectral Class:** K0-Orange**Size:** 0.7 solar radii**Surface Temperature:** 4,630°C**Distance from Sol:** 15.9 light years

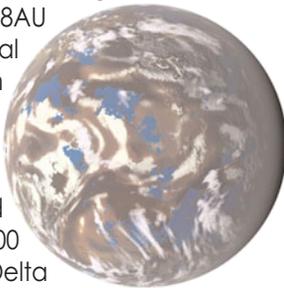
A warm orange star, Omicron Eridani A shares a trinary star system with Omicron Eridani B, a dwarf blue-white star, and Omicron Eridani C, a red star. Omicron Eridani A lies approximately 400AU from its sister stars, which are roughly 34AU apart, and completes one orbit of them every 8,000 years. The stars are also known as 40 Eridani or Al Keid, an Arabic name translating to "The Eggshells" - an allusion to a distant star named "The Egg" that appears nearby when viewed from Earth.

Omicron Eridani A has 12 planets, named from Arthurian legend. The second world, Gawaine, supports a thriving agrarian colony supplying food-stuffs to less hospitable planets in other systems, while the first, Percivale, has been settled clandestinely.

The star system lies closest to Epsilon Eridani and Tau Ceti. A commercial jumpgate operates outside the orbit of Guinevere, the sixth planet, and construction of a Fujihara-Mitsuya communications array has begun. The array will not be operational for at least two years.

Percivale (Omicron Eridani A I)**Orbit:** 0.38AU**World Type:** Terrestrial**Equatorial Radius:** 3,052km**Gravity:** 0.5g**Atmosphere:** Normal**Surface Temperature:** 46°C**U.W. Status:** Unexplored**Population:** 10,000**Starport:** Delta

Moons: 0



Percivale has become home to a secret colony of squatters who settled the world in defiance of U.W. Ministry of Colonial Affairs regulations. A thin atmosphere at 0.4 Earth pressure shrouds Percivale, and dust storms obscuring visibility for hundreds of kilometers are frequent. Temperatures range from 60°C or more at the equator to a still hot but tolerable 26°C at the poles. Vast, dusty plains and parched mountains comprise most of the terrain, with water covering less than 20% of the arid world. Occasional solar flares can bathe the planet in lethal doses of hard radiation. Percivale has no native life, and has not been listed for colonization by the U.W. Ministry of Colonial Affairs.

Fires of Heaven^{v1.0}

In 2234CE, however, elements of the Church of Jesus Christ of Latter-day Saints (frustrated by bureaucratic delays in efforts to gain a colonization charter) founded a squatter colony on Percivale. Acting without the knowledge of church elders, they surreptitiously established a tiny settlement they named Promise (alluding to the biblical Promised Land) near the barely habitable south pole. Relying on a handful of freighters owned by the faithful to smuggle in supplies, the colony has so far escaped detection by authorities.

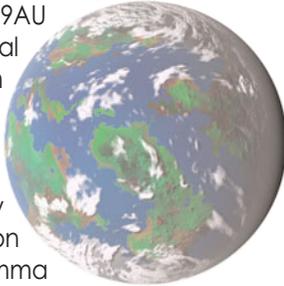
Life is hard in Promise, with extreme heat and dangerously high background radiation requiring constant attention to safety when out of doors. During solar flares, colonists must spend hours or even days inside cramped radiation shelters. Most of the colony is built below ground in a network of caverns for added protection from radiation and detection by U.W. authorities, with food grown in huge hydroponics caverns. The ever-present risk of discovery before the colony can become solidly established, presenting itself to the federation as a *fait accompli*, also wears on its leaders.

Essentially a theocracy, Promise is governed by church law and Mormon beliefs. Polygamy is technically not permitted, but a few polygamous families are largely ignored; the colony is still too small to permit itself to alienate any productive members of its society.

A few confederates on Gawaine are aware of the hidden colony. They help arrange supply runs by smugglers, provide a legitimate cover for the increased shipping activity to the system, discourage investigation of Percivale, and warn colonists of any impending danger of detection.

Gawaine (Omicron Eridani A II)

Orbit: 0.59AU
World Type: Terrestrial
Equatorial Radius: 5,503km
Gravity: 0.8g
Atmosphere: Normal
Surface Temperature: 6°C
U.W. Status: Colony
Population: 12 million
Starport: Gamma



Moons: 3

A cool, Earth-like world, Gawaine has become home to a prosperous colony based on farming and ranching. The world, already a breadbasket for nearby worlds, seems poised to someday become an economic hub of several star systems. Gawaine has a breathable atmosphere at .4 Earth pressure. The world's eccentric orbit causes seasonal weather extremes, with temperatures soaring to 40°C in summer and dropping to -19°C in winter. Saltwater oceans cover 66% of Gawaine, divided by six continents and several archipelagos. High mountain peaks, rolling grass-covered plains and dense forests are mixed with occasional deserts and swamplands. Gawaine has an extensive biosphere with many plants and animals edible by humans. Several Earth species have also been introduced, although the thin atmosphere makes it difficult for most terran animals not adapted to high altitudes to thrive.

One of the more notable native animals, dubbed "brontos" by early settlers, throng the grasslands of Gawaine in herds numbering in the millions. Warm-blooded quadrupeds with tough scaly hides, brontos average four meters high at the shoulder. Fortunately, they are peaceful herbivores and not very bright. Bronto meat, obtained from domesticated herds and hunting, is a key export.

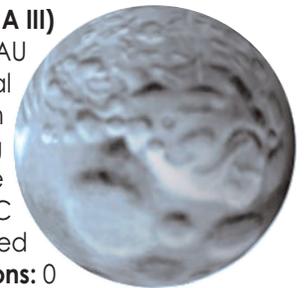
The Ministry of Colonial Affairs authorized three colonies on Gawaine in 2215CE. The largest, chartered by a coalition of investors from Australia, is named Outback. A band of settlers from the southwestern United States founded New Texas on a small, semi-arid continent, and the colony of Tara, organized in Ireland, occupies a temperate island chain.

While still under federal authority, the colony has made great strides toward independence. Most citizens of Gawaine live in rural towns surrounded by crops and grazing land, but a few reasonably large cities exist, such as New Sydney, the capital of Outback. Mining operations in the mountains are productive, but Gawaine still relies on agricultural exports to underpin its economy. In particular, Gawaine has strong ties to Asgard in the Epsilon Eridani system, providing food in exchange for manufactured products. Most inhabitants are unaware of the secret colony on Percivale, save for a few allies in league with the settlers.

Three small moons orbit Gawaine. Named Agravaine, Gaheris, and Gareth, for the three brothers of the Arthurian knight, they are rocky, cratered planetoids with few resources.

Bedivere (Omicron Eridani A III)

Orbit: 1AU
World Type: Terrestrial
Equatorial Radius: 1,598km
Gravity: 0.2 g
Atmosphere: None
Surface Temperature: -82°C
U.W. Status: Unexplored



Moons: 0

A chill, rocky world whose internal fires died early, Bedivere is incapable of retaining an atmosphere, and has a prodigious number of craters mixed with plains of hardened basalt from long-past lava flows. No water or life exists on Bedivere, which lies outside the narrow habitable zone of its star. A manned expedition visited the surface during initial exploration of the Omicron Eridani A system, but no further surveys have been undertaken.

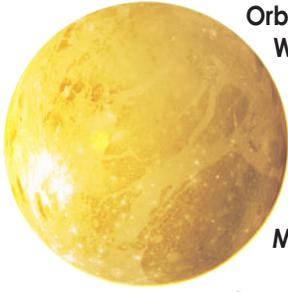
Galahad (Omicron Eridani A IV)

Orbit: 1.4AU
World Type: Terrestrial
Equatorial Radius: 5,893km
Gravity: 0.9g
Atmosphere: Reducing
Surface Temperature: -123°C
U.W. Status: Unexplored

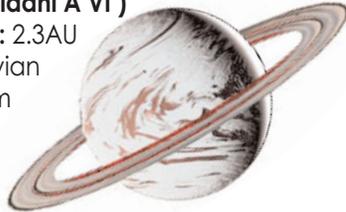


Moons: 1

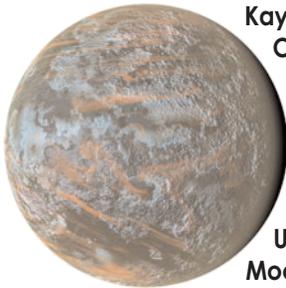
Ice-covered Galahad has a methane atmosphere at 0.8 Earth pressure. A mantle of permanently frozen water ice envelops the world, creating a featureless frozen landscape stretching from horizon to horizon. Galahad has no liquid water or native life. The planet has a single moon with a radius of 1,178 km. Named Grail, the cratered, regolith-covered moon has been explored by robot probes and may have some valuable resources.

Launcelot (Omicron Eridani A V)**Orbit:** 1.8AU**World Type:** Terrestrial**Equatorial Radius:** 5,916km**Gravity:** 0.9g**Atmosphere:** Exotic**Surface Temperature:** -142°C**U.W. Status:** Unexplored**Moons:** 0

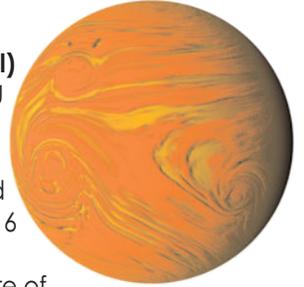
Corrosive fluorine gases dominate the atmosphere of frozen Launcelot, with a pressure roughly 0.8 that of Earth. Thick plates of hydrogen fluoride ice broken only by the highest mountain peaks envelop the planet, which has no liquid water or native life. Orbital surveys have been taken of Launcelot, but no humans have yet set foot on its chill, poisoned surface.

Guinevere (Omicron Eridani A VI)**Orbit:** 2.3AU**World Type:** Jovian**Equatorial Radius:** 19,197km**U.W. Status:** Unexplored**Moons:** 7

Guinevere, a subjovian world, boasts a beautiful set of sparkling rings. Nine shallow bands of ice-covered particles encircle the gas giant, which has a superdense atmosphere of hydrogen and helium. Guinevere has seven low-density moons of rock and ice.

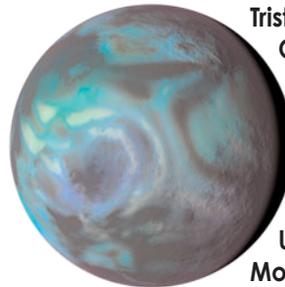
Kay (Omicron Eridani A VII)**Orbit:** 3.6AU**World Type:** Terrestrial**Equatorial Radius:** 7,232km**Gravity:** 0.5g**Atmosphere:** Exotic**Surface Temperature:** -170°C**U.W. Status:** Unexplored**Moons:** 0

A large, low-density planet comprised mostly of rock and silicate, Kay has a tenuous neon atmosphere. Few metals exist on the rocky world, which has a modest core producing a weak magnetic field and scant tectonic activity. Vast expanses of ice and barren wastelands constitute much of the landscape. Kay has no water or native life.

Fires of Heaven^{v1.0}**Arthur (Omicron Eridani A VIII)****Orbit:** 5.1AU**World Type:** Jovian**Equatorial Radius:** 59,819km**U.W. Status:** Unexplored**Moons:** 16

A superdense atmosphere of hydrogen, helium, and methane surrounds jovian Arthur's rock-iron core, displaying a complex banding pattern and frequent storms.

Arthur has 16 moons, the largest of which is named Excalibur. Excalibur has an equatorial radius of 2,353km, with extreme volcanism caused by gravitational stresses from its orbit around Arthur. At least a dozen massive, highly active volcanoes have been detected on Excalibur. Their eruptions sustain the tenuous sulfuric atmosphere clinging to the moon.

Tristram (Omicron Eridani A IX)**Orbit:** 7.9AU**World Type:** Terrestrial**Equatorial Radius:** 9,416km**Gravity:** 0.6g**Atmosphere:** Exotic**Surface Temperature:** -201°C**U.W. Status:** Unexplored**Moons:** 1

A thick crust of ice covers low-density Tristram, but reservoirs of water are thought to exist near volcanic vents deep below the icesheet. Some think one-celled life may be evolving near the vents, although no economical way to test the theory has yet been proposed.

Tristram has a single moon, named Isolde for this knight's great love. Isolde appears to be composed almost entirely of ice.

Merlin (Omicron Eridani A X)

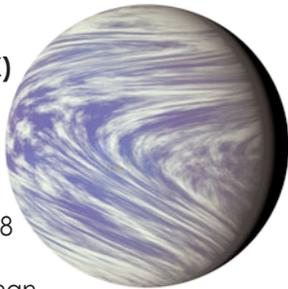
Orbit: 14AU

World Type: Jovian

Equatorial Radius: 58,808km

U.W. Status: Unexplored

Moons: 18



Only marginally smaller than Arthur is the jovian world of Merlin. Enveloping a rocky core, the cloud-layered sky of hydrogen, helium, and methane gases supports lifeforms similar to those found in a few other gas giants. Variations on the balloon-like harvesters and gliding predators seen elsewhere predominate.

The largest of Merlin's 18 moons is named Nyneve, for a sorceress who sought to entrap Merlin. Notable for frequent eruptions of nitrogen geysers that feed its vaporous atmosphere, Nyneve is 2,120km in radius.

Morgana (Omicron Eridani A XI)

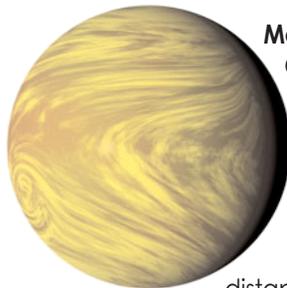
Orbit: 28AU

World Type: Jovian

Equatorial Radius: 14,846km

U.W. Status: Unexplored

Moons: 3



Omicron Eridani A's most distant subjovian world is named for King Arthur's scheming half-sister, the sorceress Morgana le Fay. An ice-rock core lies at the heart of the superdense hydrogen-helium atmosphere crushing Morgana. A complex but nearly invisible system of carbon rings circles the orb, while three tiny moonlets of ice and rock orbit outside the rings.

Mordred (Omicron Eridani A XII)

Orbit: 40AU

World Type: Terrestrial

Equatorial Radius: 5,990km

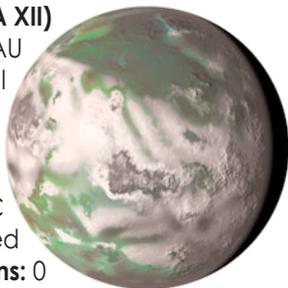
Gravity: 0.4g

Atmosphere: None

Surface Temperature: -242°C

U.W. Status: Unexplored

Moons: 0



The farthest of Omicron Eridani's family of worlds bears the name Mordred. The airless world has an unremarkable landscape of rocky wastelands and methane ice expanses. Mordred has no life or liquid water.

V'ren (70 Ophiuchi A)

Spectral Class: K1-Orange

Size: 1.3 solar radii

Surface Temperature: 4,680°C

Distance from Sol: 16.7 light years

Demarcating the edge of United Worlds expansion in its vicinity, 70 Ophiuchi A shares a binary system with 70 Ophiuchi B, also an orange star. The two stars pass from 11.7AU to 35AU apart in their 88 year orbits. Four worlds orbit 70 Ophiuchi A, including D'eir, homeworld of the alien D'eira. World names are those given by the D'eira. The star is called V'ren by the D'eira, and that name has now almost universally replaced 70 Ophiuchi A.

Surveyed by explorers in 2181CE, 70 Ophiuchi A joined the United Worlds in 2186CE as an independent state following extensive diplomatic negotiations. Fairly distant from most federation stars, 70 Ophiuchi A lies as near to Sol and Alpha Centauri as to any other systems. A jumpgate and communications array operate in the binary star system.

D'eir (70 Ophiuchi A I)

Orbit: 0.7AU

World Type: Terrestrial

Equatorial Radius: 4,965km

Gravity: 0.8g

Atmosphere: Normal

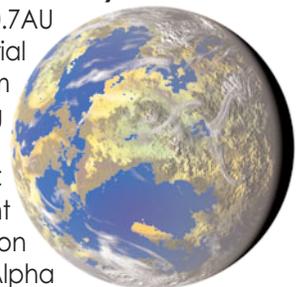
Surface Temperature: 0°C

U.W. Status: Independent

Population: 530 million

Starport: Alpha

Moons: 1



Homeworld of the D'eira, the chill desert world of D'eir joined the United Worlds in 2186CE as an independent state. Now a center of scholarship and philosophy, D'eir also attracts countless tourists intrigued by the alien sophistication of its beautiful cities of glass.

D'eir has a thin atmosphere at 0.6 Earth pressure. The world has a cold, dry climate with temperatures rarely rising above 20°C even at the equator, and plunging below -50°C in polar winter. Saltwater oceans cover just 42% of D'eir, with desolate plains, deserts, and arid mountain ranges comprising most of the landscape. A metal-poor world, D'eir possesses many types of silicates useful in glassmaking. Geothermal activity is very strong, powering numerous hot springs and geysers on the surface.

D'eir has a vibrant biosphere despite the world's seeming desolation. There are many plants and animals, particularly in the river valleys crossing the plains. Most plants have numerous broad leaves to soak up the paltry ultraviolet rays from the dim orange sun, and there are few trees. Predators are few, and none are large enough to threaten the D'eira. Most freshwater lifeforms are amphibious, dwelling near hot springs in colder regions to avoid periodic freezes.

The D'eira dwell chiefly in the river valleys and coastal regions of D'eir. Their amazing cities, built primarily of glass, rise like faerie towers in the planet's low gravity. Expert mathematicians, philosophers, and scientists, the D'eira have a highly cooperative society that had achieved early spaceflight just before contact with humanity.

A United Worlds frigate searching 70 Ophiuchi for the source of odd radio signals detected the launch of a spacecraft from D'eir in 2181CE, and soon a delegation from the federation arrived to open communications. The D'eira accepted the appearance of intelligent aliens with their customary equanimity, and by 2186CE agreed to join the U.W.

A single, sizable moon orbits D'eir, somewhat unusual for a world so close to its primary. Named D'nar, the D'eiran word for half, the moon has no atmosphere and light gravity. Cratered regolith and basaltic maria make up most of its landscape.

P'ril (70 Ophiuchi A II)

Orbit: 1.3AU

World Type: Terrestrial

Equatorial Radius: 3,336km

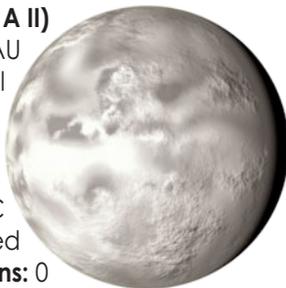
Gravity: <0.1 g

Atmosphere: None

Surface Temperature: -103°C

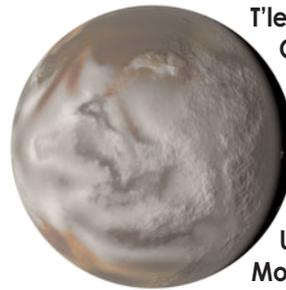
U.W. Status: Explored

Moons: 0



An unremarkable sphere of slush and ice, P'ril orbits outside the habitable zone of its weak orange sun. A low-density mix of ice and rock comprise the airless world, and thick sheets of ice cover the entire surface. Temperatures on P'ril peak at -80°C. Intense radiation bathes the chill surface of P'ril. Explorers from D'eir have visited the frigid world, but found nothing to warrant further study.

Fires of Heaven^{v1.0}



T'lex (70 Ophiuchi A III)

Orbit: 2.1AU

World Type: Terrestrial

Equatorial Radius: 3,808km

Gravity: 0.2g

Atmosphere: None

Surface Temperature: -122°C

U.W. Status: Unexplored

Moons: 0

T'lex, a pale, frozen orb, has virtually no axial tilt and no distinguishable seasons. Another airless slushball of ice mixed with rock, the frigid planet sees temperatures as low as -260°C. A deep coating of ice blankets the entire world. T'lex has been charted from orbit and explored by planetary probes, but no expeditions to the icy surface are contemplated.

M'rol (70 Ophiuchi A IV)

Orbit: 4AU

World Type: Terrestrial

Equatorial Radius: 2,169km

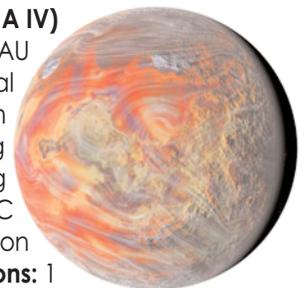
Gravity: 0.3g

Atmosphere: Reducing

Surface Temperature: -167°C

U.W. Status: Active Exploration

Moons: 1



A rocky world wreathed in a vaporous carbon dioxide atmosphere, M'rol has attracted the attention of several mining corporations. A handful of expeditions to the surface have so far failed to turn up resources worth exploiting. M'rol has a tenuous carbon dioxide atmosphere at less than 0.1 Earth pressure. Desolate plains split by high scarps and slabs of dry ice mark the chill surface of M'rol, which possesses no water or native life.

Sigma Draconis

Spectral Class: K0-Orange
Size: 0.65 solar radii
Surface Temperature: 5,100°C
Distance from Sol: 18.5 light years

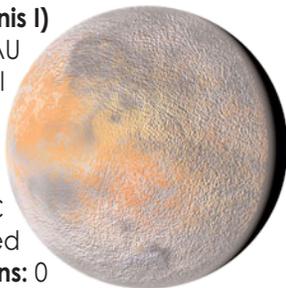
The Sigma Draconis system saw most of the fighting in the Interstellar War. Vorn ships blockaded the system, fighting several engagements with StarForces Navy vessels among the outer planets. In addition, Vorn raiding parties attacked both United Worlds colonies in the system.

In the nine years since the war ended, Sigma Draconis has become a frequent site of Vorn incursions. The StarForces military maintains a strong presence in the system. Private salvage operations targeting the hulks of warships, freighters, and Vorn craft lost during the war or subsequent raids are also numerous, despite the risk of new attacks.

Orbited by 10 planets and an asteroid belt, Sigma Draconis became home to two colonies shortly before the conflict began. The star lies closest to the 61 Cygni binaries, and is also well-placed for trade with the Ethereans of Eta Cassiopeia A. A StarForces Navy jumpgate serves military and government traffic in the system, but no communications array has been constructed.

Chu Jung (Sigma Draconis I)

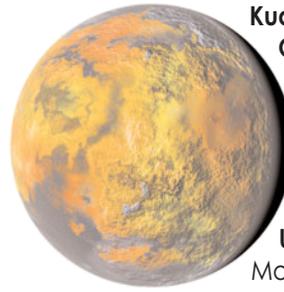
Orbit: 0.33AU
World Type: Terrestrial
Equatorial Radius: 2,448km
Gravity: 0.4g
Atmosphere: None
Surface Temperature: 132°C
U.W. Status: Unexplored
Moons: 0



Heat-scored Chu Jung derives its name from the Chinese fire deity. The airless, cratered flatlands of Chu Jung bake under the relentless rays of Sigma Draconis. Long, high cliffs split the lifeless landscape.

Kuan Ti (Sigma Draconis II)

Orbit: 0.42AU
World Type: Terrestrial
Equatorial Radius: 3,854km
Gravity: 0.6g
Atmosphere: None
Surface Temperature: 87°C
U.W. Status: Unexplored
Moons: 0

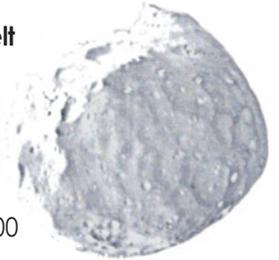


Named for a Chinese war god, desiccated Kuan Ti boasts a profusion of volcanoes spawned by tidal flexing. Some of the fiery peaks rise dozens of kilometers over the bleak plains covering most of the airless planet. Many of the volcanoes are active, periodically belching vast clouds of ash and flows of red-hot lava. No liquid water or native life exists on Kuan Ti.

A federal research grant has allowed scientists on Shen Nung to place a handful of satellites over Kuan Ti to relay observations of the violent world. Manned expeditions to the cooler polar regions are in the very early planning stages, although no funding has been found.

Asteroid Belt

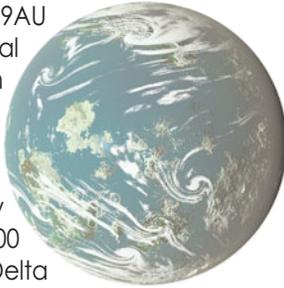
Orbit: 0.57 AU
Orbital Width: 0.05 AU
Asteroid Type: Carbonaceous
U.W. Status: Active
 Exploration
Population: 200



The asteroids ringing Sigma Draconis baffle astronomers due to their proximity to the star, as most asteroids are found in outer orbits, often resulting from the interference of high-gravity gas giants in the accretion of matter during planet formation.

Most asteroids in the belt are fairly small (the largest being 634km in diameter) and are carbonaceous in nature. A handful of prospectors and corporate survey teams are cataloguing the resources of the belt to gauge its mining potential.

Evidence of a lost alien civilization has been found in the belt. Mineralogical surveys of individual asteroids and cosmic dust here have turned up traces of advanced alloys similar to those discovered in Progenitor ruins. Also, some zero-g prospectors have reported finding ruins on some asteroids. There are fragmentary reports of an entire lost city somewhere in the belt, but this potentially astounding discovery has not been confirmed.

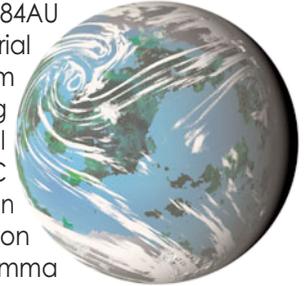
Tin Hau (Sigma Draconis III)**Orbit:** 0.69AU**World Type:** Terrestrial**Equatorial Radius:** 3,836km**Gravity:** 0.6g**Atmosphere:** Normal**Surface Temperature:** 8°C**U.W. Status:** Pioneer Colony**Population:** 920,000**Starport:** Delta**Moons:** 0

Lush, green continents surrounded by vast oceans define the small, watery planet Tin Hau, named for the Chinese goddess of oceans and fresh water.

The atmosphere has a pressure half that of Earth's. Temperatures range from an equatorial high of 32°C to a polar low of -12°C, with very high amounts of precipitation at all times of year. Autumnal monsoons are common. Saltwater oceans cover nearly 80% of Tin Hau. Native plant and animal life thrives on land and sea. The almost-daily rainfall sustains a luxuriant profusion of native vegetation on the handful of continents and scattered islands.

Tin Hau boasts the most extensive network of natural caverns yet found in the United Worlds. High rainfall coupled with vast limestone shelves on several continents has given rise to cave systems that stretch for kilometers. Many are partly or wholly water-filled much of the year, and only a tiny percentage have been explored. Exozoologists are particularly interested in the extensive underground ecosystem in the caverns.

Expeditions from India and Indonesia established pioneer colonies on Tin Hau in 2223CE. While there are indications of fair mineral resources on the world, the fledgling colony has not established much of an industrial base and relies primarily on agriculture for what little trade it has developed. The wet conditions make rice farming especially attractive, and most settlements are surrounded by acres of paddies. Coastal communities are developing a strong fishing industry. The U.W. administrator reports political friction developing between the Indian and Indonesian colonies.

Fires of Heaven^{v1.0}**Shen Nung (Sigma Draconis IV)****Orbit:** 0.84AU**World Type:** Terrestrial**Equatorial Radius:** 6,410km**Gravity:** 1g**Atmosphere:** Normal**Surface Temperature:** 6°C**U.W. Status:** Active Colonization**Population:** 3.2 million**Starport:** Gamma**Moons:** 1

A near-twin of Earth, save for its cooler average temperature, Shen Nung supports a growing agrarian colony. The world takes its name from the Chinese god of agriculture.

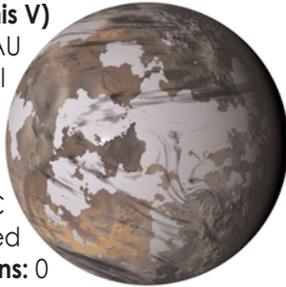
Shen Nung's atmosphere is at Earth-normal pressure. The world has strong seasons, with temperatures soaring to 58°C on the equatorial savannas in summer and plunging as low as -44°C in polar winter. Highly varied terrain covers Shen Nung's five large continents, which are separated by saltwater oceans over 71% of the world. Native vegetation ranges from tall grasses on the veldt to jungles and hardwood forests. Shen Nung also has a prodigious population of native animal life.

A number of native animal species along the equator have evolved an unusual adaptation to the dry, hot summers when food and water are scarce. The approach of summer sets off a frenzy among adult animals, even those normally considered harmless, which kill each other off in a weeks-long bloodbath. Seemingly counter-productive, this evolutionary strategy fosters survival of the young during the hard times ahead by thinning the adult population and returning nutrients to the soil.

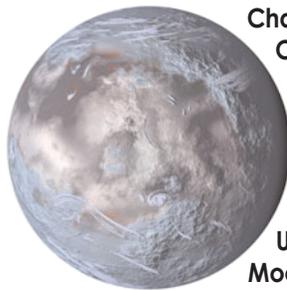
A pan-African expedition colonized Shen Nung in 2219CE. Farming and ranching underpin the economy, but planetary leaders are also working to develop a stronger industrial base. Most settlements are found on the largest continent. Active plans are being laid for expansion to other landforms as new colonists continue to arrive on Shen Nung to seek their fortunes.

A single moon, with a radius of 1,282km, orbits Shen Nung. A dead, airless world covered by regolith and craters, the moon possesses some useful resources but has not been extensively surveyed.

Pao Kung (Sigma Draconis V)
Orbit: 1AU
World Type: Terrestrial
Equatorial Radius: 5,520km
Gravity: 0.9g
Atmosphere: Exotic
Surface Temperature: -78°C
U.W. Status: Unexplored
Moons: 0



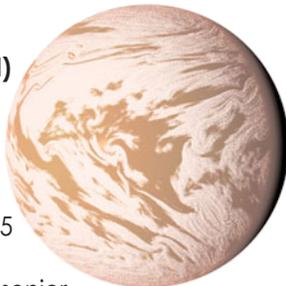
Raw winds sweep across poison seas and bitter icefields on the frigid world of Pao Kung, named for the Chinese god of magistrates. The planet's atmosphere, at 0.5 Earth pressure, consists of noxious nitric oxides. Oceans of nitric acid lap against eroded shores, turning to slush and ice at colder latitudes.



Chang Fei (Sigma Draconis VI)
Orbit: 2.4AU
World Type: Terrestrial
Equatorial Radius: 8,362km
Gravity: 1.3g
Atmosphere: Reducing
Surface Temperature: -120°C
U.W. Status: Unexplored
Moons: 2

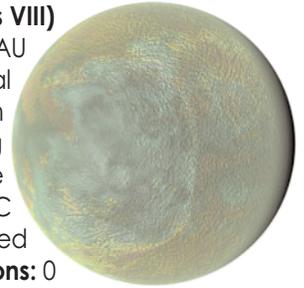
A huge, frozen world of high gravity and intense atmospheric pressure, Chang Fei takes its name from the Chinese war god who rules over winter. A dense methane-hydrogen atmosphere oppresses Chang Fei with a pressure 5.3 times that found on Earth. Temperatures rarely rise higher than -90°C, even at the equator. A shroud of snow and ice covers the entire world, and the lack of liquid water has precluded evolution of native life. Two small, airless moons orbit Chang Fei, the larger scarcely 36km in diameter.

T'ai Shan (Sigma Draconis VII)
Orbit: 3.8AU
World Type: Jovian
Equatorial Radius: 51,742km
U.W. Status: Unexplored
Moons: 25



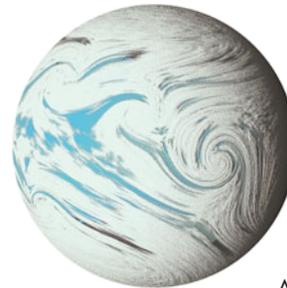
Bearing the name of the senior deity in the heavenly ministries of Chinese myth, T'ai Shan is a gas giant with a superdense atmosphere of hydrogen, methane, and helium wrapped around a rocky core. Six rings and 25 moons orbit T'ai Shan. The jovian giant possesses three sizable moons in tidelocked orbits. One, Huang Ti (named for the Chinese god credited with giving humanity the wheel), has a thin nitrogen atmosphere.

Fu Shen (Sigma Draconis VIII)
Orbit: 6.8AU
World Type: Terrestrial
Equatorial Radius: 3,783km
Gravity: 0.2g
Atmosphere: None
Surface Temperature: -188°C
U.W. Status: Unexplored
Moons: 0



An unremarkable ball of rock, methane ice, and slush, the world of Fu Shen takes its name from a Chinese god of luck. The low-density planet lacks water or an atmosphere. Icy wastes and cratered barrens cover the lifeless surface.

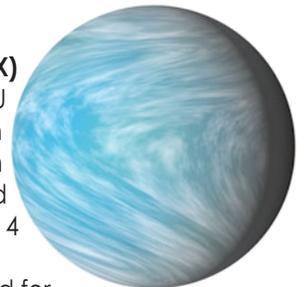
Recovery of a Vorn freighter that crash-landed on Fu Shen during the Interstellar War helped U.W. scientists unlock the secrets of gravitic technology.



Shang Ti (Sigma Draconis IX)
Orbit: 9AU
World Type: Jovian
Equatorial Radius: 81,956km
U.W. Status: Active Exploration
Moons: 24

A jovian world of violent storms and strange secrets, Shang Ti derives its name from a Chinese creation god and supreme deity. Shang Ti, which has a superdense hydrogen-methane atmosphere, is one of the larger gas giants yet discovered. Surveys of Shang Ti have uncovered tantalizing evidence of a metallo-crystalline object more than two kilometers long floating in the upper atmosphere. Many researchers believe it to be a Progenitor ruin kept aloft by some unknown advanced technology. The roiling winds and intense storms of Shang Ti have destroyed numerous robot probes sent to scan the anomaly. Twenty-four moons orbit Shang Ti, primarily low-density, airless chunks of water and ice.

Shou Lao (Sigma Draconis X)
Orbit: 34AU
World Type: Jovian
Equatorial Radius: 18,275km
U.W. Status: Unexplored
Moons: 4

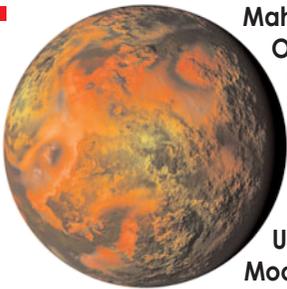


A subjovian world named for the Chinese god of longevity, Shou Lao completes one orbit around Sigma Draconis every 218 Earth years. A placid, blue-green world with a superdense hydrogen-methane-helium atmosphere, Shou Lao has a complex series of very faint rings.

Delta Pavonis**Spectral Class:** G6-Yellow**Size:** 1.07 solar radii**Surface Temperature:** 5,530°C**Distance from Sol:** 18.6 light years

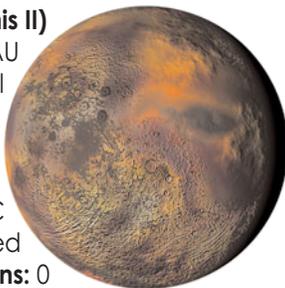
Strikingly similar to Sol, Delta Pavonis is the most recent addition to the United Worlds. The Delta Pavonis system has 11 worlds, including one home to a long-dead alien civilization.

While the U.W. colony in the system produces no surpluses for export, Delta Pavonis is well-placed for eventual trade with Epsilon Indi and several Jodoni star systems. No communications arrays or jumpgates have been built to serve the newly colonized system.

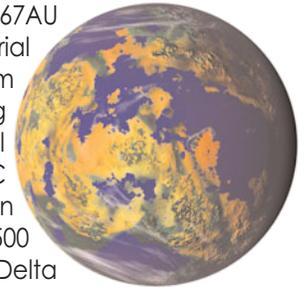
**Mahes (Delta Pavonis I)****Orbit:** 0.36AU**World Type:** Terrestrial**Equatorial Radius:** 2,912km**Gravity:** 0.4g**Atmosphere:** None**Surface Temperature:** 188°C**U.W. Status:** Unexplored**Moons:** 0

An inferno of blazing heat and lethal hard radiation, Mahes takes its name from an Egyptian deity representing the destructive power of the sun's heat.

This rocky world with an iron core possesses no atmosphere or water. Rivers of molten sulfur course through cratered, sun-baked barrens where temperatures soar as high as 227°C. No life exists on Mahes.

Sakhmet (Delta Pavonis II)**Orbit:** 0.48AU**World Type:** Terrestrial**Equatorial Radius:** 4,368km**Gravity:** 0.7g**Atmosphere:** None**Surface Temperature:** 127°C**U.W. Status:** Unexplored**Moons:** 0

Sakhmet, named for an Egyptian war goddess who breathed fire at her enemies, orbits second from Delta Pavonis. An airless, cratered world with temperatures ranging from an equatorial high of 172°C to a polar low of 75°C, Sakhmet has no water or native life.

Fires of Heaven^{v1.0}**Anubis (Delta Pavonis III)****Orbit:** 0.67AU**World Type:** Terrestrial**Equatorial Radius:** 3,317km**Gravity:** 0.5g**Atmosphere:** Normal**Surface Temperature:** 65°C**U.W. Status:** Active Exploration**Population:** 500**Starport:** Delta**Moons:** 1

Sirocco winds howl through the ruined cities of a long-dead alien civilization on the eerie world of Anubis. Ravaged by a millennia-old global thermonuclear war, torrid Anubis remained a place of ghosts until the arrival of United Worlds archaeologists determined to unlock its mysteries. The world takes its name from a funerary god of the ancient Egyptians.

The atmosphere is at a thin 0.5 Earth pressure, while temperatures are extreme, ranging from a blistering 97°C in equatorial summer to a merely uncomfortable 40°C in polar winter. Saltwater oceans cover 60% of Anubis, which has five large continents. Sweltering jungles, parched buttes, and searingly hot grasslands typify the terrain, although Anubis also possesses several vast deserts. Native plant and animal species seem well-adapted to the heat and high solar radiation.

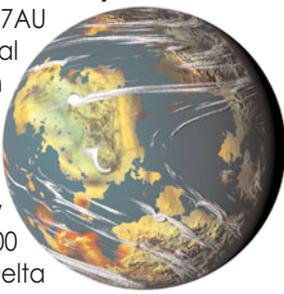
Cities partially melted to slag by atomic fire and then buried under centuries of shifting sands dot the landscape, provide United Worlds archaeologists enough evidence to deduce that the alien civilization that once flourished on Anubis destroyed itself in a worldwide nuclear exchange within a few decades of achieving spaceflight. Mammalian bipeds with a high tolerance for heat and solar radiation, the native inhabitants evidently went extinct not long after the fiery holocaust due to extreme nuclear radiation and global climate changes.

In 2228CE, explorers discovered orbital missile platforms circling in eternal, lonely vigilance above the sepulchral world, their deadly payloads long since expended, a discovery that occasioned the subsurface searches that found the ruins of Anuban civilization. The U.W. declared Anubis a protected archaeological site, and now a few hundred scientists seek to decipher the enigmas hidden in the blasted remnants of a lost civilization.

The handful of long-term expeditions on Anubis are based in the cooler polar regions. Unfortunately, most of the major cities of the lost civilization are located closer to the equator. Several research teams make short-term visits to hostile equatorial sites each winter.

A large, airless moon covered by craters and regolith orbits Anubis. There are indications of at least one visit to the moon (named Jackal after one of the avatars of Anubis) by Anubis' inhabitants prior to their demise.

Osiris (Delta Pavonis IV)
Orbit: 0.97AU
World Type: Terrestrial
Equatorial Radius: 4,585km
Gravity: 0.7 g
Atmosphere: Normal
Surface Temperature: 15°C
U.W. Status: Pioneer Colony
Population: 25,000
Starport: Delta
Moons: 2



A desert world of sandswept ergs and wind-scoured badlands, Osiris is the new home of thousands of pioneer settlers. The world bears the name of an Egyptian god of rebirth.

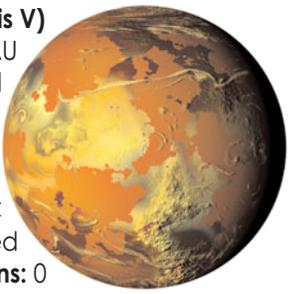
Osiris has a very thin atmosphere at just 0.3 Earth pressure. Temperatures range from an equatorial high of 51°C to a polar low of -21°C. Searing winds and dangerous sandstorms capable of ripping exposed flesh to shreds are common in desert regions. Precipitation, while infrequent, sometimes causes flash flooding. Intensely saline seas cover just 22% of Osiris. Vast sandy deserts, barren wastelands and arid mountain ranges cover the three gigantic continents of the parched world.

Desert plants adept at soaking up and storing water constitute most of the native vegetation, while nocturnal creatures that avoid the heat of day dominate animal life. Sandrats are an especially pesky native lifeform. Colonists and explorers still discover major new species almost daily as they learn more about Osiris.

An expedition made up of Arab and North African people set down on Osiris in 2232CE. The colonists built their main settlement, New Riyadh, at the mouth of an intermittent river on a northern hemisphere coastline. Most settlers are busy growing food to support the pioneer colony, but a few start-up mining operations indicate Osiris may have a bright future as an industrial world. Many buildings are at least partly underground for insulation against the heat of day and fierce desert weather. Islam dominates the religious scene, and Arabic culture is paramount.

Two small, rocky moons orbit Osiris. With radii of just 478km and 514km, the airless worlds appear to have little of mineral value but could become useful orbital stations in the future.

Set (Delta Pavonis V)
Orbit: 1.3AU
World Type: Terrestrial
Equatorial Radius: 2,879km
Gravity: 0.4g
Atmosphere: Exotic
Surface Temperature: -49°C
U.W. Status: Unexplored
Moons: 0



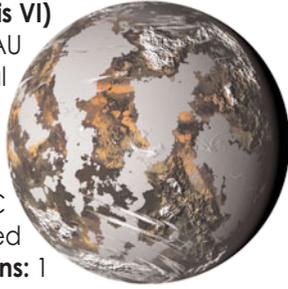
A brimstone world of sulfurous oceans and exotic sulfur-based life, Set takes its name from an Egyptian god of chaos and adversity. Small and cool, Set supports an utterly alien ecosystem.

Set has a vaporous sulfur dioxide atmosphere at less than 0.1 Earth pressure, formed by gases boiled away from the chill sulfur dioxide seas covering 72% of the planet. A few mountainous continents, also heavy in sulfur and sulfide ores, rise from these unusual oceans.

Exploratory probes have discovered microbes and simple plants that store energy by producing sulfur trioxide through a form of photosynthesis. Exobiologists are eager to examine the bizarre lifeforms of Set in greater detail.

Montu (Delta Pavonis VI)

Orbit: 1.4AU
World Type: Terrestrial
Equatorial Radius: 4,261km
Gravity: 0.7g
Atmosphere: Reducing
Surface Temperature: -63°C
U.W. Status: Unexplored
Moons: 1



This planet derives its name from an Egyptian war god. A tenuous carbon dioxide atmosphere, which condenses into dry ice at colder latitudes, clings to Montu at less than 0.1 Earth pressure. Water ice covers more than half the barren, cratered surface. Montu orbits just outside the life zone of its star. The world's single moon, airless, rocky Buchis, is named for a sacred bull associated with the god.



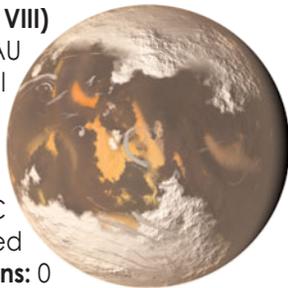
Isis (Delta Pavonis VII)

Orbit: 1.7AU
World Type: Jovian
Equatorial Radius: 20,299km
U.W. Status: Unexplored
Moons: 4

A subjovian world named for the Egyptian goddess of mothers, Isis has a seething, dense atmosphere of hydrogen and helium. Dark rings of carbonaceous particles encircle Isis, which also has four moons. The largest, named Horus for the son of Isis, may possess oceans of liquid water under its thick, permanent sheathing of ice.

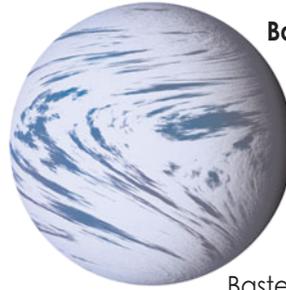
Geb (Delta Pavonis VIII)

Orbit: 2AU
World Type: Terrestrial
Equatorial Radius: 4,501km
Gravity: 0.7g
Atmosphere: Reducing
Surface Temperature: -94°C
U.W. Status: Unexplored
Moons: 0



A world half covered by dry ice that occasionally sublimates to form its vaporous atmosphere, frigid Geb takes its name from an Egyptian earth god. The world has a thin carbon dioxide atmosphere at 0.1 Earth pressure. There is no liquid water or native life on Geb.

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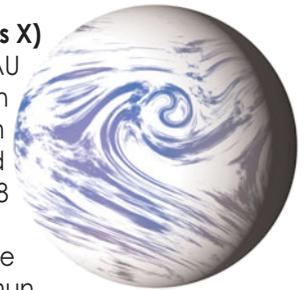
Bastet (Delta Pavonis IX)

Orbit: 3.2AU
World Type: Jovian
Equatorial Radius: 12,560km
U.W. Status: Unexplored
Moons: 5

A placid subjovian world, Bastet is named for the feline Egyptian goddess of vengeance. Clouds of ammonia crystals scud across its superdense hydrogen-helium atmosphere. Three small moons and a series of faint sparkling rings circle Bastet.

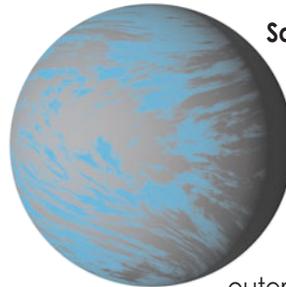
Amun (Delta Pavonis X)

Orbit: 5.6AU
World Type: Jovian
Equatorial Radius: 94,967km
U.W. Status: Unexplored
Moons: 18



Named for the ruler of the Egyptian deities, majestic Amun has a rocky core crushed by the intense pressure of its hydrogen-helium atmosphere.

Eighteen moons orbit Amun, including three sizable worlds with rocky cores. The remaining moons are airless, low-density planetoids of ice mixed with some rock.



Satis (Delta Pavonis XI)

Orbit: 11AU
World Type: Jovian
Equatorial Radius: 17,975km
U.W. Status: Unexplored
Moons: 13

A subjovian world on the outer edge of the Delta Pavonis system, Satis bears the name of a guardian goddess of the ancient Egyptians. Its hydrogen-helium atmosphere surrounds a rocky core at incredible pressure. Satis has 13 moons, all unremarkable.



ALIENS



The raiders were pulling back, and Lieutenant Koirala ordered my squad to pursue. Geary must have thought the Vorn lying in the street was dead - Tex had blown off half its legs with the M-81 during the firefight - and he moved too close, I guess. It lunged and bit off his right arm.

We opened up on it and blew it apart. But Private Hradetsky, our corpsman, couldn't stop the bleeding. Geary died a few minutes later.

The Vorn aren't aliens. They're monsters.

- Lance Cpl. Arihito Takagi, StarForces Marine Corps, 2233CE

▼ **INTRODUCTION** - Humans have encountered five intelligent races in their travels among the stars. Two are now trusted members of the U.W. federation, and formal diplomatic ties exist with two other races. A war with the most recently encountered race, the Vorn, ended inconclusively nine years ago with the inexplicable withdrawal of the formidable alien fleets.

Signs of a long-vanished race, known as the Progenitors, have also been discovered on many worlds. Bizarre crystalline ruins and a handful of inexplicable relics displaying a mastery of science far beyond that of any race yet encountered are all that remain of their race.

Contact with intelligent alien life has sparked sweeping changes to human society. Study of Progenitor artifacts found in orbit around Sol yielded insights that allowed the development of the Rozhkov Drive. Encounters with the Ethereans spread a symbiotic organism that awakened the psionic potential of a minority of humans. And the destructive war with the Vorn fell just short of destroying the United Worlds entirely.

Fires of Heaven^{v1.0}

As well, art, music, poetry, literature, science, trade, religious thought, and countless other fields have benefitted from the new insights and ideas provided by contact with alien civilizations. The societies of alien races have likewise undergone dramatic changes due to contact with humans – for example, the once-primitive Nutoa are now part of a technology-based interstellar civilization.

▼ **Note** - The names of the various races are pronounced as follows:

D'eira: Dee-eye-rah

Jodoni: Joe-dawn-ee

Nutoa: New-toe-ah

Vorn: Vwarn

▼ **ALIEN LIFE** - The alien races encountered by humanity are more alien than had been predicted by the entertainment media of the 20th century.

There are no anthropomorphic Earth animals, although a few races share certain characteristics with terran lifeforms, and there are no aliens with extremely human-like appearances.

The Nutoa, for example, vaguely resemble terran mammals, but have a life cycle involving a metamorphosis from pre-sentient larvae to young adult forms, much like that of some Earthly insects. And Nutoa possess the ability to chemically transmit learned knowledge to their pupae, something not seen in any terran lifeform.

The greatest differences between humans and aliens, however, are not physiological, but psychological.

Each race has its own worldview, behaviors, customs, and beliefs, which often seem bizarre or irrational to a strictly human perspective. To comprehend an alien society requires humans to put aside most of their basic assumptions about the universe and learn to see things from a wholly alien viewpoint.

Jodoni civilization, for example, has almost no unifying factors - no central government, no dominant religion and no single code of law. Instead, the Jodoni Combine contains thousands of independent factions that negotiate endlessly to create the complex web of interdependence necessary to sustain an interstellar civilization. While such an arrangement seems incomprehensible and unworkable to human eyes, it functions quite efficiently for the Jodoni, who consider human notions of central government to be absurdly inflexible.

Even after more than a half-century of contact with some races, humans are still picking up previously unrecognized nuances and insights to alien cultures and thoughts.

Origins - The five alien races contacted by humanity share certain characteristics. All are multicellular, carbon-based oxygen breathers. Most are bipedal in form, and they share generally similar biochemistries, although not to the point of allowing interspecies organ transplants, blood transfusions, or reproduction.

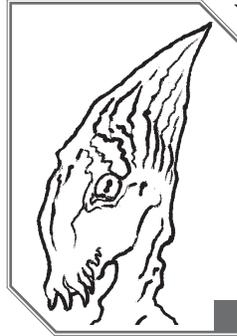
Theories on parallel evolution, life-bearing potential in the cosmic dust from which all planets formed, and space-traveling spores are all hotly contested.

One theory ascribes the rise of all intelligent life to the Progenitors. Adherents to this theory point to the unusually large moons orbiting the homeworlds of each intelligent race. These moons are responsible for the strong tidal forces that create large intertidal zones, encouraging evolution of land-based and, later, intelligent life. Most moons orbiting terrestrial worlds are quite small, giving rise to speculation that the Progenitors may have arranged placement of unusually large moons around promising planets to foster evolution of intelligent life.

Detractors argue there are far more reasonable explanations. Even if one accepts the theory of a lunar role in evolution of intelligence, no outside intervention seems necessary, critics contend. The fact that intelligent life has arisen primarily on worlds with large moons indicates only that large moons may be a vital factor in evolving intelligent life, not evidence of tampering by some long-gone race of ancients. Outside the realm of scientific thought, of course, many religions, both human and alien, have their own explanations for the existence of extra-terrestrial intelligences and their relative similarities.

I express confusion, friend Derek Hightower, at the actions of these pirates. Do they not realize that their ratio of success correlates precisely to the degree to which the federation will pursue them? Or, to express an alternate equation, their adeptness at their trade is inverse to their continued ability to practice it.

- L'Iarc, astrogator, 2237CE



▼ **D'EIRA** - A peaceful race of philosophers, scientists, and expert mathematicians, the vaguely reptilian D'eira are trusted members of the United Worlds federation.

Homeworld - The D'eira are native to D'eir, a low-density silicate planet orbiting first around V'ren, or 70 Ophiuchi A (see [page 3.35](#)).

A cold, arid world with a moderately thin oxygen-nitrogen atmosphere, D'eir has a gravity 0.8 that of Earth. The terrain is varied, although chill deserts and stark landscapes predominate.

Most D'eira dwell in beautiful, faerie-like cities of glass, but numerous space habitats built after contact with the U.W. now orbit the planet.

A cool orange star, V'ren shares a binary relationship with a second orange star and lies nearly 17 light-years from Sol. It is reasonably close to the 61 Cygni binaries, as well as Sol and Alpha Centauri.

D'eira evolved from an amphibian species native to the freshwater rivers and lakes of their world. They are now wholly land-dwellers, however, with only a few vestigial reminders of their water-dwelling ancestry. Intelligence apparently arose from the challenge of transitioning from life in the water to a land-based existence.

Physiology - D'eira are upright bipeds with calcium endoskeletons. They are warm-blooded with a closed, centralized circulatory system. D'eira breathe oxygen into four small lungs. Walking is their primary form of locomotion.

Extremely tall, D'eira tower over humans at a typical height of 228cm with a gangly build that averages 100kg. The D'eiran sternum protrudes visibly from the chest, much like the keelbone of an Earthly bird. D'eira stand on two legs and have two long arms with hands for manipulation. The three-digit D'eiran hands and feet are webbed, a holdover from their amphibious past, and D'eira have opposable thumbs.

A D'eira's head is vertically elongated, with a crest. A mass of short, prehensile tendrils surrounds the mouth for pulling food into the orifice. A nictitating membrane over the bulging eyes serves as a second eyelid, keeping the eyes moist.

Shades of blue or green predominate in D'eiran skin coloration, with markings in black, red, orange, and yellow. The D'eira attach no special significance to skin colors or markings. Chromatophores (skin cells capable of changing pigmentation) are found in a few key spots on the body, most notably the palms. These undergo involuntary color changes in response to strong emotion. Their eyes are brown or amber in color.

D'eira are herbivorous and subsist chiefly on a diet of leafy green vegetables. They are reasonably biocompatible with humans and can eat most Earth plant life, although nutritional supplements are necessary for healthy long-term consumption. D'eira are particularly fond of hot cocoa (to which they usually add a stalk of celery) and other chocolates. They shun alcohol, which is mildly poisonous (but not intoxicating) to the D'eira metabolism.

D'eiran eyes are located on either side of their heads, but bulge slightly from their sockets to give D'eira passable binocular vision straight ahead. D'eira are also capable of looking in two directions at once, like Earth birds and some reptiles. They have acute color vision, enabling them to distinguish shades and hues much better than humans, but otherwise see roughly the same visual spectra as humans. Ears, found below the eyes near the base of the skull, provide D'eira with keen hearing.

D'eira are comfortable in temperatures ranging from -5°C to 20°C . They are accustomed to 0.8g and a thinner atmosphere than humans, at 0.6 Earth pressure, but breathe easily at pressures 0.4 to 0.8 Earth-normal. Evolved on a world orbiting close to its star, D'eira are accustomed to high levels of background radiation, although concentrated doses are still injurious.

Life Cycle - The D'eira have a single gender and reproduce asexually through parthenogenesis, or spontaneous gestation of an unfertilized egg - essentially, natural self-cloning. Gestation lasts approximately 10 e-months, after which the D'eira gives birth to a single infant. D'eira young are not exact duplicates of their parents. Markings, for example, are unique to each D'eira. Also, while a D'eira inherits the genetic makeup of its parent (modified by occasional natural mutations), environment and life choices are the decisive factors in how that potential is expressed.

Fires of Heaven^{v1.0}

The parent cares for and raises the child, which reaches adulthood in approximately 20 e-years. D'eira have a natural lifespan approaching 180 e-years. By both physiology and inclination, D'eira birthrates are very low, just barely enough to sustain the race. Each D'eira reproduces once, or perhaps twice, in its lifetime.

Psychology - The D'eiran mindset reflects a deep need to comprehend; not simple curiosity, but a subconscious drive for intellectual insight into the workings of reality.

The human quip that D'eira have no religion save mathematics hits closer to the mark than most realize. D'eira view mathematics as a way to help define or quantify the cosmos - a language to express reality. Mathematical concepts and constructs can be used to reveal the very structure of the universe. The D'eira seek solutions to the same mysteries of life that stir some humans to seek answers in religious faith, and for this reason D'eira strive to perfect their mathematical skills throughout their lives. D'eira approach any calculation, even the most trivial, with a near-reverential gravity and respect.

D'eira have an extremely cooperative, non-competitive outlook. Given their physiology, diet, and low birth rates, D'eira lack many of the traditional stressors that drive other races to compete for mates, food, or living space. A D'eira seeks harmony with others, and this perspective permeates the D'eiran worldview. Disagreements are seen as an opportunity for both disputants to reconcile differing views of reality, not as a chance for one viewpoint to be proven superior to another.

In fact, most D'eira can best be described as pacifists; not only shunning violence, but lacking even a firm grasp of the basic concepts of strife and conflict. D'eira who spend time around other races can reach an intellectual, if not emotional or instinctive, understanding of the root causes of discord. Even so, conflict and competition remain alien concepts to D'eira.

D'eira are reserved by nature, which others sometimes take as aloofness or indifference. They aren't prone to rash behavior and lose respect for those who act impetuously. D'eira admire precision and are very deep thinkers who are less driven by emotion than other races.

They do care emotionally for their offspring, in a detached way unreadable to most humans. D'eira have no sense of love for a partner; while they can forge strong intellectual friendships with other D'eira or individuals of other races, they do not form romantic relationships.

Surprises, particularly outbreaks of sudden violence, often confuse D'eira. Their tendency to try to analyze a predicament rather than take immediate action can make D'eira slow to react to emergencies, but once they do act D'eira often have a much better grasp of the overall situation than their more hasty comrades.

Society - D'eira view family as an unbroken line extending from parent to offspring down through the years. A D'eiran family line goes from parent to first-born offspring. Once they reach adulthood, later-born offspring start new family lines, usually allied with the parental line.

The D'eira have a caste-based society founded on ages-old family lines. Each family line belongs to one of a dozen or so broadly defined castes, and young D'eira pursue careers affiliated with their caste. The professional, labor, crafts, farming, and intellectual castes are among those associated with the largest numbers of family lines. This creates an orderly, logical society in which all needs are met without rancor or competition.

While a human might chafe at being denied a choice of careers, the arrangement makes perfect sense to the D'eira. Also, unlike caste-based human societies, the cooperative perspective of the D'eira prevents some castes or family lines being viewed as inferior to others. All work together in harmony, recognizing and valuing the contributions of each family line.

Councils, with members elected from amongst the oldest and most-respected family lines of the leadership caste, are the decision-making bodies of government on D'eir. Civil service posts are, naturally, filled by family lines associated with bureaucratic tasks. The highly cooperative perspective of the D'eira makes governance a fairly simple, non-divisive task.

The D'eira have no analogues to Earthly religions based on a deity or deities, but many D'eira follow philosophical beliefs, some quite ancient and well-respected. While their precepts vary, all are in keeping with basic D'eiran values of pacifism, cooperation, and equality. D'eira are also intrigued by some Earthly religions, particularly Buddhism and Confucianism.

The D'eira favor large, loose-fitting, flowing garments somewhat resembling human robes or kimonos. Shades of blue, green, and purple are most popular, and simple patterns are sometimes screened on clothing. D'eira also wear some jewelry. The wearing of gloves by a D'eira would be considered odd or even offensive, as it would imply a desire to conceal the emotion-revealing colors of the palm, an attempt at deceit or stifling of full communication.

D'eiran artwork displays their fascination with mathematics, often taking the form of geometric shapes created in glass to reflect a particular concept or theorem. Likewise, D'eiran music tends to express mathematical relationships in its rhythms and melodies. The D'eira do not sing; their music is all instrumental.

The D'eira have two languages. The most common, D'eiran, is used for everyday life. N'hren, a variant with a customized vocabulary and syntax, is used for discussions (spoken and written) of higher mathematics. D'eira can learn and speak Anglic, although their pronunciation is muffled due to their mouth tendrils.

Skin coloration changes in the chromatophore-laden palms are used to convey emotional undertones, which aren't reflected in speech or body language. As a result, other races often mistakenly believe D'eira do not feel or express strong emotions. These emotion-based color changes are consistent among D'eira - a particular color always reflects a certain emotion regardless of the speaker.

D'eira have a single given name, which always starts with a stuttered consonant. Names within the same family line start with the same consonant, so C'cral might name its child C'cern, for example. D'eira have no surnames - the full name of each D'eira is a recitation of its family line back to its founding. This recitation (which can take several hours for a venerable line) is only used on very formal occasions.

Science and Technology - At the time of contact with the United Worlds federation, the D'eira had achieved spaceflight using solar-sail craft launched by chemical rockets. The limited mineral resources of D'eir precluded widespread industry as known to humanity, but the D'eira had a solid industrial base employing advanced ceramics in roles humans might employ metals. The D'eira relied heavily on geothermal and solar power before contact with humanity.

D'eir now has a highly respected place in the federation as a center of scholarship and science. There are many D'eira scientists of renown, and D'eira professors teach science, higher mathematics, or other subjects at universities throughout the U.W. In addition, D'eira are avidly sought as astrogators for interstellar starships.

The D'eira are extremely proficient at all types of mathematics. Any adult D'eira could teach college-level math courses on Earth and can convert from its native base-6 to human base-10 math with ease; members of the mathematician caste deal in concepts that are beyond the comprehension of more than a handful of humans.

D'eira are unparalleled craftsmen with glass, using it to construct their beautiful cities. Soaring towers and spires glitter in the light of the desert sun over D'eir, employing clever mixes of clear, colored, and frosted glass to preserve privacy where necessary.

Diplomatic Relations - Peaceful and cooperative, D'eira are open to learning more about other races. D'eir joined the U.W. in 2186CE, just a few years after humans established contact.

The D'eira quickly adapted to life in a wider interstellar civilization. Their insights into mathematics outstripped human scholarship at the time, earning the D'eira a measure of respect. For their part, the D'eira eagerly embraced the field of interstellar astrogation, newly opened to them through contact with the federation.

In the 23rd century, many D'eira have left their homeworld for space or other worlds. They are best known in the federation as scientists, teachers, mathematicians, and astrogators, but D'eira may be found in almost any role.

Some D'eira are troubled by humanity's propensity for violence, but most consider humans worthy friends to their race. Humans tend to see D'eira as brilliant but distant and difficult to get to know.

Fires of Heaven^{v1.0}

We do not know the future. We know all futures.
- *Etherean Ambassador to the U.W., 2200CE*



▼ **ETHEREANS** - An ancient, tired race of psions, mostly disinterested in the petty concerns of younger races, the insular Ethereans are a highly advanced civilization that is vaguely congenial to humanity. Their phantasmal beauty inspired the human name for the aquatic aliens, whose true race name can only be spoken telepathically.

Homeworld - The Ethereans dwell beneath the world-encompassing ocean of Etherea, a large, 1.3g planet orbiting Eta Cassiopeia A. Warm, yellow Eta Cassiopeia A, part of a binary system with a red star, lies 19.2ly from **Sol**, close to the **61 Cygni** binaries and **Sigma Draconis**.

The Ethereans evolved from a manta-like species of filter feeders deep beneath the oceans of Etherea. Intelligence arose due to the challenge of escaping the numerous, sizable predators found in the worldsea. All Ethereans carry a symbiotic spore native to Etherea, which awakens their powerful psionic potential. Indeed, all life on Etherea carries this spore, giving Ethereans a perpetual psionic rapport with the life-filled oceans around them. This indescribably beautiful voice of the planet is known as the Worldsong, and many human psions travel to Etherea to experience it.

Physiology - Ethereans have endoskeletons of cartilage. They are warm-blooded, with closed, centralized circulatory systems. They breathe oxygen dissolved in water through gills into a single lung. Swimming and psychokinetic flight are their primary forms of locomotion.

Physically weak, Ethereans average 170cm in length and weigh 60kg on average. Two arms support wings used to glide through the waters of their homeworld. A long tail helps Ethereans change direction while swimming. Hands with three long, skinny digits, including an opposable thumb, are found at the end of each wing-arm.

Ethereans have translucent skin, through which their muscles, cartilage, and internal organs are vaguely visible. Bioluminescence creates natural light in shades of green, blue, violet, gold, and occasionally other hues beneath their shimmering skin. Their eyes are black, with no iris.

The Ethereans have a single, hermaphroditic gender and reproduce sexually. Matings occur between two individuals, either or both of whom may be impregnated. Young are born live and gradually mature to adulthood.

Herbivorous filter feeders, Ethereans feed on a tiny, plant-like organism similar to Earthly plankton. Their cilia-filled mouths entrap these organisms as the Ethereans swim. They eat constantly, paying it no more mind than a human does breathing. Ethereans can go several days without eating if they must travel outside their home waters, but must eventually return to the ocean to feed.

All Ethereans possess incredibly strong psi powers, including telepathy, psychokinesis, and a worldwide mind link with all other Ethereans, known as the Unity. Etherean psi powers do not vary from individual to individual as do human psionics. A microscopic organism native to Etherea has evolved a symbiotic relationship with Ethereans and other life on the watery world. This spore awakens the psionic potential of the host's mind and is responsible for the amazing psi powers of the Ethereans.

Eyes found on either side of the head provide Ethereans with reasonable vision. Their eyesight extends into the ultraviolet but is red-deficient, having evolved deep in oceans where sunlight rarely penetrates. Ethereans have good hearing underwater, but this sense degrades in air. However, a psi power enables Ethereans to sense other minds around them, and their telepathic powers more than make up for the inability to hear spoken words. Ethereans are mute, again relying on telepathy for communication. Their sense of taste, the equivalent of a human's sense of smell, relies chiefly on water as a medium and does not function well in air.

When visiting air-filled spaces, Ethereans prefer to float in mid-air in a sphere of water suspended by psychokinesis - some have described them as resembling bioluminescent butterflies. If necessary, an Etherean can survive wholly outside water for a time, using psychokinesis for locomotion and psychokinetic manipulation on a cellular level to breathe air. Their starships and off-homeworld quarters are water-filled, allowing them to relax and rest. They prefer a water temperature near 20°C, though they can survive in almost any temperature water. Out of water, they can be comfortable in temperatures ranging from 0°C to 40°C. They generally counter atmospheric pressure and gravity effects with their psi powers.

Life Cycle - Ethereans reproduce sexually. Two fertile Ethereans mate, impregnating either or both of the single-gender, hermaphroditic partners with one or two children. Gestation lasts approximately six e-months.

Young are born live as small, physically immature Ethereans. They grow to adult size over the course of roughly 15 e-years, but mature mentally much faster due to the all-pervading influence of the Unity.

The frequency of Etherean matings has been declining, and very few young Ethereans have been noted in recent times. Human exobiologists are uncertain as to the reason for this declining birth rate, and the Ethereans volunteer no clues.

Ethereans have achieved functional immortality by using psychokinetic manipulation to halt aging at a cellular level. Accident or injury can still kill an Etherean, of course, and infrequently one chooses to die of natural causes when they tire of life.

Psychology - The tremendous psi powers of the Ethereans deeply affect their psychology and outlook. Bonded by the Unity, Ethereans conform to neither a collective nor an individualistic viewpoint but a blend of both perspectives.

While they are not a hive mind, Ethereans do possess a sense of self different from that of humans. They regard themselves as distinct entities who come together to form a whole in the Unity. Anglic pronouns are a source of enormous confusion to Ethereans, who use "I" and "we" interchangeably.

Nonetheless, individual Ethereans are quite uncomfortable outside the Unity and are disinclined to leave it for all but the most pressing of causes. For this reason, the Ethereans have not settled other worlds, nor do they often travel. Those who wish to trade or converse with the Ethereans must come to them.

In addition to the Unity, Ethereans experience a constant psionic rapport with all life on Etherea - a primal communion known as the Worldsong. This further disinclines them to leave their cherished homeworld.

The Etherean view of time is likewise inextricably intertwined with their prescient psi powers. As best human exosociologists can decipher, where humans envision a uniform, linear progression of time, Ethereans look ahead to infinitely branching possible futures.

These probabilities seem to drive Etherean actions and decisions. For example, an Etherean may refuse a seemingly simple request due to the probability of later harm, or undertake a seemingly foolhardy course of action that precognition has revealed as having a high probability of yielding favorable results. Since almost any action embodies at least some likelihood of an undesirable outcome, Ethereans often choose to do nothing.

A reticence, disinterest, or inability to explain the reasoning behind such decisions renders Etherean thought processes baffling to other races.

Society - The psi powers of the Ethereans have radically shaped their society, much as it has their psychology. The psychic bond of the Unity perpetually links all Ethereans, eliminating the need for governments or leaders. Decisions affecting the whole are debated and decided by all Ethereans who choose to take part - a psionic form of pure democracy.

Likewise, Ethereans feel no specific bond with their mates or offspring, since all Ethereans are more closely bound by the Unity than even the closest couples or families of other races. In fact, Ethereans feel no need for physical proximity to others of their race at all.

Their physiology requires Ethereans to swim constantly in order to feed, precluding them from ever settling down in one place. While they could probably devise some form of aquaculture, the Ethereans apparently choose not to do so.

As a result, Ethereans have no cities, homes, or gathering places. Each glides through the worldsea alone in a physical sense, yet constantly surrounded by fellow Ethereans via the power of the Unity.

A fundamentally incurious race, Ethereans are content to spend most of their time pursuing individual interests (such as art, music, philosophy, or scientific thought) and sharing their ideas with other Ethereans.

Ethereans wear no clothing or decoration.

Fires of Heaven^{v1.0}

Incapable of speaking, Ethereans rely on telepathy, which functions at a deeper level than speech, to communicate. It could be argued that Ethereans have no language beyond pure thought.

Ethereans do not seem to have individual names among themselves, although at times some apparently adopt names when dealing with other races in an attempt to ease communication and understanding. This occasionally leads to confusion, however, because different Ethereans often identify themselves by the same name. Adopted names vary in convention. Some Ethereans prefer melodic names, while others adopt the name of an important personage from the history or culture of their audience. Still others string together several words that express concepts reflecting the Etherean's current role.

Science and Technology - The Ethereans possess almost no technology, relying instead on their vast psionic powers to provide for their physical needs.

When they must travel beyond Etherea, the Ethereans use living ships, apparently creatures native to space. These lifeforms share a psychic bond with the Ethereans and are capable of crossing interstellar distances via some unknown psionic talent. This power seems to be unique to the species. The physiology, origin, training, and other details pertaining to these creatures are a complete mystery to human scientists. Since the creatures have never been encountered "in the wild" (that is, without Ethereans aboard or nearby), it is suspected that the original stock they came from has since migrated to some part of the galaxy outside the radius of human exploration. The Ethereans have not allowed a detailed study of their ship-creatures, nor offered any information on their unique talents.

Conditions changed have. Agreement and reality accord not. Adjustment requires.

- Ne'che'te're, free trader, 2237CE

Diplomatic Relations - The Ethereans seem friendly toward the United Worlds and other non-hostile civilizations, but they are disinclined to offer much direct assistance to other races.

Initial human exploration of the Eta Cassiopeia A system in the 2150's failed to detect the Ethereans, but a follow-up expedition encountered the ageless psions in 2172CE. The telepathic powers of the Ethereans eliminated obstacles to understanding, and the United Worlds quickly established friendly relations with the Ethereans. Within a few years, it was discovered that some humans now harbored the spore responsible for awakening psionic powers. This briefly created tension between humans and the Ethereans, who had never thought to warn the United Worlds of this potential outcome of contact.

Since the Ethereans possess no real technology and produce little beyond occasional works of art, trade between the civilizations consists chiefly of ideas rather than goods. This gives the gamemaster all kinds of possibilities. Since the Ethereans neither have nor need currency or material possessions, all commerce with them is barter for ideas or services, and since Ethereans are telepathic *and* can see the future, getting the best of them in a negotiation is *highly unlikely*.

Scientists, diplomats, philosophers, psions, and others are always welcome on Etherea, their access restricted more by federation policies intended to avoid annoying the Ethereans than by the aliens themselves. Very few Ethereans visit U.W. worlds, however, save for the Etherean ambassador to the federation government on Earth.

Many regard Etherean psionics with awe but consider the Ethereans a tired, dying race, given their predilection for introspection and disinterest in outside affairs.

Some Ethereans have vaguely hinted at a long-ago encounter with the Vorn. Some exohistorians believe that several Vorn warships once entered the Eta Cassiopeia binary system, but were somehow persuaded or forced to leave. If true, this could indicate the existence of collective psi powers even more sweeping than those exhibited by individual Ethereans.



▼ **JODONI** - A delicate race of canny negotiators, the Jodoni hail from a society consisting of countless independent factions that has nonetheless spread its power across five star systems. While some Jodoni factions are hostile to the United Worlds, others are willing to enter into trade and diplomacy with the federation.

Homeworld - Jodoni are native to Jodonn, a low-gravity world orbiting Aen, a yellow star known to humans as Alpha Mensae. The closest human-occupied system to Aen is **Epsilon Indi**. A world rich in natural resources, Jodonn possesses a thin nitrogen-oxygen atmosphere. Harsh terrain, including impassable mountains, vast deserts, and wide oceans, separates the numerous fertile regions of Jodonn and may partially account for the factionalized nature of Jodoni society. U.W. ships have been prohibited entry to the Jodoni home system, so there are no official surveys of it, only information that the Jodoni have chosen to release.

Beautiful but fragile gossamer cities cover the Jodoni homeworld, which is ringed by orbital factories, defense platforms, and space habitats.

Aen lies roughly 30 light-years from Sol. The Jodoni have also colonized four star systems, identified by humans as Beta Hydri, Gamma Pavonis, LFT 1747, and Zeta Tucanae. All are orange, yellow, or white stars. The nearest of these to United Worlds space, Beta Hydri, lies some 8 light years from Delta Pavonis and 11 light years from Epsilon Indi. These stars are known collectively as the Jodoni Combine.

Physiology - A light exoskeleton of a chitin-like substance supports their bodies on Jodonn, although Jodoni require supportive environment suits in higher gravities. Jodoni are warm-blooded, with an open, centralized circulatory system in which blood is pumped through their three lungs into large cavities for absorption of oxygen by surrounding tissues. Walking is their primary form of locomotion.

Radical sexual dimorphism creates extreme physical differences in the two Jodoni genders.

Male Jodoni are upright bipeds, averaging 152 cm in height with light builds (typically massing no more than 50 kg). Jodoni stand on two multi-jointed legs and have two arms with hands for manipulation. Tendons on the joints are found *outside* the exoskeleton. Hands and feet have four digits each. Each hand has two opposable thumbs. Toes are covered by thick nails, with three on the end of the foot and a fourth hoof-like toe descending from the heel. The Jodoni head is somewhat wedge-shaped, with large eyes and two antennae. Their mouth is used only for eating, with air intake through two slit nostrils. Soft, fuzzy fur is found under the chin and along the jawline. Their exoskeleton provides useful protection, but Jodoni are fairly frail underneath it.

The physical mannerisms of male Jodoni appear abrupt and twitchy to human eyes. They seem to be in a constant state of agitation, although this nervous energy is normal for Jodoni and doesn't reflect inner distress.

Female Jodoni are quadrupeds, with a body structure resembling legendary centaurs. Their torso, head, and arms are physically much like a male Jodoni, but are attached to a long, quadrupedal body with spinneret organs (capable of producing gossamer webs) near the rear end. Females are larger than male Jodoni, averaging 150cm in height, 167cm in length, and 120kg in mass. Most physical details, such as hands and feet, are similar to those of male Jodoni, but females possess a third, long, antenna that droops over the back of the head for rearward sensory detection.

Jodoni genders are also radically imbalanced in terms of population; males outnumber females by a 5:1 ratio, according to most United Worlds estimates.

Jodoni exoskeletons have a smooth, molded texture, and are colored in shades of brown and mustard yellow, the coloration varying only slightly among individuals.

Fires of Heaven^{v1.0}

The omnivorous Jodoni favor a diet consisting chiefly of grains, fruits, vegetables, and some meat. Most Jodoni foods are cooked to what humans would consider a tasteless mush, but dietary practices vary among Jodoni demesnes as much as any other cultural cue. Jodoni are somewhat biocompatible with humans, and can eat some Earthly foods. They tend to like coffee, and enjoy experimenting with different flavors. Caffeine has a strong and unusual effect on the Jodoni metabolism, however, acting almost as a narcotic. Jodoni who are not careful to moderate their intake become drowsy and may even pass out.

Jodoni eyes are green with gold flecks. They have pupils and irises, and Jodoni see essentially the same visual spectra as do humans, although their eyesight is weak. Their antennae appendages are extremely sensitive smell receptors capable of detecting pheromones, enabling Jodoni to "taste" the emotions of those around them. Jodoni hearing is also acute, given the thin atmosphere of their homeworld, but extremely loud noises can be painful to them.

Jodoni are most comfortable in temperatures from 5°C to 45°C, but are very adaptable to temperature variations. They are accustomed to gravity of .5 g or less, and must wear supportive e-suits in gravities higher than .8 g. Jodoni breathe easily in pressures ranging from .3 to .7 Earth-normal.

Life Cycle - Jodoni reproduce sexually. Male and female Jodoni mate, after which the female spins a gossamer egg sac containing a score or more fertilized eggs. The eggs hatch immature Jodoni after approximately 16 e-weeks, during which the female tends the sac.

Jodoni attain sexual maturity in about 10 e-years. The young undergo several molts as they mature, periodically shedding their exoskeletons to allow physical growth. The soft under-exoskeleton hardens a few hours after molting. Male Jodoni continue to molt and grow throughout their lifetime, the pace slowing after they reach sexual maturity.

A mature female Jodoni can reproduce several times in her life, but male Jodoni die within a few days of mating. Both sexes molt during mating, but massive hormonal changes prevent the male from forming a new exoskeleton. This is known as the deathmolt. Male Jodoni have a relatively short natural lifespan of about 20 e-years, which may be shortened by mating, while female Jodoni may live 80 e-years or more.

Psychology - The sexual dimorphism exhibited in Jodoni physiology carries over to their psychology. Male Jodoni are dynamic, energetic achievers, with a short-term perspective oriented to trade, negotiation, exploration, and expansion. Female Jodoni tend to be reclusive, deliberate thinkers, absorbed by philosophy, art, creativity, and deep reflection.

Change and mutability are central to the Jodoni perspective on life. They revel in the inherent chaos of the universe rather than creating artificial structures of government or religion to contain it.

Negotiating comes as naturally as breathing to all Jodoni. In the Jodoni worldview, entropy demands flexibility and constant adaptation to fit changing circumstances. The human notion of a binding contract seems nonsensical to the Jodoni. When they use them at all, Jodoni draft contracts that cover only immediacies, and which become void as conditions change, rather than trying to craft ironclad, durable documents.

Jodoni find security in adaptability, opportunity in uncertainty, riding the endlessly shifting tides of chance at work in the universe much as human surfers negotiate ocean waves.

The Jodoni regard everything, even victory or defeat, as fleeting. They are neither as joyful nor as dismayed as humans by a reversal of fortune - circumstances will certainly change again before long.

Jodoni trust entropy, and more importantly, their own preparedness to take advantage of it, to fulfill their needs and desires.

Society - The Jodoni Combine consists of a multitude of interdependent yet autonomous socio-political-economic factions known to humans as *demesnes* (pronounced "de-mains").

Each demesne consists of up to several dozen Jodoni (and in a few cases, even humans), who can freely depart or join as they wish. A Jodoni can only belong to one demesne at a time, however. No matter its size, each demesne seems to contain one or more female Jodoni. A demesne typically has a purpose or belief that binds it together, such as a particular business enterprise or field of thought.

A demesne may be a factory, a starship, a church, or the physics department of a university. Particularly large ventures, such as a manufacturing center or starbase, may consist of several demesnes working together under a joint accord.

Individual Jodoni lead some demesnes, while others make all decisions collectively. The practices and organization of demesnes seem nearly infinite in their diversity. In many cases, they are still not clearly understood by United Worlds exosociologists. No demesne has authority over any other, unless a demesne voluntarily places itself under the authority of another as part of some bargain. The Jodoni Combine lacks a central government of any kind, but some demesnes are more powerful than others, owing to their innate size or their ability to gain the allegiance of lesser demesnes.

Negotiation lies at the heart of Jodoni society, knitting demesnes together in a complex web of agreements, trade accords, defense treaties, and other pacts. This enables the Jodoni to support an advanced interstellar civilization in spite of what other races view as a hopelessly splintered society.

The Jodoni do not make war to destroy their enemies; once a demesne has gained a clear combat advantage, the two warring factions typically negotiate realignments in status based on their new circumstances. Demenses tend to splinter once they reach a certain size, so a very successful demense does not become unstoppable large. Military forces, like all facets of Jodoni society, are independent agents who negotiate with other demesnes to provide protection or armed might in exchange for supplies or other considerations.

The cultural diversity of the United Worlds pales in comparison to that of the Jodoni. While the Jodoni Combine includes no alien races, its hundreds of thousands of demesnes present a staggering array of political concepts, economic theories, religious beliefs, customs, foods, and other cultural cues.

Jodoni society has no pair-bonding or marriage analogues. Female Jodoni care for their young in communal nurseries within each demesne.

Gender roles among the Jodoni are a source of controversy to United Worlds exosociologists. Very few humans have ever been permitted to meet female Jodoni, initially leading to speculation of discrimination. Some exosociologists now contend Jodoni society is matriarchal in nature, with the dynamic males merely carrying out policies set by deep-thinking females who are revered and protected.

Male Jodoni tend to wear functional but basic clothing, with little regard to fashion. As befits short-term thinkers, they focus on garments that protect from the environment, and sometimes wear ornaments or badges to denote function or position. A typical male Jodoni wears a belted loinplate, so that organs can be protected and pocket pouches can be hung. A full body wrap, a helmet, or other necessary clothing may be worn depending on territory and function. Female Jodoni tend to dress more ornamentally, and even impractically. Fashion sense (which varies even more than among other races) is a highly prized trait among females, and can be used in negotiations just like any other asset. Popular clothing styles among females run from thin gossamer wraps with long trailing tendrils to sturdy leather-like studded straps that partially cover the body at odd angles.

Jodoni artistic styles vary from demesne to demesne, although most works appear extremely chaotic to human eyes. But the strangest part, to humans, is that art is a living, ongoing process. Jodoni art museums, such as they are, are completely hands-on experiences. Works of art do not stagnate behind glass, but are added to by the viewers.

Jodoni music also evolves with the audience. Many songs are of the sing-along variety, with each audience inventing its own harmonies, and modifying the words as they go. The closest human equivalent might be open-microphone jazz night, or interactive improv theater. There is very little recorded Jodoni music - at least very little listened to by Jodoni. The act of trapping a living sound seems as silly to them as binding contracts. The entire purpose of the art is for it to adapt to its participants and for the participants to adapt to it.

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The Jodoni have a common root language, but individual demesnes often have their own dialects. They also possess a written language of pictograms, and can learn to speak Anglic as well as many other human languages with a few pronunciation changes to accommodate physiological differences. In Jodoni, the verb-equivalent comes at the end of the sentence. Also, few articles or pronouns are used.

EXAMPLE: A Jodoni speaking "Why for run?" could be asking "Why did you run?", "Why are they running?" or "Why should we run?", the actual meaning depending on the context of the situation it was spoken in.

A Jodoni has a single, multi-syllabic name that changes throughout his lifetime. Jodoni add new syllables to their names to commemorate life-changing events, great achievements, honors, losses, or other milestones. Sometimes Jodoni choose to shorten their names by removing syllables - for example, a Jodoni who leaves one demesne for another may eliminate from his name syllables tied to his prior affiliation. Most Jodoni choose syllables with the same vowel for their names. A deceased Jodoni may have a special last syllable added to their name in conversation or recorded media to signify the manner of their passing, such as mating, in battle, old age, etc. Adding a syllable to *someone else's* name in conversation can either be a complement or an insult, depending on the meaning of the syllable and the context it is used in.

Science and Technology - Jodoni science and technology are roughly equivalent to those of the United Worlds. Jodoni starships possess interstellar jump capability, although the technology's origin remains cloudy. There are hints that Progenitor ruins exist in some Jodoni Combine systems, giving rise to speculation that Jodoni scientists may have also deduced the principles of jump drives from Progenitor relics.

Because one can't bargain with a machine, the Jodoni favor durable technology with backup systems or redundancy; equipment failures or damage can easily force a demesne to negotiate at a disadvantage. Starships typically have two maneuvering engines and multiple weapons, and while they cannot mount two jump drives, they can travel in pairs or carry lots of spare parts. "One" is never a fortuitous number for a Jodoni, and they have a near-superstitious preference for even numbers over odd numbers.

The Captain wants more speed. I guess we could start shoveling coal into the fusion drive.
- Mirgo, starship engineer, 2236CE

Diplomatic Relations - First contact between the United Worlds and the Jodoni Combine took place in 2218CE when a Jodoni scout craft jumped into the Epsilon Indi system. Federation officials there established friendly relations with the Jodoni crew. In time, U.W. diplomats made contact with other Jodoni demesnes as both civilizations learned more about one another.

The fractious nature of the Jodoni Combine makes diplomacy incredibly complicated, since treaties with one demesne are not binding on any others, unless a coalition of demesnes agrees (often temporarily) to abide by the terms of a particular accord. Nonetheless, ties between the United Worlds and Jodoni Combine continue to expand. Most Jodoni demesnes are eager for trade with federation worlds.

While many Jodoni demesnes are friendly, or at least neutral, to the United Worlds, a few are openly hostile. These factions sometimes carry out attacks on federation shipping or other targets. Authorities classify them as a low-level threat, on par with internal terrorism or piracy. The Ministry of Intelligence and StarForces intelligence services keep a close eye on the activities of hostile demesnes (a category whose numbers are constantly changing), and the border of Jodoni Combine space has become a hotbed of espionage.

Most humans find Jodoni society hopelessly fragmented. The absence of a central government, religion, or other factor as a unifying force is utterly foreign to a human perspective. In addition, many humans misread the Jodoni penchant for renegotiation as greed - an attempt to wring every last credit or other advantage from every deal. The Jodoni find the human concepts of binding contracts and central governments absurdly restrictive.

Jodoni admire individuals who can think on their feet and wring some benefit out of almost any circumstance. Those who cling to artificial notions of contracts and laws to protect them from chance are pitied.



▼ **NUTOA** - Inquisitive pranksters, the Nutoa are U.W. members who have been catapulted from crude treetop villages to interstellar travel in a very short time.

Homeworld - Nutoa are native to Yewel, third planet in orbit around the hot white binary star Tiika (Procyon A, see [page 3.28](#)). Along with deep oceans, Yewel possesses considerable surface water in the form of lakes, rivers, and extensive marshland. The hot, humid world has a diverse biosphere.

The Nutoa, descended from a mammaloid species of tree-climbers, evolved high in Yewel's towering rainforests. Intelligence arose due to the challenges of life in the treetops, as well as the needs of survival in the distinct ecosystems found at different levels of the rainforest.

Physiology - The Nutoa have an endoskeleton of calcium bones and an upright bipedal form. Nutoa are warm-blooded, with a closed, centralized cardiovascular system. They breathe oxygen into paired lungs. Climbing, walking, and gliding are the chief forms of locomotion for Nutoa.

Averaging 100cm in height, the lithe and wiry Nutoa weigh 15kg on average. They stand on two legs and have two arms with hands for manipulation. Extensible flaps of skin, called *patagia*, stretch from a bone spur on the knee to the wrist to permit gliding. A long tail, with bristly hair flaring to either side, acts as a natural rudder while gliding. Nutoan hands and feet have four digits each, including an opposable thumb. Claws aid in climbing, as does a rearward toe on the foot.

Soft, short fur covers a Nutoa's entire body, chiefly in shades of orange, gold, brown, tan, white, or gray. Their chest and stomach are typically lighter in coloration. Muted stripes are visible in the fur of some Nutoa. Completely white-furred Nutoa are very rare and are considered holy figures in some villages. Nutoan eyes are brown, green, or amber in hue.

There are two Nutoan genders, with both contributing genes to offspring. Nutoa go through a three-stage life cycle: first as pre-sentient larvae, then becoming pupae, to eventually emerge as adult Nutoa.

Omnivores, the Nutoa originally subsisted on a diet of fruit, nuts, tree grubs, and small tree-dwelling animals similar to rodents. In some villages, adult males hunt larger game cooperatively. Nutoa do not skin or cook their meat, which can be quite disconcerting to humans unused to Nutoan eating habits. In space or on other planets, Nutoa adapt their diet to locally available foods, preferring a mix of fruits, nuts, and meat. They are biocompatible with lifeforms on many worlds, and can eat some human foods, considering blueberries a heavenly delicacy.

Acute senses of smell and hearing help warn Nutoa of danger in dense jungles, where lines of sight are often obscured. Their vision roughly equates to human norms, and Nutoa see the same visual spectra as do humans. Their large pupils contract or widen radically to adjust to available light. Sensitive, mustache-like whiskers help the Nutoa sense air currents, particularly when gliding.

Nutoa are comfortable in temperatures ranging from 15°C to 45°C. They are accustomed to a gravity of 0.9 g and a slightly thicker atmosphere than humans, at 1.3 Earth pressures, but breathe easily at pressures from 1.1 to 1.5 Earth-normal.

Life Cycle - Nutoa reproduce sexually, male and female Nutoa mating and fertilizing two to three eggs in the female's womb. Gestation lasts approximately six e-weeks.

Young are born live in a pre-sentient larval stage. The larvae dwell in a pouch, carried by the mother, where they are nourished by nursing. Before a larva grows large enough to interfere with climbing or gliding, it emerges from the pouch to enter a pupal stage. The larva creates a fluid-filled cocoon suspended from a branch or other overhang. Over the next six e-months, the pupa metamorphoses into an adult Nutoan body.

Fires of Heaven^{v1.0}

During this time, adult Nutoa pass learned knowledge to the pupa via chemical transmissions. A teacher periodically enfolds the cocoon with their body, providing nourishment and educating the changing pupa within by secretions from specialized glands. Only pupal Nutoa are capable of absorbing knowledge in this way.

Nutoa emerge from the cocoons as sentient young adults, albeit undersized and in need of a few e-years of further education to take their full place in Nutoan society. The average Nutoa lives about 55 e-years, although Nutoan lifespans are rising due to improved nutrition, health care, and other post-contact benefits.

Psychology - Nutoa constantly seek new experiences, knowledge, puzzles, and mysteries. High technology holds a particular fascination for Nutoa, who regard machinery they don't comprehend as a challenge. This innate curiosity eased the transition from a primitive, planet-bound society to membership in a starfaring civilization for the Nutoa.

As a consequence of their treetop origins, Nutoa instinctively equate height with security. Nutoa in danger often seek high ground, providing both an advantageous position from which to attack pursuers and, in most cases, an easy avenue for escape by gliding.

The Nutoa possess a highly developed sense of humor, and humor plays a serious role in Nutoan society. Pranks, in particular, are very nearly an art form to the Nutoa; the best may take years to unfold. Paradoxically, the Nutoa favor deadpan humor and rarely even smile at the wit of others. They strike other races as strangely earnest jesters, perpetually striving to outdo others in providing amusement yet rarely partaking of the merriment they inspire.

Society - The Nutoa have a tribal, village-based society exhibiting some aspects of pack behavior. Prior to contact with humanity, they had no central government. Respected elders or councils of dominant adults typically govern Nutoan villages. A similar arrangement covers most independent off-world enterprises, much like the board of directors of a corporation. Even the planetary government established on Yewel as a prerequisite of federation membership continues to cede much of its authority to individual villages.

Nutoa typically form group marriages consisting of several males and females. Immature Nutoa recently emerged from their cocoon are cared for collectively, but young adults strike out on their own once they are considered mature. In most villages, unmated males and females dwell in separate, communal households.

The Nutoa generally consider both genders equal, but mated individuals have an implied social status greater than unmated individuals of either gender.

Outwardly gregarious, the Nutoa are locked in constant, subtle contention for dominance and prestige. Humor plays a pivotal role in this veiled conflict. The Nutoa use humor to resolve conflicts, reinforce social status, assert superiority, and fulfill other societal needs.

Laughter confers the ultimate sign of respect for a well-played trick or perfectly timed joke, as Nutoa consider laughter the breath of life. In the case of humor used to resolve conflicts, causing another to laugh constitutes victory, the laugher having ceded breath to the jokester. Consequently, Nutoa rarely laugh voluntarily except in situations where they are entirely comfortable with their social ranking (such as among close family or intimate friends).

The Nutoa normally do not wear clothing, as it would interfere with climbing and gliding. On their homeworld, Nutoa sometimes wear tight-fitting jewelry, but in space or on other worlds they sometimes experiment with loose necklaces and other decoration that would be a hindrance on Yewel. Some are fond of wearing human hats, particularly for the amused reactions this sometimes provokes.

Nutoan artwork tends toward sculpture, combining form and sound much like human wind chimes. Native Nutoan music consists chiefly of percussion and flute-like instruments. Nutoa are fond of any music with a heavy bass beat.

The Nutoa have a spoken language, but no form of written communication. They pass on knowledge via chemical transmission to pupae or by oral tradition. Nutoa can learn to speak, read, and write Anglic or other alien languages.

Nutoan given names are short and simple, typically no more than two to three syllables long. Male names always end with an "o", while female names always end with an "i". In Nutoan, these names confer some description of their bearer, whether physical appearance, personality, or history. To human ears Nutoan names often have a frivolous sound.

The Nutoa have no surnames, but sometimes use village names when dealing with outsiders. For example, Trilo of Krel village might use the name Trilo Krel when visiting another village to avoid confusion with any Nutoa with a similar name.

Science and Technology - The Nutoa have little in the way of indigenous technology. Prior to contact, most villages existed at an iron age level.

The Nutoa are quite skilled at natural medicine, however, utilizing the rich plant life of their forest habitat to remedy a variety of ills. Their talents in this arena surpass human medicine, and many medical researchers visit Yewel to study with Nutoan healers.

Diplomatic Relations - An outgoing, curious people, Nutoa generally get along well with other races, their friendly nature usually overcoming any problems caused by their sense of humor. Yewel became a full member of the United Worlds in 2170CE - only eight years after a party of human surveyors made first contact with the Nutoa.

The Nutoan ability to pass learned knowledge to their young by chemical transmissions greatly speeded the transition from a primitive society to membership in a star-spanning civilization. Each new generation of Nutoa entered adulthood possessing knowledge that took its elders years to comprehend through other means. The elders who spent the entirety of their adult lives to educate a complete generation of Nutoa into the 23rd century are highly revered historical figures. Their ability to chemically pass knowledge to their pupae also makes their diplomats extraordinarily canny, carrying with them the skills and knowledge of generations of predecessors.

In the 23rd century, large numbers of Nutoa leave Yewel for new experiences in space or on other worlds. Their intense interest in technology drives many Nutoa to enter technical fields, where they typically excel. While adept at using and modifying existing technology, they are not as skilled at creating new technologies. However, Nutoans are considered the mechanics and engineers of choice for outdated technologies, for the simple reason that you can usually find a Nutoan who has skills passed down from an engineer or mechanic who worked on the technology when it was new.

Humans tend to discount the Nutoa as playful forest innocents, but their child-like stature and seemingly frolicsome demeanor masks a deep, mature culture rich in nuance and complexity. Those who haven't studied Nutoan society often misread their propensity for pranks and jokes, in particular, as mere playfulness.

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Challenge/Life. Deficiency/Death.

- Ttkkalis, ground warrior, 2229CE



▼ **VORN** - A race of fearsome warriors with highly advanced technology, the starfaring Vorn are considered the pre-eminent threat to the United Worlds. The Interstellar War that followed human first contact with the Vorn very nearly destroyed the federation and ended only when the seemingly unstoppable alien fleets mysteriously withdrew to deep space.

Homeworld - The Vorn evolved on a faraway planet rendered incapable of supporting life ages past by ceaseless warfare between Vorn clans. A volatile planet tidelocked to a red dwarf star, the world possessed a thick atmosphere and dense cloud cover providing some relief from periodic stellar flares. Following the near-total destruction of its biosphere in endless wars, the strongest clans abandoned the lifeless husk of their homeworld for space. The Vorn are now worldless starfarers, roaming space in vast cityships accompanied by fleets of deadly warships.

Vorn civilization has adapted completely to life in space, and Vorn have little interest in planets except as hunting grounds. The Vorn mine asteroids and comets for resources. Their cityship armadas contain factory vessels capable of producing anything needed by the Vorn, including new starships. First encountered in the Chi Draconis system, they have remained there, apparently still mining that system's resources and using it as their base of operations for their infrequent raids into U.W. space. Even making astrogation calculations via a computer hooked up to public datanets is flagged and likely to result in surveillance, especially if the computer is owned by a starship or astrogator.

Vorn evolved from arthropods dwelling on the rocky shorelines of raging oceans. Intelligence arose from the challenge of fighting other Vorn for food, mates, and living space.

Physiology - Vorn have endoskeletons of calcium-impregnated chitinous bones and thick, chitinous carapaces that serve as natural armor. Vorn are multi-limbed with bilateral symmetry. They are warm-blooded, with a closed, centralized cardiovascular system. Vorn breathe oxygen into a single lung. Walking is their primary form of locomotion.

Vorn females (which are the dominant gender), are frighteningly huge, heavy creatures, averaging 274cm in height and 366cm in length when standing upright. They weigh approximately 800kg, supported by three pairs of sturdy legs ending in three hooked toes. Vorn have two muscular combat arms, ending in dangerous hooks capable of eviscerating or pinning enemies, and two pairs of smaller tool arms ending in three opposable digits for manipulation. The large, flattened tail, which once aided in swimming, now counterbalances the bulk of a Vorn to help her stand upright. The Vorn have multiple eyes and deadly hooked mandibles for devouring food. Despite their size, Vorn are surprisingly agile and at least as fast as an average human.

Vorn carapaces are chiefly dark brown in color, shading to a yellowish-tan on the underbelly. Scarred chitin or regrown limbs are slightly paler. Their multiple eyes are dead black.

The two Vorn genders reproduce sexually with both contributing genetic material to offspring. While they share a similar physiology, male Vorn are considerably smaller and weaker than the dominant females. They are also markedly less intelligent, barely qualifying as sentient beings by human standards.

The Vorn are carnivorous predators. They prefer to hunt prey and eat freshly killed meat, but this is obviously difficult to manage aboard starships. Cloning vats aboard Vorn ships produce some meat, which the Vorn consider an unpalatable but necessary hardship.

Vorn are biocompatible with a wide range of lifeforms, including humans. Contrary to rumor, Vorn do not typically devour defeated enemies on the battlefield - stopping for a meal in the midst of a firefight shows very poor judgment. After the battle is won, however...

Vorn have multiple eyes, allowing them to see in all directions at once, and can see well into the infrared spectrum, having evolved in the plentiful infrared light of a red dwarf star. Vorn also have a scent gland that produces pheromones, which are an important element of communication, detectable by other Vorn.

Injuries heal quickly for the Vorn, and they can naturally regenerate lost limbs in a matter of weeks.

Vorn are comfortable in temperatures from 5°C to 35°C. They artificially maintain 1.2g aboard their starships, but are also fully capable of operating in freefall. Vorn are adaptable to a wide range of atmospheric pressures, breathing easily at pressures from 0.6 to 1.4 Earth-normal. In vacuum a Vorn requires only an air mask and a light insulating suit to protect against radiation; her carapace protects the rest of her from vacuum damage. However, not being fools, they typically have extra protection in case their carapace is breached.

Life Cycle - The Vorn reproduce sexually, a female Vorn producing hundreds of eggs that are fertilized by male Vorn in a savage mating process before being laid. As a female prepares to lay eggs, she emits a pheromone that attracts fertile males. The males, in turn, exude pheromones that send the female into a primal feeding frenzy. As the males manually insert their sperm-equivalent into the female egg-laying organs, they provocatively wave their heads and forelimbs in front of her, inviting her to rip them from their bodies and devour them. This spells death for the males, but a slow one that distracts her long enough for them to accomplish the fertilization. Multiple males can fertilize the same brood of eggs, and a Vorn mating typically involves several males striving to fertilize the most eggs before being killed by the female.

After the mating is completed, the female eats the rest of the bodies in order to build up energy to lay the fertilized eggs. A short time later, the female deposits hundreds of jelly-like eggs in a water-filled nursery. This is the last she has to do with her offspring.

The eggs begin to hatch a few weeks later, and the hungry, immature Vorn begin life feeding on the as-yet unhatched eggs of their siblings. Mimicking the natural habitats of their lost homeworld, the Vorn maintain huge nurseries in their cityships, in which the young Vorn struggle amongst themselves for survival.

As the hatchlings mature, they periodically split their chitinous carapaces as their size increases, leaving them vulnerable until a new shell grows. Upon reaching adulthood, a Vorn will grow a permanent carapace that lasts the rest of their life.

Fewer than a dozen Vorn typically survive to maturity from each brood of several hundred eggs, and their numbers will be further winnowed by the endless Vorn pursuit of personal challenge. At birth, the ratio of male to female Vorn is 10:1, but by adulthood it typically drops to 6:1. Vorn have a natural lifespan of approximately 60 e-years, although very few Vorn die of old age.

Psychology - An primal sense of evolutionary imperative drives the Vorn. Fighting for food, living space, and other necessities in cityship nurseries, young Vorn learn the core beliefs of the Vorn worldview: those who are fit, survive; those who are deficient, *die*.

Fitness includes physical prowess, naturally, but also intelligence and wisdom. No single Vorn, no matter how strong, can possibly defeat all her scores of siblings at once. As those who fail to learn this lesson fall, the survivors learn the value of strategy and tactics.

Immature Vorn quickly learn to prize cunning as well. Males, considerably weaker and less intelligent, survive by stealing food from the dominant females. Those who cannot defend what they have against more than physical threats are doomed.

The young Vorn also learn cooperation as their hard carapaces periodically split while they grow. Even the most powerful, battle-hardened Vorn in the nursery needs allies to protect her while she is soft-shelled and vulnerable.

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These primal lessons underscore the Vorn psychology. To the Vorn, the universe is a hostile place of infinite danger. A Vorn seeks out this danger to proclaim her fitness to the universe. Those who fail, die, and do not weaken their clan or race with their deficiencies.

For this reason, Vorn do not surrender in battle or take prisoners out of mercy. Capture is a form of failure, and those Vorn who fail do not want to live anyway. The very concept of surrender is alien to the Vorn and few are capable of understanding it even in the abstract.

The Vorn do, however, comprehend *retreat*. Fighting a superior foe proves, not fitness, but a failure to fight intelligently. Vorn will also take prisoners at times as a strategic necessity - for example, for biological study or military intelligence purposes. They do not exchange prisoners for captured Vorn, nor do they keep prisoners of war after they've outlived their usefulness.

Vorn consider war the ultimate challenge. They do not make war on other races for territory or resources, but to challenge *themselves*. The Vorn ended the war against the United Worlds when they determined that humans were not a sufficient challenge to warrant expending lives and resources. The U.W. has actually figured this one out, but it is one of the most closely guarded secrets in the federation. The effects on morale, the economy (and face it, some political careers) would be catastrophic if the general public realized that the best the United Worlds could do, the sacrifices, the losses, the heroism, were so pathetic that the Vorn didn't think us worth the effort of conquering. There would also be a quite large political faction that would oppose the federation's rearmament and technological upgrades from a (justifiable) fear that it would provoke another war with the Vorn.

In the end, the Vorn psychological viewpoint helps the Vorn keep their runaway population in check; if every hatchling survived to maturity, the Vorn would quickly breed themselves out of existence.

Society - The Vorn have no families. A Vorn may keep track of her surviving daughters once they emerge from the nursery, taking pride in their accomplishments as a sign of her own evolutionary fitness, but without the emotional bond found in other races.

Females are the dominant gender, physically and intellectually superior to the barely sentient males. All warriors, leaders, scientists, engineers, and laborers are females. Male Vorn tend the nurseries containing Vorn hatchlings and can do menial tasks not requiring much intellect, but otherwise have almost no role in Vorn society.

Vorn civilization consists of several clans roaming space light-years apart. The autonomous clans are wholly self-sufficient, each with its own stellar armada. Vorn clans are extremely hostile, and have little contact with each other - some have been out of touch for decades. Clans are as likely (if not more so) to fight each other as an outside enemy.

All U.W. contact with the Vorn to date has involved a *single* clan. This fact is another closely guarded secret at the highest levels of federation government to avoid panicking the civilian population. One of the secret, long-term projects is using long-range recon ships to try to locate one or more of the other Vorn clans. While the prospect of negotiation or alliance is zero, the chance that one can be manipulated into conflict with the other is considered worth exploring.

Every aspect of Vorn life, from daily concerns to leadership of a clan, centers on challenge. A Vorn strives ceaselessly to test herself against her fellows, her enemies, and the hostile universe. Survival is the reward of success. Failure and death are neither mourned nor feared. By her own death, a Vorn earns honor by keeping her clan and race strong.

Rank is earned and kept by right of combat. At high ranks, challengers may have to battle many bodyguards and subordinates first. This enables top leaders to spend their time governing the clan rather than fighting off endless challengers.

This evolutionary imperative extends beyond the individual to the clan and the entire Vorn race. Clans seek constant challenge, thus the Vorn race as a whole grows ever stronger. While the Vorn took some casualties in battles against the federation, they deemed the increase in their own fitness from these losses negligible.

Vorn have no religion, although some say their belief in the fundamental hostility of the universe resembles the angry gods of some human faiths. The analogy is flawed - the Vorn defy the universe rather than try to placate it, and in any case do not deify it or perform any sort of worship.

Clothing is a matter of utility, not decoration or modesty, for the Vorn. Belts for carrying equipment are the extent of Vorn fashion.

Each Vorn clan has a spoken and written language, traceable to a root common tongue but highly diversified after centuries of minimal contact between clans. Pheromones are a vital aspect of Vorn communication, conveying emotion and at times even sparking physiological reactions in listeners.

The Vorn can learn to understand Anglic, but are physiologically incapable of speaking it. Likewise, humans cannot speak Vorn, which consists chiefly of sibilant hisses, clicking mandibles, and pheromone overtones. The federation intelligence services have devised translation technology for very crude communication with the aliens. The lack of a pheromone component to these communications renders them, at best, extremely simplistic. The Vorn may have devised similar technology, but they may not be interested in communicating with humans any more than we are interested in communicating with cattle.

Lacking any sense of family, Vorn have no surnames. Most lack even individual names, having only titles referring to their job or rank. Vorn who distinguish themselves are given individual names by their peers, typically reflecting some aspect of their prowess, and linked to the name of their ship. For example, "Hstktkslss ob Serensstk" translates in Anglic roughly to "Stealth/Attacker of the ship Serensstk", representing a Vorn known for her skill at ambush.

Science and Technology - Vorn science and technology are highly advanced in certain fields, particularly metallurgy and gravitics. Other fields of study, such as medicine, can hardly be said to exist among the Vorn.

The worldless Vorn have a strong shipbuilding industry. Factory ships and mobile stardocks produce a staggering array of deadly vessels. Crystalline hulls, artificial gravity systems, inertialess gravity well drives, and devastating gravity shear weapons make even Vorn cargo vessels formidable foes.

Every Vorn starship consists of a collection of spheres of various sizes, numbering anywhere from a half-dozen or so for a fighter to well into the thousands for cityships. Some humans have compared the appearance of Vorn vessels to soap bubbles or clusters of grapes, but despite their seeming fragility the starships are structurally sound and enormously resistant to attack. The StarForces dub Vorn ship classes with the names of devils and demons, such as the *Lucifer-class* heavy fighter.

On the ground, Vorn soldiers augment their natural weaponry with continuous beam laser rifles capable of tunneling through flesh to cause steam explosions in soft targets or carving through the armor of hard targets.

At the time of the Interstellar War, the Vorn possessed a significant military technological advantage over the United Worlds. The federation has since capitalized on captured or salvaged Vorn equipment to produce its own artificial gravity generators, and federation scientists are hard at work deciphering other Vorn secrets.

Given the length of time the Vorn appear to have been in space and the uniformity of their equipment, U.W. intelligence analysts believe the Vorn may be slower than humans in the research and development of new technologies. This may enable the United Worlds to surpass the Vorn lead in technology, given enough time...and make us enough of a challenge to be worth attacking again.

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Diplomatic Relations - The United Worlds first encountered the Vorn when an alien strike fleet jumped into the recently settled Sigma Draconis system in 2228CE. The strange crystalline ships obliterated a StarForces Navy task force and seized control of the system, sparking the Interstellar War. After 18 months of steady U.W. losses, the Vorn abruptly halted their attacks and pulled back to deep space. The people of the U.W. still do not know why the seemingly unstoppable Vorn ended their assaults, and contact with the hostile aliens has been limited to harassing raids on outlying United Worlds systems.

The U.W. has no diplomatic relations or any communication channels with the Vorn. Reports of Vorn activity are subject to immediate military response, and StarForces officers have standing orders allowing them to attack Vorn ships in federation space on sight. Technically, a state of war continues to exist between the U.W. and the Vorn. The only contact the U.W. has with the Vorn is radio and laser-scatter intercepts of in-system communications between Vorn vessels in the Chi Draconis system, but even the existence of the spy ships used is highly classified, and the intercepted communications are a matter of military analysis, not diplomatic communication.

Terror and hatred are the most common human (or other U.W. member) reactions to Vorn. They are modern bogeymen - implacably hostile, merciless, incomprehensibly frightening aliens seemingly bent on the destruction of humanity. Even hardened veterans have experienced debilitating flashbacks of combat against the Vorn.

Nutoa share the human fear of the Vorn, while the pacifistic D'eira are baffled by the relentless Vorn thirst for combat. The Jodoni know of the Vorn and give them a wide berth, but Ethereans seem curiously unconcerned about the Vorn.



ADVENTURERS

"We've got very few of the old-style racists left, like I learned about in school. Nowadays, the ones who used to look down on people because of where they were born now act that way about the aliens. Not many say so openly, but when they run starport facilities they're easy to spot. They never claim to make things difficult for Nutoa or D'eira, they just don't seem to have facilities for the aliens for "economic reasons". Fine. If they don't want to serve my Nutoa buddies, they don't get my credits either."

- Maribea Wesbois, fusion tech, 2233CE

▼ **INTRODUCTION** - The first step in designing a **Fires of Heaven** adventurer is to come up with a basic concept of his background, training, and goals. Determining the essentials of the adventurer's story and purpose in life can be a big help when it comes to defining the nitty-gritty details of their skills, characteristic scores, and so on.

Types of Adventurers - The gamemaster should decide what category of adventurers the player's designs will fall into. Low average, at 60A and 60S, may not be competent enough for the challenges of interstellar adventure. Average human, at 80A and 80S is usually good enough, since you can design an Olympic athlete with this level of points.

A cinematic or high-power **Fires of Heaven** campaigns will probably use more points, going into the Heroic range, or giving points that may only be used for specific Traits (if you want adventurers to have a starship, given them extra Wealth...). This gives players a chance to create some highly skilled adventurers capable of taking on anything the galaxy throws at them. Or so they believe.

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▼ **ATTRIBUTES** - Attributes function identically for all campaign settings, so the guidelines presented in the **EABA** rules apply. Since **Fires of Heaven** is a "real world" setting, human adventurers should follow the normal limits on their physical Attributes as listed under the Age Trait (**EABA**, page 2.12). An alien adventurer would take their racial modifiers and apply them to these limits to get limits for *that* race.

EXAMPLE: Since a Nutoa has a inherent Strength penalty of -4, a Nutoa in their physical prime would have a maximum Strength 4 points lower than a human in their physical prime.

In general, adventurers from core worlds, where the environment has been tamed and robots are commonplace, will have less need of high levels in Strength or Health, while those on the colonial frontier or in intensely physical professions wouldn't need high Awareness. Still, even a Marine Corps grunt will encounter technology at every turn, from their entertainment console to the targeting computer in their rifle, and a corporate executive will appreciate a high Agility when faced with a trade-war assassin. People from particular planets might have world-specific Attribute averages.

Strength - Adventurers from high-g worlds will have a higher average Strength, while natives of low- or zero-g environments may have a fairly low Strength. As a quick guide, the "average" Strength for an environment will be adjusted by the difference in lifting capacity required. A useful table for this is on [page 9.5](#).

EXAMPLE: A Strength of 6 has a lifting capacity of 50kg, while a Strength of 7 has 63kg, about a 20% difference. An adventurer native to a 1.2g world is on average 1 point stronger than an Earth native.

The Trait of Experience (**EABA**, page 2.13) may be especially useful for heavy-worlders to offset encumbrance penalties.

Agility - Adventurers who spend a lot of time in a zero-g environment may develop higher than average Agility, since just getting around involves a lot of diving, spinning, and other acrobatics.

Fate - Fate serves all the normal purposes in a **Fires of Heaven** campaign, as a means of twisting fate, determining psionic potential or as a base for some alien abilities. The average person only has a Fate of 0d+2. Adventurers who wish to have any psi talent will need a minimum Fate of 1d+2.

▼ **HUMAN ADVENTURERS** - Humans are the most populous inhabitants of the United Worlds. They may possess psi powers or cybernetic enhancements, but in the end humans of the 23rd century are a lot like their forebears. Most adventurers and extras in a **Fires of Heaven** campaign are likely to be human, but the vast array of homeworlds, cultures, careers, and skills available virtually guarantees that no two people need ever be alike.

Free Skills - These are the basic skills that any human, regardless of their other education, has at least some chance of using successfully. The following standard lists should be used as defaults for humans in **Fires of Heaven** campaigns. There are three lists, representing the everyday skills picked up in the various environmental backgrounds found in the United Worlds. Skills on the list marked with an asterisk are full +0d skills (worth 5S), and represent things the adventurer grew up with, and has a lot of casual experience with, like their native language, familiarity with their culture's technology, their environment, and so on. The rest of the skills will be highly limited +0d specializations worth 1S. An extra 4S must be paid to upgrade an this specific skill to its generally useful +0d equivalent, after which it can be specialized or improved to +1d or higher levels of proficiency. These skills are *free* to adventurers with the appropriate background and does not count towards any point limits for that adventurer. It only costs points if the player wants to upgrade the skill.

EXAMPLE: A Core World citizen gets a free skill in "Hovercar". This is a +0d skill level at operating hovercars, which are a small subset of the available ground vehicle types. If a player wants to upgrade this skill to a +0d with "land vehicles", this would cost an additional 4S. Note that even in this case "land vehicles" would be limited to modern ones, and there would be a separate skill for archaic vehicles like a horse and wagon.

"Homeworld familiarity" skill is just the absorbed knowledge a person gets from living somewhere for a long time. You may not know everything, but you know how to flush the toilets, hail a taxi and all the other day-to-day tasks people in that area know how to do without thinking. You also know enough that questions can be answered with an Awareness roll, rather than the unskilled Awareness minus 1d roll that a non-native would have.

New skills or special skill rules for the **Fires of Heaven** universe start on [page 5.7](#).

Core World Citizen - The core worlds of the United Worlds are often wonders of advanced tech. Speeding hovercars, bustling automated factories, and homes packed with the latest gadgets fill the vast cities of core worlds. Computers and robots are a part of everyday life for most people. In addition, core worlds are centers of government, trade, science, and academics.

Core World Free Skills

- Native language*
- Homeworld familiarity*
- Hovercar operation or ground car operation
- Computer Programming (profession-specific)
- First Aid (for 1 hit injuries)

Frontier Citizen - On the frontier, people tend to live closer to nature. Villages and scattered farms are the norm, at least on reasonably habitable worlds. Reduced access to high technology means citizens of the frontier often have to fall back on age-old ways of getting things done.

Transportation choices depend on local conditions - horses are common mounts on fairly Earth-like worlds, while rovers are used on hostile planets. On oceanic Nai, boats and submersibles outnumber any form of land or air transportation.

Frontier Free Skills

- Native language*
- Homeworld familiarity*
- A land vehicle or riding animal (choose one)
- Scrounging (limited subtype of an environment)
- First Aid (for 1 hit injuries)

Spacer - In the 23rd century, billions of United Worlds citizens live in space. Starships, starbases, or space habitats are their homes, workplaces, and playgrounds. In space, most people know how to handle themselves in zero gravity, but some spend so much time in spin or artificial gravity environments that they never develop full zero-gravity movement skills.

Spacer Free Skills

- Native language*
- Starship, starbase or habitat familiarity*
- Zero-g movement (using handholds)
- Systems operation (for a particular job)
- Computer programming (profession-specific)
- Language: Anglic (specialized job lingo)

▼ **ALIEN ADVENTURERS** - Five alien races exist in the **Fires of Heaven** setting. Three, the Jodoni, D'eira, and Nutoa, are suitable for player adventurers; the Ethereans and Vorn as extras. Assessments of alien Attribute modifications, enhanced senses, and other criteria are based on differences from the human norm.

Alien Attributes - Alien races may have different adult averages in their Attributes than humans. To reflect this in adventurer creation, a race that has a higher average than humans will be listed as "+n", and a race that has a lower average than humans will be listed as "-n". In both cases, you add this amount to the level of the Attribute *after* A points are spent. The new amount becomes the Attribute level for all purposes, including future increases.

EXAMPLE: D'eira have Awareness(+3). This means that if a player spends enough points for their D'eira adventurer to have an Awareness of 7, the adventurer gets an Awareness of $7+3=10$.

This Attribute modification can be considered a type of Trait that a player has no choice over, and which has no point cost. It just represents differences in physiology. Aliens do not have to be balanced in terms of points or capabilities compared to humans. It is possible that they can overall be superior or inferior in specific aspects of play.

The costs for an alien race's inherent traits neither cost nor give points to the adventurer. They are simply listed to provide an indication of play balance. Players get the benefits and limitations of an alien race just by choosing it.

EXAMPLE: A Jodoni's native limitations and abilities would net 30A and 15S if the points were counted towards adventurer creation. However, they aren't, so the adventurer has the effect of these limitations, and none of the point benefits. Given this, and the fact that Jodoni don't like anything in single quantities, perhaps a player could have two Jodoni adventurers to make up for the general point inferiority in only having one.

Aliens do not have the same maximum limits on their Attributes as humans. In general, their normal adult maximum in an Attribute is altered by their bonus or their penalty on that Attribute.

EXAMPLE: Jodoni have Strength(-3), so their adult maximum is 3 points lower than a human's. A strong Jodoni may be stronger than some humans, but the strongest human will *always* be stronger than the strongest Jodoni.

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Alien Everyman Skills - Each alien race in **Fires of Heaven** has a unique set of Everyman Skills, representing the basic abilities every member of the race has at least a chance to use successfully, based chiefly on the environment and culture of its homeworld.

As for humans, alien Everyman Skills are either general or specialized +0d skills. Likewise, a +4S cost must be paid to upgrade an Everyman Skill into a normal Skill at +0d.

Alien Lifespans - Aliens will usually follow the same progression of maturity and aging as humans, but may be on a different scale. Assume that 80 years is the default human lifespan, and a race whose normal lifespan is more or less than this will take aging modifiers at a proportionately higher or lower age. Specifically, you take the 65 year period between the end of the Young Adult (age 15) and Elderly (age 80) brackets (**EABA**, page 2.11) and assume this is the adult lifespan.

EXAMPLE: A male Jodoni has an average lifespan of only 20 years, but reaches bodily maturity at age 10. Their 10 year adult lifespan (compared to a humans 65 year adult lifespan) means that Jodoni take 6.5 years of aging effects per year of actual age past 10 years old. A Jodoni adventurer starting play at an actual age of 12 would be counted as having a human age of 23 for purposes of the Age Trait. When they turned 13, they would move into the next age bracket and would apply the difference (they would lose 10A but gain 10S). They would stay in this age bracket (Mature) until an actual age of 15, at which point they would become "Middle-aged", lose another 10A and gain another 10S.

If necessary, each 20 year bracket past the end of the aging chart doubles the A penalty and gives +10S. Aliens whose normal lifespan is significantly longer or shorter than humans should have the appropriate Blessing/Curse Trait (**EABA**, page 2.11).

D'eira Adventurers - A tall, vaguely reptilian race, the D'eira are members of the U.W. federation. Evolved on a world orbiting close to its star, D'eira have eyes capable of looking in two directions at once. Pacifists, D'eira have trouble comprehending notions of competition or conflict, and seem to lack the strong emotions of other races.

Their alien physiology means D'eira gain no game benefits from their height.

D'eira Racial Abilities

Awareness(+3)
Blessing (small): Tolerance to radiation (-10A)
Blessing (medium): Extended lifespan (-20A)
Forte on Awareness for mathematics (-5A)
Looks: Distinctive
Personality: Austere, remote (3 levels, +15S)
Personality: Pacifist (3 levels, +15S)

Cost of abilities: lose 35A, gain 30S

D'eira Everyman Skills - The D'eira consider mathematics a language for expressing reality, and approach any calculation with gravity and respect. The D'eira have a somewhat caste-based society, with each family line associated with a particular career field or task, to create a harmonious, orderly world.

D'eira Everyman Skills

Mathematics*
Language(D'erian)*
Homeworld familiarity*
Area knowledge: Caste affiliations*
First Aid (for 1 hit injuries)

Jodoni Adventurers - The Jodoni hail from an interstellar civilization that engages in trade and diplomacy with the U.W. Evolved on a low-gravity world, Jodoni are frail, with a supportive exoskeleton. Antennae-like appendages act as smell receptors, allowing Jodoni to "taste" the emotions of those around them via pheromones.

These packages of abilities and skills represent male Jodoni, who would be based on a point total one level lower than human adventurers. For instance, if humans were based on average points (80A and 80S), then Jodoni would be low average (60A and 60S). Female Jodoni, who are physically and psychologically different from males, are rarely even seen by outsiders. They are the thinkers, builders, and policy-makers of Jodoni civilization.

Jodoni Racial Abilities

Agility(+2)
Awareness(+2)
Strength(-3)
Health(-1)
Gifted: Armor equal to Fate (up to 1d+0)(-10A)
Gifted: Use Fate roll to detect emotional states (pheremones)(-10A)
Weakness on Awareness (poor vision)(+10A)
Curse (large): Short lifespan (+40A)
Looks: Distinctive
Personality: Negotiator (3 levels, +15S)

Cost of abilities: gain 30A, gain 15S

Jodoni Everyman Skills - The Jodoni Combine consists of millions of independent socio-political-economic entities know as *demesnes*. These *demesnes* negotiate constantly, creating the web of interdependence necessary to support an interstellar civilization. The Jodoni have no notion of binding contracts - *everything* is renegotiable as conditions change.

Jodoni Everyman Skills

Jodoni language*
Familiarity with their demense*
Negotiation*

▼ **Note:** Due to the significant different in body size between the various races, it is suggested you use the Hit Brackets rule (EABA, page 2.19) to represent frailer or tougher body types. If you don't, then players might want to explore taking the Toughness Trait (EABA, page 2.18), either in a positive sense (for the bigger aliens) or negative sense (smaller aliens).

Nutoa Adventurers - A curious, seemingly playful race, Nutoa are members of the United Worlds federation. They are short, furry bipeds with extensible skin flaps (patagia) between their arms and legs, for gliding among the trees of their native rainforests.

Nutoa Racial Abilities

Awareness(+1)
 Agility(+1)
 Strength(-4)
 Health(-1)
 Gifted: Reduced body size (+2 to be hit, decreased melee reach, -1 to walk speed)(-10A)
 Gifted: Claws (punch+0 lethal damage)(-10A)
 Gifted: Gliding (fly on air currents up to Fate distance level per turn)(-10A)
 Forte on Awareness (hearing)(-5A)
 Curse (medium): Short lifespan (+20A)
 Looks: Distinctive
 Personality: Inquisitive (4 levels, 20S)

Cost of abilities: lose 15A, gain 20S

Nutoa Everyman Skills - The Nutoa have a tribal society based on scattered villages found high in the treetops of their tropical homeworld. Once accustomed to a fairly primitive technology level, Nutoa have quickly adapted to life in the high-tech United Worlds.

Nutoa Everyman Skills

Nutoan language*
 Climbing*
 Familiarity with home region*
 First Aid (for 1 hit injuries)
 Scrounging (in their home region)

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Ethereans - Enigmatic psions, Ethereans are friendly to humanity but disinclined to offer much assistance to the U.W. They are a physically weak, aquatic race. Adventurers may *not* be Ethereans. This information is just for the gamemaster's benefit.

Etherean Racial Abilities

Strength(-3)
 Health(-3)
 Fate(+12)
 Gifted: Gills (use Fate as Health in water)(-10A)
 Gifted: Fins (underwater move as running)(-10A)
 Blessing(medium): Can do without food or sleep for up to a month(-20A)
 Forte on Fate (defense against resisted or thresholded psionic attacks)(-5A)
 Larger than Life (2 levels, psi skill rolls only)(-20A)
 Forte on Will (universal reputation)(-5A)
 Weakness on Awareness (deafness/mute)(+10A)

Cost of abilities: lose 60A, gain 0S

Known Etherean psionic powers

Mental sense (use Fate as Awareness to spot mental signatures)
 Telepathy (gather information using thresholded Fate vs. Will roll, with line of sight range)
 Mindsight (gather information using Fate as Awareness, line of sight range and through one mundane barrier)
 Psychokinetic shield (use Fate as personal armor against kinetic or energy attacks)
 Psychokinetic barrier (use Fate minus 2d as armored wall up to 7 meters in radius)
 Telekinesis (use Fate as Strength with line of sight range)
 Flight (up to 15 meters per turn)
 Pyrokinesis (Fate minus 2d as ranged lethal damage with 125 meter range)
 Unity (mental link only with other Ethereans)

Ethereans usually have *all* these abilities.

Etherean Everyman Skills - Bound into the world-wide mind link known as the Unity and capable of meeting most of their needs via psionics, Ethereans lack the complex social structures or technology of other races. They spend much of their time in reflection and communication by pure thought.

Etherean Everyman Skills

Etherean language (telepathic)*
 Etherean culture*
 Personal artistic talent*
 Ocean Scrounging (for food)*

EABA

Vorn - A race of worldless starfarers, Vorn are a physically powerful, highly advanced civilization that thrives on challenge. Protected by an armored carapace and possessing lethal natural weaponry, Vorn are deadly warriors. Adventurers may *not* be Vorn. The information is strictly for the gamemaster's benefit.

Vorn Racial Abilities

Strength(+3)

Health(+6)

Will(+6)

Gifted: Increased body size (-2 to be hit, increased melee reach, +1 to walk speed)(-10A)

Gifted: Armored carapace (Fate plus 1d as inherent armor against all physical or energy attacks)(-16A)

Gifted: Claws/manidibles (punch+0 lethal damage)(-10A)

Gifted: Heat sense (use Fate as Awareness to spot warm/cold targets)(-10A)

Gifted: Use Fate roll to detect emotional states (pheromones)(-10A)

Blessing(small): Psi blockers (ignore first -1d of psi attacks)(-10A)

Blessing(small): Extra arms (ignore first -1d of extra action penalties)(-10A)

Blessing(small): Sealed body (ignore or subtract first -1d from any gas, contact toxin or pressure/vacuum damage)(-10A)

Forte on Awareness (360° vision)(-5A)

Forte on Health (rapid healer)(-5A)

Looks: Distinctive

Personality: Craves challenge (4 levels)(-20S)

Cost of abilities: lose 96A, gain 20S

Vorn Everyman Skills - The Vorn are a highly advanced, starfaring civilization with technology far beyond that of the United Worlds federation. Vorn consider war the ultimate challenge, and all are proficient at combat. As a spaceborne race, they are skilled at operating in zero gravity.

Vorn Everyman Skills

Vorn language*

Claw/mandible use* (equal to human brawling)

Zero-g movement*

Home ship knowledge*

Laser rifle*

▼ **SKILLS** - Most **EABA** skills can be used in a **Fires of Heaven** campaign. However, some skills must be reinterpreted given the technology, culture, and environment of this particular science fiction setting. This section lists all the **EABA** skills that would be altered or new to this setting, and any other changes that should be made.

▼ **AGILITY SKILLS (Combat)**

Blade(adjusted) - This skill is bought as either Short Blade or Long Blade, the former for weapons like knives or high tech weapons wielded in a similar fashion, and the latter for swords or similar items. Some sports or cultures may have a specialization for long blades, such as Fencing.

Firearms(adjusted) - Firearms all operate in more or less the same way. The broader range of weapon types means that specializations are also broader. A person would normally specialize in a method of operation (like lasers) instead of physical form (like pistols), though the latter is still an option if the gamemaster allows it. *Specializations: Laser, Slugthrower, Gauss, Blaster, P-beam, Archaic.*

Brawling/Martial Arts(adjusted) - These skills remain the same, but differences in alien physiology may allow alien maneuvers or specializations available only to that race.

Starship weapon(new) - Skill at aiming and operating long-range anti-ship weaponry, including missiles. However, acquiring targets with long range sensors or defeating countermeasures is use of Sensor Ops skill. *Specializations: Laser cannon, Plasma cannon, Ion cannon, Missile rack.*

▼ **AGILITY SKILLS (Transport)**

Beast riding(adjusted) - The increased number of possible riding animals means that this skill must be bought for a *specific* planet's animals. These might be used off-planet, especially on the colonies of the originating world, but this is not guaranteed. This skill is now three separate skills (Riding Animals, Animal-Towed Vehicles and Animal Handling), each with their own specializations. Animal handling would be the use of animals for purposes other than riding or towing a vehicle, like using oxen for plowing or using elephants to act as logging equipment.

Riding Animals or Animal Handling

Equines (horses, donkeys, mules)

Cattle/Oxen

Camels

Elephants

Other (a specific alien creature)

Animal-Towed Vehicles

Wagons

Sleds/sledges

Air vehicles(adjusted) - Automation and autopilots means that anyone who knows the basics can probably fly any atmospheric vehicle of a given type (winged, VTOL's, etc.). However, the increased technical complexity of such vehicles makes it less likely they can fly any *other* type using more than their default Agility roll. This skill is now four separate skills, and may be specialized *within* that class.

VTOLs

Aircars, Military

Helicopters

Light, Heavy, Military

Fixed-wing

Ultralight, Light, Cargo, Acrobatic, Military

Lighter than air

Balloons, Zeppelin/dirigible

Land vehicles - Aside from the addition of autopilots and autonav, land vehicles operate in a way that most players would be familiar with. Hovercraft are more common in some urban areas, and are a common specialization. The "free skill" in land vehicle operation many adventurers will have will either be the limited "automobile" or "personal hovercraft" specialization at +0d. Common and uncommon land vehicles that can be specialized in are:

<i>Bicycles</i>	<i>Construction vehicles</i>
<i>Motorcycles</i>	<i>Agricultural vehicles</i>
<i>Automobiles</i>	<i>Tracked military</i>
<i>Heavy trucks</i>	<i>Rail/tube vehicles</i>
<i>Personal hovercraft</i>	<i>Snowmobiles</i>
<i>Cargo hovercraft</i>	

Water vehicles(adjusted) - Water vehicle operation is now three separate skills: Archaic, Modern and Commercial. Archaic covers sailing vessels, oared vessels or other primitive types, while Modern covers speedboats to yachts to small cutters, and Commercial covers tankers, freighters and most large military vessels. Operation of commercial water vehicles is an Awareness skill, not an Agility skill. Within these skills, they may be specialized to specific vehicle types:

Archaic water vehicles

*Small wind-powered, Large wind-powered,
Small oared, Large oared,*

Modern water vehicles

Jetski, Minisub, Speedboat, Yacht, Hydrofoil

Commercial water vehicles

Tanker, Cutter, Freighter, Destroyer, Capital ship, Submarine

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Space vehicles(adjusted) - There are a large number of specialized space vehicles, and skills useful for one may not transfer to another. Each class of space vehicle that follows requires a *separate* skill, but having one skill *does* allow use of a default Agility roll on the others, something not possible for a person who is completely unfamiliar with space vehicles. The space vehicle classes are:

Work pod: A small, one or two person craft designed for short range operation, usually within sight of its support vessel.

Shuttle: Any sort of medium-range vehicle, usually with re-entry, takeoff and soft-landing capability. A space fighter pilot or belt miner would use this skill.

Interplanetary: Any deep-space vessel, from a pod hauler to a dreadnought. As for water vehicles, maneuvering a vessel of this size is an Awareness skill, not an Agility skill.

Within these classes, the skill can be further specialized. A fighter pilot might have Shuttle skill, specialized for space fighters, while an up-and-down cargo hauler might have the skill specialized for re-entry maneuvers.

▼ **Note!** - Many hobbies include or are a skill with very specialized vehicle types. Unless the adventurer is a "pro" in a sport involving such a vehicle or form of transport, a "hobby" level of skill is usually sufficient. Examples of such skills might be SCUBA diving, parasailing, skate-, snow-, or windboards, zero-g wings, re-entry diving gear, water, cross-country or alpine skis, and ice- or rollerskates.

▼ AGILITY SKILLS (Other)

Trades(adjusted) - This is practical application of various theoretical fields, like Mechanic would compare to Mechanical Engineering. Examples would be skills on the adventurer templates like Mechanic, Electronics and so on. These trades do not have to be a narrowly defined single skill, but application of other skills is specific to the nature of the trade. In general, a trade is a sort of creation, building or repair skill. Blacksmith would be an example that is useful on frontier worlds that still use draft animals. Trades, especially the Agility ones, are usually going to be low-tech skills. For instance, there may be trades for building or repairing reasonably complex mechanical items, but there are no "trades" associated with fusion engines.

▼ AWARENESS SKILLS (Academic)

In general - Skills in this category are going to be *much* more general than in more limited game-worlds. For instance, "Law" now has to include the separate legal systems of *other* worlds *and* alien races. For that reason, most skills in this category will have to be narrowed down. "Law" might be several separate skills, rather than a single skill with a specialization. "Business Law" is a separate skill, but it covers legal matters for transactions between other worlds and other races. It could have its own specialization, such as a +1d in "Human Business Law".

Languages(adjusted) - Everyone gets a full +0d skill in their native language for free, and this includes basic literacy for any language that has a written component. For the other languages of your home-world, a +0d fluency includes literacy, but for an alien language, a +0d skill confers only the ability to read it or write it, not both. It requires a +1d in an alien language to have spoken and written knowledge at a conversational level. Phonetically-based translation and transliteration programs for pocket computers will allow virtually anyone to get everyday concepts across, and even profession-specific terms if you have the right program, but this normally takes several times longer than unassisted communication would.

EXAMPLE: You ask your computer "how do I say 'which way to the Senate building?'". Your computer translates it, then displays the phonetic pronunciation (or says it into your earphone), and then you say it, your computer records the response, and gives you the best translation it can of what was said in the alien language. It also paints glowing neon letters on your forehead that say "I'm a tourist! Rip me off!"

Outside of Earth, the main human language in the United Worlds is Anglic. Other languages might be heard more often on some worlds but almost everyone can speak at least a little Anglic. Evolved in the late 21st century as a trade and technical language for space operations, Anglic is based on American English with a bit of Russian, Japanese, German, French, and other languages. There are various dialects of Anglic, particularly on Mars, where speaking non-standard Anglic is a continuing symbol of their cultural independence.

Anglic has a more regular set of cases, tenses and genders, with specialized terminology and altered pronunciation to make it speakable by as many of the known alien races as possible, and easy for computers to translate for those who cannot easily operate in the human speech and hearing range.

Anglic as a free skill for some adventurers means that they know Anglic terms appropriate to their best income generating skill, but cannot otherwise use the language. If you were a cargo handler, you could direct a crew to put shipping containers in the right spot, and say "Idiot! It says 'this end up!'", but you wouldn't be able to haggle with a shopkeeper over the price of a dozen Chaldar oranges. If a spacer adventurer takes Anglic as their native language, their free language skill becomes one of their choice, similarly limited.

EXAMPLE: A spacer trained as a sensor operator takes Anglic as their native language, and Jodoni as their profession-related free skill. They have a +0d in the major Jodoni dialect, which lets them read Jodoni control panels and do simple "tech talk" with sensor ops on any Jodoni ships they encounter (in case they don't speak Anglic).

On Earth, there is still a large contingent of pure English speakers, as well as strongholds of various national languages that rival English in number of fluent speakers (Chinese in particular). An Anglic speaker can be understood in English and vice versa, but at a -1d to the level of comprehension and detail that can be expressed.

EXAMPLE: As a language for spacers, Anglic has a one-syllable word that means "decompression hazard!". Shouting "blouw!" at an English-speaking ground-pounder is only going to get a puzzled look from them, and the Anglic-speakers in earshot are unlikely to spend the time to explain what it means (since they'll be busy sprinting for the nearest pressure-tight door).

The alien races contacted by humanity have their own languages, of course, except for the Ethereans, who express themselves by pure thought via telepathy, which operates at a deeper level than speech and requires no language. All alien languages are inherently difficult for other races to learn, as they share no common root or even perspective, and in some cases evolved to be spoken with non-human vocal organs. Languages alien to the speaker's own cost are considered to be at 1d less fluency than the same level of skill by a member of the race the language is native to.

EXAMPLE: A human who knows Jodoni with a skill roll of 3d+1 is treated like they had a skill roll of 2d+1 when trying to communicate complex ideas.

▼ **Note** - While the occasional conflict or problem because of language difficulties can be interesting, unless it is central to the drama of a particular adventure, the gamemaster should minimize the level of die-rolling involving languages. Make sure that all the adventurers can communicate with each other, regardless of background, either by a shared language or at worst, an intermediate adventurer who can understand all the languages involved and act as an intermediary.

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Sciences(adjusted) - Not much change, but the following is a list of fields that would fall under this category, some of which may also be considered specializations of other skills (at gamemaster option).

Aerospace Eng.	Hydrology
Agriculture	Immunology
Aquaculture	Industrial Eng.
Anatomy	Inorganic Chemistry
Anthropology	Linguistics
Archaeology	Literature
Architecture	Marine Biology
Artificial Intelligence	Materials Science
Astronomy	Mathematics
Astrophysics	Mechanical Eng.
Bacteriology	Medicine
Biochemistry	Metallurgy
Biomechanics	Meteorology
Biomedical Eng.	Microbiology
Biophysics	Military Theory
Botany	Mining Eng.
Cartography	Molecular Biology
Ceramic Eng.	Nanotechnology
Chemical Eng.	Neuroscience
Chemistry	Nuclear Eng.
Civil Eng.	Nuclear Physics
Climatology	Oceanography
Computer Eng.	Organic Chemistry
Computer Science	Paleontology
Criminology	Pharmacology
Cryobiology	Philosophy
Cryptography	Photonics
Cybernetics	Physics
Ecology	Physiology
Exobiology	Planetology
Exobotany	Political Science
Exopsychology	Psionics
Exosociology	Psychology
Exozoology	Robotics
Electrical Eng.	Sociobiology
Environmental Eng.	Sociology
Ethology	Statistics
Forensics	Subatomic Physics
Forestry	Thanatology
Genetics	Theology
Genetic Eng.	Toxicology
Geology	Urban Planning
Geography	Veterinary Medicine
Geophysics	Virology
Gravitation Physics	Zoology
History	

Many of these can be further broken down into specialties. Some of these skills may be good for theoretical tasks within that field (pure research and developing new ideas), but are at -1d for hands-on work like repair tasks. An architect might know how to design buildings, but not be very good at trying to build one.

Medicine(adjusted) - As with law and some of the other Awareness skills, a Medicine skill is usually specific to a particular race, with a -1d penalty for trying to use it on any other race. Even if they are not all that similar, the adventurer's formal training would have gone over the basics of alien anatomy. With the exception of the frontier world general practitioners (as popularized in the holodramas), most medical professionals will have a specialization of some sort (a licensed physician will have at least a 4d+2 overall skill roll, and a "board certified" specialist at least a +1d specialization on their skill roll). If you have a "science" skill of Medicine, you can use that as a complementary skill with the practical application of the field (a "medical college" doctor probably spends more time in a lab than with actual patients, but has a deeper insight into the causes of a problem than the "out in the field" doctor).

Emergency medical techs normally have a +1d level of skill. The very specific +0d free skill of "first aid" allows you to have a normal Awareness roll to bandage and effectively treat very minor injuries (1 lethal hit), and stop or slow bleeding injuries, but would take the unskilled -1d penalty to do anything else.

Programming(adjusted) - In **Fires of Heaven**, this skill applies almost entirely to computers. Various aspects of hacking, forgery and datathievery have their own specialties, as does research involving quantum computers, AI's and even theoretical nanotech. Again, this is a race-specific skill, and overlap of concepts allows you to use it outside your race's computers at a -1d penalty.

If you have a free skill in programming, this means that you have a +0d skill in working with programmable devices as relates to your best income-generating skill, and take the normal -1d penalty for all other computers or programmable devices.

EXAMPLE: If you are a hovercar mechanic whose background has a free "computer programming" skill, you get +0d programming skill to diagnose, adjust or program the on-board computers in a hovercar, but take a -1d penalty trying to program any other kind of computer.

Psychology(adjusted) - While "getting into someone's head" is a general talent, the skill only applies to one particular intelligent species. So, there would be "Human Psychology", "Jodoni Psychology", etc. Within each of these would be the various +1d specializations that can be bought, though at gamemaster discretion, these can be pan-species skills, trading specialization for cross-species use.

EXAMPLE: An adventurer who has "Human Psychology" and a specialization in "Criminology" has some training in all aspects of human behavior, but specializes in understanding the human criminal mind. An adventurer with just "Criminology" is trained to understand the criminal mind of any species, but is completely unsuited for treating something like a phobia or eating disorder.

At gamemaster option, you may attempt Psychology tasks outside your field, but at a -1d penalty.

Various "psych" skills can be based on Attributes other than Awareness. Being intimidating, a good conversationalist or seductive are simply aspects of psychology taken as separate Will, Awareness or Health-based skills. A Jodoni's natural negotiating instincts are a psychology skill. These are typically resolved as a skill vs. Will roll, with penalties or bonuses depending on circumstances and how much resistance there would be to the skill. And of course, some psychological ploys simply will *not* work on certain aliens. No matter how good you are, you cannot seduce a Jodoni, or rabble-rouse D'eira into a lynch mob.

Fortes unique to the **Fires of Heaven** universe may boost the potential of these skills, and some Weaknesses may make them harder. Exposed cyberware can make you more intimidating, but being a clone might make people uneasy about dealing with you.

Religion (adjusted) - Religion and philosophy are more or less the same in the Fires of Heaven universe (though many believers will argue the point). The skill is about belief. That belief can comfort you in times of trouble, sway the hearts of others, give you strength when hope is lost, and provide inspiration to do great things. And all of these can be used in a very negative sense, as pernicious philosophies and intolerant religions have shown. The Angels of the Apocalypse have their own "religion".

Having a religion skill is a good way to get a complementary skill bonus when engaging in social or business interaction with other members of that religion or philosophy, whether this is a Buddhist negotiating on Ryujin for an exploration permit on one of the outer planets, or an undercover agent trying to infiltrate the Angels of the Apocalypse.

▼ AWARENESS SKILLS (Psi)

Psionics(adjusted) - In **Fires of Heaven**, this would take the place of Sorcery skill, the required mental training that allows one to access their psionic potential. Each particular discipline an adventurer has will be a +0d or +1d specialization on the overall Psionics skill, just as it would be done for magic. Psionic powers that come from being Gifted (page 5.21) do not require this skill. The known psi powers available to adventurers are listed later, starting on page 5.58.

▼ **Note** - Just to keep you ahead of the game, a human psion will need/require:

1. Adjusted Fate roll of 2d+2, either as a 2d+2 Fate or a 1d+2 Fate and the "Psion" Forte (page 5.20).
2. Cursed(psion), which represents the very slow but thus far irreversible neural degeneration associated with human psi powers (page 5.74).
3. Psionics skill at +0d or more (5S)
4. A particular discipline of +0d or more (5S)

So, to have an adventurer with psi powers will mean a *minimum* investment of 10S over that of a non-psion adventurer. It turns out the extra cost of the minimum Fate requirement is exactly offset by the Cursed(psion) Trait.

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▼ AWARENESS SKILLS (Other)

Area Knowledge(adjusted) - Fires of Heaven uses a lot of general knowledges. These are not professions, but experience that helps you do something else better, and can be called area knowledges, familiarities and so on. A starship captain has Knowledge(crew), because knowing his crew's background and personalities helps the captain run the ship better. For +0d levels in a very limited field (like "my crew"), the specialized 1S version of the skill may work, but for +1d or broadly useful knowledges, the cost is as for any other skill. The skill costs the same, but a smaller scale gives greater detail. A corporate head who has a Knowledge(employees) knows far less about each employee than the starship captain does.

System Ops(new) - System Ops is an area knowledge specific to sealed environments like spaceships, space stations or habitat domes. Living and working in these environments is neither as safe nor simple as living on a normal planet. You have to know how to use an airlock, where the escape pods are, things that can mess up the life support system, which way to jump if an "integrity breach" sounds (and what it sounds like), and so on. It also covers a basic geographical knowledge (floor plan) of that type of environment. As listed on the adventurer templates, it is specific to that profession. Bought by other adventurers, it should be defined as to the type of "system" the "op" is for.

EXAMPLE: A skill of System Ops (StarForces vessels) means that you are fully versed in the basic layout and technical systems of StarForces vessels.

System Ops of the right kind that is no more than 1d less than any sort of repair or diagnostic skill will let the repair skill roll an extra 1d.

EXAMPLE: If you are a ship's engineer and you have a Fusion Tech roll of 5d+1 and a System Ops (cargo ships) of 4d+1, you can roll 6d+1 for your Fusion Tech skill rolls when working on a cargo ship's fusion reactor or engine. If you are trying to work on the reactor of a space station, you lack the System Ops skill for that environment, so you do not get the bonus.

In general, the difference between an Area Knowledge and a System Op is that the latter deals mostly with mechanical details, while the former is usually associated with geographical, cultural or social interactions. You might have Area Knowledge of the spin-habitat "Kupier Station", which confers useful, but *different* knowledge than the skill "System Ops (spin habitats)". Some tasks might fall into common ground between the skills, while some would be specific to one or the other.

Bureaucrats(new) - Knowing how to wade through the (electronic) paperwork of the federation can require a skill unto itself, above and beyond simply knowing rules and regulations. Bureacracy can be used as a help or hindrance. The right papers can open the right doors, or their lack can keep those doors permanently closed. Knowing how the system works can often be used by itself to find the best way through a tangle, but it can also be used in combination with another skill in a complementary fashion.

EXAMPLE: Your adventurer is trying to get a shipment past Customs to meet a deadline, and their knowledge of Trade Law on this planet isn't working. However, they use Bureacratics to dig up an obscure regulation about freedom of religious practice, and convinces the impatient buyer to find a religious organization who will place a purchase order. Thus armed, the adventurer goes back to Customs, and gets a +1d to their Trade Law roll to convince an obstructionist bureaucrat that they don't want to get in the way of "free worship". And even if both parties realize it is a bogus argument, everyone has followed the letter of the law and is officially "covered" if there are any problems. And so, *the shipment is released...*

If the gamemaster has certain official hurdles that need to be jumped in a particular scenario or generally in place at a particular location, the difficulty and base time required should be set according to the level of hassle involved. And remember that even if you do not have the skills to get the task done, you can spend extra time to get a modifier on the difficulty, or as a last resort, hire a local ombudsman who makes a living smoothing over such difficulties.

Cryptography(new) - This skill deals with the encoding and decoding of information, not just to keep it from being intercepted, but for mundane purposes such as image compression, enhancing detail or even things like new forms of music. Unless an adventurer is a university mathematician, their knowledge of cryptography is used in combination with some other skill. Communications or sensor operators on a starship, programmers and datathieves are the most likely users. Cryptography can either be used in a skill vs. skill fashion (with modifiers for time and equipment), or used in a complementary fashion, as part of a template skill requirement, or in a manner similar to System Ops skill when a knowledge of cryptography might be of assistance (see [page 5.12](#)).

▼ **Note!** - In **Fires of Heaven**, quantum computers and even some psionic powers make it possible to decrypt just about anything...given time. So, no matter how well it is done, an encoded bit of data can probably be decoded eventually, if someone thinks it is worth the time and effort. However, sometimes, time is of the essence. You only need your secret battle plans to stay encoded until after the battle is over. For information stored in the UW's computer networks, security is gained by simply changing the codes on a regular basis, weekly, daily, hourly or even every time the information is accessed. If it takes two hours to crack a code, and the code is changed every hour, you are just out of luck. People who want their information kept private can usually manage. And adventurers (and their enemies) can be creative...

Gambling(new) - A general knowledge of how to play (and cheat) at various games of chance. When playing in any game where chance is the major factor, knowledge of the odds and subtleties of the rules gives you little edge. Most such games would be adjudicated as a 3d+0 roll, with "the house" winning on a result of ten or better (for a fairly even game), and the player getting 2:1 return if they win. Rigged or less even games would have the house win more often. Most games where skill makes a difference require significant skill to gain a barely profitable advantage (in the long run). The way gambling skill works is a skill vs. skill roll, either against the other player or "the house". Beating their roll nets the player a one point shift in the odds for each die of difference in the skill rolls (minimum of one point shift). "The house" usually has at least a 4d+0 roll in games requiring skill.

EXAMPLE: A blackjack table has the standard odds (house wins on 3d+0 roll of ten or more). The adventurer is an expert card counter, with a skill roll of 6d+1 vs. the house roll of 4d+0. The player wins their roll, so the house now only wins on a roll of twelve or more (two point shift because the player had two more skill dice than the house). Of course, the adventurer has to place their bet *before* making their roll.

Many are the accounts of casinos or fellow gamblers getting a bit "irritable" when someone wins too much or too consistently, so a professional gambler should not be surprised to find they are on someone's "Enemy" list. Any big-budget casino will have every known security measure to make sure no contraband devices are allowed in, numerous concealed cameras, DNA scanners and the like, all connected to powerful computers with huge databases and full-time monitoring by security personnel.

EXAMPLE: If you open the front door of a major casino, odds are you just gave a fingerprint and DNA sample, your picture was taken, your height, weight and cadence measured, and everything that is a matter of public record and a lot that isn't is now floating above your image in a security monitor. Anything out of the ordinary flags you for special observation, whether it is because you wore gloves to avoid giving them a DNA sample, or you're a known psionic, a wanted fugitive or a cargo captain who just sold a big shipment and just came into a lot of money. Casinos datamine like their livelihood depends on it...which it does.

Technician(adjusted) - This is the practical (real-world) application of various academic fields, like Electronics would compare to Electrical Engineering. It is the Awareness equivalent to an Agility-based Trade skill. These trades do not have to be a narrowly defined single skill, but application of other skills is specific to the nature of the trade.

EXAMPLE: A Belter's skill of "Mining" includes aspects of geology, explosives use and even law, but these are specific to mining use. A Belt miner might know how to crack open a micro-asteroid, but not how to crack open a safe. They could quote chapter and verse of space salvage law, but know nothing about corporate mergers.

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A "technician" is the inverse of the academic skill in some respects. The tech can diagnose and repair things related to their field of study, but would take a -1d to their roll to do anything creative or new involving that field.

EXAMPLE: A "fusion tech" might be skilled at monitoring, maintaining and even repairing fusion-based technology, but they do not have the theoretical background needed to design new or improved versions of existing fusion technology.

▼ **Note** - A sufficiently intelligent (and skilled) person can have a high enough roll in theory (academic) to be good in practice (technician), and vice versa. Your "legendary" ship's engineer" would be such a person.

Scrounging(adjusted) - Scrounging serves its normal purpose. As a 1S "free skill" it only covers the needs of a specific profession or a very limited area. A destitute person might have an overall "urban scrounging" skill, or just a +0d that is specific to a particular city. A Nutoa might know the best places to find food near their home village, but not anywhere else.

Navigation(new) - There are two separate navigation skills: Astrogation covers spaceflight, including interstellar jumps; while Navigation allows air, land, and sea navigation in a planetary environment.

Adventurers with Astrogation skill can determine the exact position of their starship, plot efficient interplanetary courses, and set up interstellar jumps. A skilled astrogator can do all of these with tools no more sophisticated than those used by a 19th century sea captain, but it is a more precise and much, much less time consuming and safe to use computers and sensors (especially for the interstellar jump part).

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Basic navigation and course plotting takes about ten minutes in optimum conditions. The intricacies of plotting a jump require at least an hour to complete for the default roll. In an emergency, a jump can be set up in less time but with a greater chance of error (i.e. an increased difficulty on the roll). Note that in both cases, a star system not in the ship's database will result in a significant delay, as the ship's sensors have to acquire and categorize all planetary bodies and spatial conditions that would affect the results. Spending double the time checking and rechecking results is good for a -2 to the difficulty of Astrogation tasks, and this can be done twice for a maximum of -4 to the difficulty. Halving the time spent is a +2 to the difficulty, and this can be done as many times as the astrogator thinks they can get away with.

Appropriate Area Knowledges can be used as complementary skills to Navigation or Astrogation. Good equipment, such as a properly programmed computer, and taking extra time beyond the standard time can reduce the difficulty of both Navigation and Astrogation rolls. Failed Astrogation rolls can result in a jump error, ranging in severity from a minor annoyance to a catastrophe.

Astrogation task	Difficulty
Fuel-efficient course (10 min.)	Challenging (9)
Minimum-time course (10 min.)	Average (7)
Plot interstellar jump (1 hour)	Challenging (9)

Modifiers	Amount
Multiple-body transit	+2 per
No ship's computer	+4
No database entry for system	+2
No high-tech sensors	+2
Each light year of jump distance	+1
Quantum jump-calc computer	-2
Recent (≤ 1 month) sensor readings	-2
Jump initiated at a JumpGate	-2
Jump from within Rozhkov Radius	+6
Jump into Rozhkov Radius	+6

EXAMPLE: Lt. Wilhelm Steiner of the StarForces Navy has an Astrogation skill roll of 5d+1. His captain orders Lt. Steiner to set up a 6 ly jump from Omicron Eridani to Epsilon Eridani; a difficulty 15 task (base difficulty of 9, +6 for a 6 light year jump). Using four hours rather than one hour for a -4 to the difficulty, Lt. Steiner now has a difficulty 11 task to successfully plot the jump. If they had been at a port or been in contact with other ships in the past month, Lt. Steiner *might* have recent sensor data from the destination system, which would drop the difficulty from 11 to 9.

Later, the captain orders Lt. Steiner to chart a course for Sol, 10 ly from Epsilon Eridani. Recognizing that he has almost no chance to successfully plot such a jump, Lt. Steiner breaks it into two 5 ly jumps. Pirates attack before Lt. Steiner can complete his calculations, and the captain orders him to jump the ship to safety. Lt. Steiner calculates a 1 ly jump, a +1 to difficulty, but he only spends fifteen minutes on it (+4 difficulty), and +2 more since the quantum characteristics of the destination (an unknown point in interstellar space) is not in the database. He has to make a difficulty 16 roll to plot an uneventful jump.

If an astrogator fails a course plotting roll, they usually just take longer or use more fuel than expected. However, if they fail a jump calculation, things can be a bit less pleasant.

Failure Result

1 to 4	Jump Error: The vessel fails to jump, uselessly expending the charge in its capacitors and remaining in its original location.
5 to 8	Minor Misjump: The starship transits the jump point but emerges up to 1d+0 ly away from its intended destination. This may place the ship in a precarious situation if it was attempting to emerge close to a planet or star.
9 to 12	Serious Misjump: The vessel transits the jump point, emerging up to 10d+0 light-years from its intended destination, possibly in uncharted space. The Rozhkov Drive may be damaged by the misjump.
13+	Catastrophic Failure: The starship never emerges from the jump, or arrives inside a star, in the atmosphere of a planet or into some other disastrous situation. The Rozhkov Drive may be destroyed by the failure, as may the entire ship.

▼ **Note!** - The exact results of a mishap are *always* left to the gamemaster. Failing by 9 or more pretty much gives the gamemaster free reign to do whatever they want as far as manipulating the plot. It is never a good idea and never any fun to have adventurers be killed or otherwise removed from a campaign because of someone else's botched skill roll. Even more so when *all* the adventurers are on the same starship. You can have a series of adventures or an entire sub-campaign based around a botched jump, but reappearing *inside* a star makes this kind of difficult.

Surveillance(new) - This would be considered "shadowing" in more primitive eras, but in **Fires of Heaven** it is this and more.

Eavesdropping, surveillance, and tracking devices are highly advanced in the 23rd century, with enhanced clarity, range, durability, and anti-detection systems. Miniaturization has produced bugs that are nearly invisible to the naked eye. Equipment designed to detect and defeat bugs has also gained in efficiency. Nonetheless, these devices must be properly placed and operated, requiring skill for optimum utility. Surveillance skill covers both the placement and detection of such devices, as well as useful knowledge about their capabilities and their manufacturers.

Most surveillance tasks are a skill vs. skill contest, the skill of the person placing the device or doing the shadowing competing against this skill, the Awareness of the person or persons being watched, or any skill appropriate to thwarting information-gathering attempts. This is a measure of both the chance of the target spotting the eavesdropping or shadowing, and their caginess about how much they reveal by their movements and in their conversation or other communication.

EXAMPLE: An underworld figure might not detect an eavesdropping device, but they are smart enough that they are unlikely to make blatantly incriminating statements like "I order you to execute John Smith and his family." They would roll against surveillance skills with either Awareness or perhaps a legal, cultural or area knowledge skill to represent the ingrained habit of being careful about what you say and who you say it to.

Surveillance and counter-surveillance gadgets may have their own skill roll, independent of the user, or can be used in skilled hands to gain a bonus to Awareness or skill at spotting such devices. Situational modifiers also apply. You may be more open if you feel secure in a particular place. It might be harder for someone to get an eavesdropping device into a secure location, but if successful, the rewards could be higher.

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For straightforward shadowing tasks, the skill vs. skill roll will have modifiers based on how much someone wants to spot a tail, how much the shadower cares about being spotted, and the ease with which a shadower can follow unseen.

EXAMPLE: It would be mighty suspicious to find a tramp freighter is going to the same three obscure star systems at the same time you are. It would be far less suspicious for someone on a crowded city street to be going in the same direction as you for a few blocks.

Each person involved has to set a threshold of action and response from +0 to +6, and how these modified rolls come out determines the interaction between the two parties. Basically, whoever wins the roll gets their action, but unless the winner's *unmodified* roll *beats* the loser's roll with the modifier *reversed*, then the winner is never sure if they have been spotted. That is, any aggressiveness *increases* your chance of success, but *decreases* the chance of being subtle about it.

EXAMPLE: A shadower gives themselves a "+1" for "tenacity", which is a little suspicious, but not excessively so. An adventurer who thinks they are being followed gives themselves a "+4" in "evasion", which is fairly overt. If the adventurer has a base roll of 13 and the shadower a 14, then the adventurer loses the tail (adventurer result of 17 vs. shadower of 15), but the adventurer was never sure if they were actually being tailed to begin with (adventurer's base result of 13 vs. shadower's *adjusted* result of 13). That is, the shadower's roll is *adjusted down* by how tenacious (and suspicious) they were. But since the adventurer only tied the roll instead of beating it, the adventurer doesn't know if they were being tailed or not. The shadower is pretty sure the adventurer was trying to shake any pursuit, but doesn't know if they were actually spotted or the adventurer is just being paranoid.

On the other hand, if the adventurer had a base roll of 14 and the shadower a 12, again the adventurer loses the tail (adjusted result of 17 vs. 13), but since the adventurer's *base* roll (14) *beats* the shadower's *adjusted* roll (11), the tenacity of the shadower gives them away. The adventurer spots the tail, and *then* loses them.

Security Systems(adjusted) - In Fires of Heaven.

most aspects of this skill will be Awareness-based instead of Agility-based. Even a bicycle lock is probably electronic rather than mechanical. While some simple electronic locks or security measures can be bypassed with a screwdriver and a few pieces of wire, most tasks will require specialized (and often illegal) tools. While owning a holo-fingerprint synthesizer might not be illegal, being caught breaking and entering while in possession of one isn't going to get your bail set any lower...

Many of these tools will have their own default skill rolls, allowing almost anyone to use them with some degree of effectiveness. In skilled hands, they usually work a bit better. Normally, any such tool with an inherent skill roll can either use its skill, or give the user a 1 point shift in the difficulty of the task per full die of skill in the device.

EXAMPLE: A 2d+0 e-lockpick either gives a 2d+0 skill roll, or gives a 2 point shift to the difficulty of the task.

Mechanical locks or security systems usually require tools as well, though these do not have inherent skill rolls, and only the highest quality tools provide any bonus. Normally, the tools are simply required if the skill is to be used at all.

Lock/alarm type	Difficulty
Basic mechanical	Hard(11)
Complex mechanical	Heroic(15)
Basic electronic	Hard(11)
Complex electronic	Heroic(15)
Advanced electronic	Impossible(19)

▼ **Note** - This is an example of where a System Ops skill can often be used for a complementary skill bonus. For instance, a person who is already familiar with the technical infrastructure of a StarForces ship might get a +1d skill bonus to defeat its security systems. This person might also be able to gain access to schematics or codes that would drop the difficulty to more manageable levels. It might also be a case where specialized, one-of-a-kind tools are used to drop the difficulty to where a skilled person has a chance of completing the task. A particular criminal, military or espionage operation might have a tool designed to defeat one very specific type of system, or even one designed to defeat a *unique* security system (and thus be useless against all others).

Simply bypassing a lock does not do anything about an interlinked alarm system. On simpler systems, an alarm is part of the lock, and it is simply a little harder to defeat the lock (+1 difficulty). Other systems have dedicated alarms which require a separate skill roll (and often separate equipment) to defeat. The best locks and alarm systems simply cannot be defeated without "inside information" that helps reduce the difficulty. Inside information, especially for secure systems does not necessarily mean the system can be defeated from outside. In addition to having to do certain tasks at certain times, they may have to be done from a location that is simply not accessible from outside the area you're trying to get into. This means you have to legitimately gain access or have a confederate already in place.

EXAMPLE: It would be far easier for a spy to gain physical access to a StarForces ship's computer if the spy was already a member of the crew. It would be possible but more difficult if the spy was in a media detachment on the ship or employed by a civilian contractor involved in resupply of ship's stores, and next to impossible to simply sneak on board and gain access without already being in the ship's database of at least marginally authorized personnel.

▼ WILL SKILLS (Other)

Leadership(adjusted) - Like other social skills,

Leadership is obviously going to be affected by status differences (page 5.22). It will also be greatly affected by racial characteristics. The mindset of different races causes them to respond differently to various styles of leadership. As mathematicians, the D'eira would be more likely to follow a reasoned, sound argument, while humans have an unfortunate tendency to follow fancy uniforms, emotional appeals and the call of the herd. So, Leadership will have a specialization for each other race. If the group being led includes more than one race, the specialization only applies to one group, with a lesser roll for those who find the leadership appeal...less appealing. *Specializations: Human, Jodoni, D'eira, Nutoa, Etherean, Vorn.*

▼ **Note!** - The last two specializations are not usable by adventurers and may not even be teachable outside their respective races.

Psychology(adjusted) - See notes under this skill on page 5.11.

HEALTH SKILLS (Other)

Running (adjusted) - Running skill operates normally. This is just a note to remind you that operating at any speed higher than a walk in non-standard gravity conditions may require an Agility or zero-g skill roll to avoid mishaps, or in the case of zero gravity, drifting loose from whatever surface you are trying to move across.

Flying (new) - This is the equivalent of Running skill for species like the Nutoa which can glide or fly, and would be the professional version of the hobby skill (see **Hobbies**, **EABA** page 2.10) of using artificial wings to glide and soar in zero-g or low-gravity environments.

Carousing (adjusted) - In addition to being able to hold your liquor or other mood-altering substances, carousing skill also lets you know which substances are useful or should be avoided among alien diets. It might also be a complementary skill in certain negotiations, or when actually dealing in contraband substances (like running underground espresso bars for Jodoni stoners).

OTHER SKILLS (Other)

Hobbies (adjusted) - The level of technology, alien cultures and cosmopolitan nature of the core worlds means that there are countless activities that people engage in as hobbies. As mentioned in **EABA**, these can be bought at +1d proficiency for only 5\$. These can seldom be used in combat or for generating income, but they can often be used as complementary skills.

EXAMPLE: An adventurer who is a passionate fan of "Unlimited Fissiontorch racing" might get a +1d to figuring out how to fire one up should they ever find themselves behind the controls, or +1d to repair one, identify one on scanners, recognize a famous pilot in a crowd, and so on.

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▼ **TRAITS** - Most of the standard **EABA** Traits are usable in a **Fires of Heaven** campaign. Modifications and new Traits are below.

Age(adjusted) - Notes on how this Trait applies to alien races are on [page 5.4](#). Improvements in medical care and treatment of the diseases of old age have greatly improved human lifespan, so all *human* adventurers will be considered to have a biological age of only two-thirds their chronological age, at no cost. More accurately, each three years of age past age 16 only counts as two years for use of the Age Trait.

EXAMPLE: A human adventurer at age 31 is 15 years past age 16. In *Fires of Heaven*, they would only count as 10 years past age 16.

This is really just a matter of flavor for the campaign, like the fact that normal retirement age is now around 80 instead of 65, and many families will have surviving great-grandparents, and even great-great-grandparents. There are still people alive who were present at the launch of the *UWS Calypso* (and maybe even a member or two of its crew!). For us in the early 2000'sCE, this would be like knowing someone who *fought* in the US Civil War! And for long-term campaigns, it means adventurers will stay in a given age bracket proportionately longer.

Adventurers who wish to take advantage of antigeria treatments really just have to cough up the *one million* credits for the initial treatment, and a hundred thousand more credits each year to sustain it. The best the treatment can do is push your back one age bracket from your biological age at the time of the first treatment (specifically, to the middle of that bracket). This restores A points, which are applied evenly to Attributes at full effect, but has no effect on skills that might have been lost. However, if the treatments are applied to a starting adventurer, they can have the skill benefits of increased age, without having the negative effects on their Attributes.

EXAMPLE: A starting adventurer who somehow had a million Credits to burn could start with the S points of someone in the Mature bracket, but the A points of someone in the Physical Prime bracket.

Failing to sustain the antigeria treatment simply restarts the aging process at the current effective biological age.

Blessing/curse(adjusted) - The **Fires of Heaven** universe will use this Trait to represent certain aspects of alien biology, and the **Gifted Trait** (page 5.21) for some other aspects. Blessings and Curses generally represent an aspect of being rather than the accumulated training or physical conditioning represented by an Experience (page 5.19).

Extra limbs: Not taking a -1d penalty for taking two major actions in one turn is a small Blessing (-10A). *Vorn*.

Lifespan: Having half the normal human lifespan would be a medium Curse (+20A), while having double normal human lifespan would be a medium Blessing (-20A). Having a quarter the normal human lifespan would be a large Curse (+40A). *Jodoni, Nutoa, Etherean, D'eira*.

Life support: Being able to recycle or adjust your metabolism to avoid taking hunger, thirst or sleep effects for a month is a medium Blessing (-20A). *Etherean*.

Metal-tolerant: Being able to avoid the first -1d of effects from heavy metal poisoning is a small Blessing (-10A). *Gene-engineered human*.

Psi blocker: Reduces the effect of psi powers on an individual by 1d. *Vorn*.

Psion: The Etherean spore that allows for human psionic ability has long-term negative effects (see page 5.74). *Human psion*.

Radiation tolerant: Ignoring the first 1d of radiation damage and its other effects would be a small Blessing (-10A). *D'eira*.

Sealed body: Ignoring 1d of damage from sudden pressure changes, and ignoring the first 1d of hits accumulated from being in vacuum is a small Blessing (-10A). *Vorn*.

Enemies(adjusted) - The rules for Enemies are about the same, you just need to keep the scale in mind, and the gamemaster needs to take certain long-term campaign ideas into account. For instance, if the gamemaster expects the first part of a campaign to be an extended stay on one particular planet, an Enemy there would be somewhat devalued if the adventurers eventually left the planet and the Enemy had no reach to follow them. This would mean that either the adventurers would have to "buy down" the Enemy before they could leave the planet, or the Enemies would have to be worth less points to begin with, to take into account their lesser role in the later part of a campaign. In the former case, the existence of the Enemy might be what prevents the adventurers from leaving, and defeating or neutralizing the Enemy gives the adventurers the points they need to buy this Trait off.

Experience(adjusted) - The **Fires of Heaven** universe has a lot of potential for environmental tolerances or life experience that can reduce various penalties adventurers might otherwise take. Most of the environmental adaptations will cost 5A, while the ones based on life experience will cost 5S.

Cold-tolerant: Subtract 5°C from the minimum comfortable temperature. Humans can't be heat- and cold-tolerant.

Combat vet: Take 1d less of an Attribute penalty from armor encumbrance (you're used to working in heavy body armor).

E-suit: Avoid the -1d penalty on overall Agility and fine manipulation tasks associated with the stiffer joints and thick fingers of e-suit gloves.

Heat-tolerant: Add 5°C to the maximum comfortable temperature.

Heavy-worlder: Take 1d less of an Attribute penalty (offset up to a -3) from the effects of increased gravity on your Agility and skills.

High-pressure adapted: Take one row less effect from increased atmospheric pressure. Humans cannot be high- and low-pressure adapted.

Jump-tolerant: Reduce the effects of Jump Shock (page 5.24) by 1d. You cannot have jump sickness and be jump-tolerant.

Low-pressure adapted: Take one row less effect from reduced atmospheric pressure (**EABA**, page 7.14). Vacuum exposure will not be altered by this.

Sleep-tolerant: Add six hours to the time you can remain awake without penalty.

Spin-adapted: You are experienced with the quirks of living and working in a spin-gravity environment and offset up to -1d in Agility penalties.

Zero-g: Offset up to -1d Agility penalty (up to a -3) normally taken in zero-g or low gravity environments.

The background when or where the adventurer gained the experience should be mentioned. It adds a little flavor to the adventurer, and the player can possibly use the detail to their advantage later in the campaign.

EXAMPLE: Your adventurer got their zero-g experience from a year they spent at Kupier Station. At some random point in the campaign, they end up back on the station. Even if they are not Friends the adventurer bought with points, they might know people who can help them out in various ways.

You can make up your own Experiences, as long as they are appropriate. Remember three things:

1. An Experience offsets an *external* dice penalty (typically up to -1d or -3), or a one row shift on a table, but *never* confers any bonus.
2. An *external* penalty to a die roll is something that happens because of circumstances imposed on the adventurer (encumbrance, gravity, etc.), while an increase in difficulty usually comes from circumstances that *surround* the adventurer (poor lighting, bad footing, motion, etc.). It's a subtle difference sometimes. For instance, poor lighting is not something you would expect to have an experience with, *unless* your race is native to an environment with lower light levels than humans are used to.
3. It has to be something that is *reasonable* to have an experience for. What is "reasonable" may be different for Jodoni than it is for D'eira, so keep this in mind. If it is something that is "reasonable", but not something that can be learned, it is probably a small Blessing, *not* an Experience. For instance, a Vorn's extra limbs are a Blessing (inherent biology) that lets it avoid multiple action penalties, not an Experience that it learns.

Forte(adjusted) - There are a handful of Fortes that are specific to the **Fires of Heaven** universe. The most important is "Psion". This is a +1d to Fate for determining psionic potential (add 3 to Fate if trying to reach a minimum Fate requirement on a power).

Most of the other Fortes are on Will, and have to do with how you feel about yourself, and how your appearance affects the way others perceive you. For Fortes, it usually means you are more intimidating or have some aura about you that affects normal interaction and first impressions. Skills that could be based off of Will can use such a Forte to good effect. While the following Fortes may convey an advantage, they may also foster resentment. You may have an advantage on someone if they are intimidated by your genetically enhanced intellect, but every time you beat them with it, they will hate you just a little bit more...

Cyborg (Forte on Will): Bearers of some types of undisguised cybernetic implants (especially mil-spec hardware) are likely to be perceived as "dangerous" or "rogue elements".

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Etherean (Forte on Will): The reclusive Ethereans are very rarely seen in the United Worlds, and are a source of great curiosity to many humans. Their Forte is more of a jaw-dropping, reputation-based pause than any sort of appearance.

Genetic Engineering (Forte on Will): The horrors of the Biotech Wars instilled a fear of biotech that makes a lot of people uneasy around genetically enhanced humans. This only applies if the enhancement is visible or well known. Anyone with a physical abnormality or distinct trait who has a position of fame or power might be suspected of being gene-engineered, even if they aren't.

Known Psion (Forte on Will): Human psions are rare, making them a subject of interest to some people. The hype and mystery about psions put them in the same category as Ethereans, but with the added knowledge that a human psion has all the emotional frailties and possible psychoses of other humans, unlike Ethereans, who are seen as strange, but not threatening.

Vorn (Forte on Will): Deadly foes of humanity, the Vorn inspire terror wherever they go.

Friends(adjusted) - Friends and associates willing to lend a hand are a valuable resource no matter the era. A journalist's inside source, pirate's black market fence, or colonist's fellow settlers are all examples of Friends. As with Enemies, the overall scope and scale of the campaign will influence the cost of Friends.

At gamemaster option, Friends who are exceptionally useful or powerful people, such as the StarForces commander, a United Worlds delegate, or the CEO of a megacorp, cost 5S extra and require notes in the adventurer's background to explain them.

Alien (that is, not of *your* race) Friends may also cost extra at gamemaster option, depending on the rarity of the race in the United Worlds federation. For example, a human adventurer who has a Friend of a Nutoa starship engineer might purchase it at base cost, but one with an Etherean may cost 5S extra, since Ethereans rarely visit other worlds. To be honest, though, Ethereans are not generally Friends with anyone, adventurers or not. It's just not in their nature. The best that one could hope for is a measure of reciprocity on a past debt, and even that is subject to the limits of the Etherean psyche.

Gifted(adjusted) - The presence of passive psionic powers has led to a number of unusual talents which would be bought as being Gifted. Certain cyberware also qualifies, if the player wishes to spend A or S on it instead of money. If they do, the gamemaster can assume the investment represents a favor from someone fairly wealthy, was a health benefit for military personnel, or that it has a lifetime warranty or involves experimental self-repairing technology. That is, if the adventurer loses cyberware bought as Gifted, they can get it replaced (eventually) at little or no cost. Any adventurer with a psi-based Gifted ability may find themselves on someone's "watch" list. Any psi-based Gifted ability requires the adventurer have an adjusted Fate roll of at least 2d+2 (which may be a 1d+2 Fate roll and a +1d Forte for psi).

Precog(13A): The adventurer has a 1d+0 Awareness roll that sees *into the future*. Not much into the future, and not *the* future, but a future. On average, the adventurer is living three seconds in the future. They know when the phone is going to ring, but they don't know if picking it up ahead of time is going to make a change ten minutes from now. The adventurer automatically gets a warning about hostile intentions in their vicinity, usually worth a 2 point difficulty shift in actions taken to prevent such actions. Note that this *can* get you into trouble ("honest officer, I just *knew* he was going to take a swing at me...so I decked him first...").

Savant(10A): The adventurer has a +2d to their Awareness roll that applies to a *particular* math-related skill, such as Cryptography, Astrogation or many of the theoretical sciences.

Dragonslayer(10A): The adventurer has a +2d to their Agility roll that applies to a *particular* combat skill (unarmed, melee or ranged). They have the uncanny ability to sense trajectories and unconsciously factor in such things as gravity, wind and range, or place shots in the weak spots of an opponent's defenses. This talent is thought to be a variation on the Savant and/or Precog abilities.

Inherent Gifted abilities for the alien races and their costs are listed in their racial templates (starting on [page 5.5](#)).

Looks(adjusted) - Aside from the Vorn, who are damned intimidating to look at, Looks is just a matter of racial distinctiveness and is worth no points. No one is going to miss a D'eira in a crowd of humans, or mistake a Jodoni for a Nutoa. Aspects of Looks that qualify as a Forte or Weakness are listed in that section.

Personality(adjusted) - The spectrum of human behavior exists in the **Fires of Heaven** universe, and there are a few particular personality traits worth mentioning.

Addictive personality: Any sort of temporary ability or personality altering substance can be addicting, and some are more vulnerable to addiction than others. Each level of this is +2 to the difficulty of resisting the urge to "do it again". In the U.W., "moods" are the most common addiction. Moods are illegal drugs that induce a particular emotion. Frequent users can become psychologically addicted, relying on the drugs to artificially regulate their emotional state.

Exophilia: A fascination with aliens and anything associated with alien races. Exophilia was more common before the Vorn were encountered. Some turn their fascination into a career in the exosciences, while in others it leads to belief in alien religions, or obsessive collection of alien trinkets. Each level of this is a +2 difficulty to resist or not visibly react to the presence of something alien, particularly if it is new or unique.

Exophobia: A deep-rooted fear of alien races and most things associated with them. This often manifests as distrust, hatred, or discriminatory practices. Each level of this is a +2 to the difficulty of social or business interactions with aliens, even to your own detriment, like refusing to fly on starships with D'eira astrogators.

Prejudice: An unreasoning distrust or dislike of a distinct group, such as clones, aliens, psions, or adherents of a fringe religion, expressed as discrimination, verbal slurs and such. This is a very unheroic Trait for adventurers. A prejudice is different than a phobia, though they may share some characteristics. A person with exophobia fears aliens, but does not inherently hate them. They will go out of their way to *avoid* them. A person prejudiced against aliens dislikes or hates being in their presence, but is not afraid of them. They will go out of their way to *harass* them.

Psichophobia: A fear of psions and psi powers. Each level of this is a +2 to the difficulty of dealing with known psions, and often makes it more difficult for a psion to do anything beneficial for that person (like healing).

Technophilia: An infatuation with technology. Starship engineers, technicians, and individuals who just have to buy the latest model of everything may have this trait. Each level of this is a +2 to the difficulty of resisting the lure of new gadgets or gizmos. Technophiles may also feel a need to take things apart, just to see how they work...

Technophobia: A fear or mistrust of new tech advances. The crusty old curmudgeon who avoids what he considers experimental equipment, dislikes talking computers, prefers spin gravity to gravity plating and refuses to deal with robots is likely to have technophobia. Each level of this is a +2 to the difficulty of most tasks involving recently commercialized technology and makes it very unlikely the person will ever accept cybernetic implants or cloned organs. Adherents of some minor 23rd century religions are fairly technophobic.

Wanderlust: An inability to set down roots. Many explorers, free traders and other inveterate travelers of the spacelanes are struck by wanderlust. Each level is a +2 to the difficulty of agreeing to any commitment that ties a person to a particular place, or +2 to the difficulty of tasks in such a commitment (the adventurer is chafing to be elsewhere). This can include many job contracts, college education, marriage, or other opportunities that require long-term training.

Secret(adjusted) - Secrets can be tough to keep in the **Fires of Heaven** universe, what with advanced eavesdropping technology, psi powers and such. But, criminals still get away with things, and governments keep secrets for generations, so adventurers can probably do so as well.

There are secrets, and then there are secrets. There is a lot of suspicion that OmniCorp is up to no good in a lot of ways, but no one has managed to catch them at it yet. In **Fires of Heaven**, a Secret that is an "open secret" is worth 5A or 5S more than normal, because you have to constantly be on guard to defend the truth of the situation from those who are actively looking to find it (much like the OmniCorp example). An open secret will have effects similar to Status among certain people or groups.

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EXAMPLE: If your adventurer is a clone, and people generally suspect this is the case (but can't prove it), those who have biases against clones will tend to look down on the adventurer, even if they don't have solid evidence. Anti-clone extremists might like to make an example of the adventurer, but only hold back because of the lack of solid evidence. Pro-clone advocacy groups might resent the adventurer for "denying their nature" or on the other hand, they might give assistance to a "closet brother". And all the while, the proof of the matter remains unknown, and the adventurer strives to keep it that way.

Status(adjusted) - There are a lot of forms of Status in the **Fires of Heaven** universe, but they follow the same general rules. There is "overall" status. While this is not universally recognized, it is recognized within a culture or cross-species cultural institution. A UW Senator or planetary president would be an example. This type of status costs 10A or 10S per level, as normal. Below this is limited status, which usually operates only within a culture or environment. It may have a lot more perks than responsibilities. An interstellar pop star would have this type of status, as would someone powerful enough in the corporate world to be known in all the right circles. This type of status costs 5A or 5S per level. Outside its limited circles its effects are one level less.

Very limited status is something like police or military rank, starship captaincy, underworld notoriety and so on. Within its limited sphere, it has the same effect as any other type of Status, but outside this sphere, the effects are two levels less.

EXAMPLE: Having two levels of rank in the StarForces Navy won't get you any advantage in trying to get a room at an overbooked hotel, but one level of "pop star" might.

EABA

Very limited Status only costs 2A or 2S per level. Compared by someone to their own sphere of influence, any type of other status is counted a level less, very limited status is two levels less, and if their status is of a more expensive kind than yours, the effects are further reduced by the difference.

EXAMPLE: In the political sphere, a UW Senator with two levels of overall Status would have a status advantage over a pop star with three levels of limited status or over a StarForces colonel with four levels of very limited Status. The pop star loses a level for the Senator having a different type of status, and another level because the pop star has a less expensive type of status. The Colonel is the same, but loses another level of Status effect because his type of status is even more limited. The Senator *would* respect the other people for their status, but it would *not* be enough to influence the Senator's decisions. On the other hand, both the pop star and the Colonel respect the Senator's superior connections and influence, and they *would* be subject to modifiers on their social interactions as a result.

The types of organizations that adventurers might have Status in or be affected by are to the right. The numbers in circles next to each one indicate comparable levels in status as the UW or planetary government person would view someone else.

EXAMPLE: A major CEO ⑤ can walk into a Senator's ④ office and expect to be treated on equal terms. If the CEO ⑤ goes to a mayor's ④ office with a proposal, the CEO has the status advantage.

To compare *other* groups to each other, add one to the number for the person outside their sphere of influence. For instance, a ④ in the sphere of entertainment would command a ⑤ level of respect in corporate circles.

EXAMPLE: A StarForces lieutenant ⑦ trying to make an impression on a major underworld figure ④ (maybe as part of a secret assignment) wouldn't even get the time of day. On the other hand, a colonel ④ would rate as much respect as a local crimelord ⑤, and might be worth talking to.

Overall (10A or 10S per level)
United Worlds or Planetary government

- ① President (4 levels)
- ② Minister (3 levels)
- ② Senior Senator (3 levels)
- ③ Senator (2 levels)
- ③ Governor, large region (2 levels)
- ④ Junior Senator (1 level)
- ④ Governor, small region (1 level)
- ④ Mayor of large urban area (1 level)

Corporate (5A or 5S per level)

- ③ Major CEO (4 levels)
- ④ Major board member/Minor CEO (3 levels)
- ⑤ Minor board member/Exec.VP (2 levels)
- ⑥ Major VP (1 level)

Entertainment (5A or 5S per level)

- ④ Superstar (3 levels)
- ⑤ Star (2 levels)
- ⑥ Minor star (1 level)

Underworld (5A or 5S per level)

- ② Interstellar crimelord (5 levels)
- ③ Planetary crimelord (4 levels)
- ④ Regional crimelord (3 levels)
- ⑤ Local crimelord (2 levels)
- ⑥ Up-and-coming talent (1 level)

Military (2A or 2S per level)

- ② Branch/Fleet Command (6 levels)
- ③ General (5 levels)
- ④ Colonel (4 levels)
- ⑤ Major (3 levels)
- ⑥ Captain (2 levels)
- ⑦ Lieutenant (1 level)

Police (2A or 2S per level)

- ⑤ Commissioner (3 levels)
- ⑥ Captain (2 levels)
- ⑦ Lieutenant (1 level)

Academic (2A or 2S per level)

- ④ Prestigious, well-known academic (4 levels)
- ⑤ Prestigious award-winner (3 levels)
- ⑥ Multiple advanced degrees (2 levels)
- ⑦ Advanced degree holder (1 level)

Status is only worth this much detail because people with it tend to expect certain deference or advantages because of it. Status in the form of power in an organization makes you worth dealing with more carefully. Someone important who wouldn't think twice about having you removed might decide against it if your status would make it more trouble than it was worth. Status also indicates you are someone worth dealing with to begin with.

If you annoy someone with significant Status, you can pick up the liabilities of a new Enemy without the benefit of getting points for it!

Since adventurers will probably not start with a lot of status, it leaves open possibilities for later adventure that simply did not exist earlier in the campaign. The example about infiltrating a crime ring would be a good case. Until the adventurer had achieved enough military rank to be worth noticing, they would have no chance of getting access to the higher levels of the crime ring.

▼ **Note!** - Things like security clearances are usually tied to different types of status, typically governmental or military. Appropriately, cross-organizational status differences apply in such cases. A senator may have the same governmental status as a general, but does not have the same clearance for military secrets.

Weakness(adjusted) - There are several new Weaknesses that are appropriate to the **Fires of Heaven** setting.

Clone: Some clones are indistinguishable from ordinary humans, but slave clones may have distinctive features to help their masters distinguish them from others; total hairlessness, for example. Escaped or freed clones may suffer from an inferiority, persecution or other complexes that permeates their personality, regardless of whether or not they are true. Adventurers with this Weakness suffer a -1d penalty to Will from social awkwardness.

Jump sickness: Adventurers normally take 1d+0 non-lethal hits after a jump. Adventurers with jump sickness take this, and a -1d to Awareness for 24 hours after a jump.

Spacesickness: The adventurer takes a -1d to Health in any zero-g or micro-gravity (<.1g) environment. This will affect any Health-based skills, movement rates, and Health rolls for being stunned, but does not affect the adventurer's healing or recovery rolls.

Both of these last two Weaknesses can be mitigated but not eliminated with modern drugs. Those with social problems due to being a clone may try to correct this with mood-altering drugs, which they may become psychologically addicted to.

In the 23rd century, advanced medical care can correct many disabilities and physical ailments. Of course, not everyone has money or access to such care, but most long-term physical infirmities are a thing of the past. Still, not all physical Weaknesses have been banished by technological advances.

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Wealth(adjusted) - The Credit (abbreviated Cr) is the basic unit of currency in the United Worlds federation. One credit has approximately the same buying power as a United States dollar in 2000CE.

Wealth operates normally in the **Fires of Heaven** universe, both in terms of starting goods, cash and income potential. Certain places or planets may be economically depressed, and have an overall lower income, or certain skills or industries may be over- or undervalued (are CEO's worth their astronomical salaries?). Knowledge that a person is genetically modified or a clone may result in subtle forms of discrimination that are difficult (and expensive) to prove in court, giving such adventurers reduced financial freedom.

▼ **Note!** - For an adventurer with a 5d+0 skill roll to start the game with one million Credits in the bank and five million Credits in assets would require seven levels of Wealth, ranging in cost from 35S to 70S, depending on how much control they had over this money and assets.

The precise importance of money depends on the style of campaign. The topic will rarely arise during a game centering on colonists settling an untamed world, but income and costs are likely to be central to a free trader campaign.

As an option for a **Fires of Heaven** campaign, a group (*not* an individual) may start play with an übergadget of some kind, some item (usually a starship) that would be prohibitively expensive for an individual in terms of Wealth, but which is a reasonable sacrifice if split among a group. A group contribution totalling 75S is sufficient to warrant ownership of a cantankerous and obsolescent but reasonably safe tramp freighter with interstellar capability or a much smaller but new vessel (see [page 8.80](#) and [8.82](#)). A +5S (once only) to the cost of either is sufficient to warrant minor improvements or alteration on the vessel. The actual ownership arrangements have to be worked out amongst the players. This ship is assumed to be fully inspected, tanked, and certified for the next e-year, but all operating costs from day 1 will need to be paid by the adventurers. It is also insured for the first year for replacement value, *for travel between core worlds* (with licensed operators, doing legal business, etc., etc.). In terms of Wealth, it is "limited wealth". The adventurers have physical control of it, but have to make monthly bank payments of about 50,000 Credits a month for the next 30 years to keep from defaulting on the loan.

▼ **BIOTECHNOLOGY** - Tremendous strides have been made in the field of biotechnology, although the sense of horror instilled by the Biotech Wars of the 21st century still influences 23rd-century society's attitude toward genetic science. Engineered vaccines or temporary bacterial symbiotes are accepted forms of genetic manipulation, but even these fall under heavy government scrutiny and some say excessive safety testing before being released for general use.

United Worlds law forbids whole-body cloning and human genetic engineering, but these strictures have merely driven the practices underground. Unauthorized biolabs produce clones, often for sale as slaves, and tinker with designing better humans. Some parents-to-be hire black-market bioengineers to give their children a genetic boost over their playmates.

Meddling with DNA can be a tricky business. Altering the genetic structure of a fertilized egg cell may introduce desired traits, but at the risk of producing unforeseen undesirable changes as well. Biolabs simply eliminate defective clones, but clients seeking designer children are usually stuck with the result. Problems created by genetic engineering often remain hidden for years.

Officers of the Biogenic Crimes Division of the United Worlds Security Force, the gene cops, strive to stamp out illegal genetics labs and clone factories, but for every facility they raid another appears. Nevertheless, clones or other illegal biolab products are an interesting option for unusual adventurers. Most clones are probably escapees from their underworld masters, and may have incomplete personalities or confused perspectives on society due to their isolated upbringing.

Biotechnology for starting adventurers is a combination of Traits, making a sort of package deal. Since it is generally illegal, and in almost every case is done before the adventurer is born, it will always involve the Traits:

Unusual background(-5A or -5S): How and why the gene-engineering was done, are those who paid for it still around, and so on.

Secret(+5A or +5S): You are gene-engineered and may face discrimination, loss of career opportunities, or outright fear and hatred from some people should it be revealed.

If the adventurer had a gene-engineered clone of themselves made, and used body parts from the clone to enhance themselves, this would be:

Secret(+15A or +15S): You have committed a major crime, and could be charged under a number of statutes and made a fugitive in most of the federation should this information be revealed.

Genetic Enhancements - These are some typical genetic enhancements available in the biolabs of the 23rd century. Some are presented simply as Powers, while others are Traits. Prices charged for these procedures are included chiefly for the gamemaster's reference. As a special exception to the normal rules for creating adventurers, points *gained* as part of any genetic enhancement "package" do not count towards the normal limits on adventurer creation.

EXAMPLE: An adventurer built on 80A and 80S can have a maximum of 40 points in Traits (one quarter their total points). The points they get for the Secret of being genetically engineered do *not* count towards this limit, which effectively gives this adventurer a maximum of 45 points (or more) in Traits.

There is no difference in game terms between a low-level artificially boosted ability and a natural one. A person who naturally heals quicker (a Forte on Health) is no different than a person who had the same advantage grafted onto them in the womb. However, an adventurer with *any* genetic enhancements is *required* to have one of the previously mentioned Secrets, which really just means that tests can detect that the adventurer's genome has been tampered with. Note that this requires detailed and subtle tests. Normal DNA scans and almost all medical screenings won't pick up subtle genetic enhancements, which are designed whenever possible to mimic natural occurring (but rare) traits, or place the adventurer within but near the top of the human ability curve.

EXAMPLE: Figuratively pointing a finger and calling someone a "mutant" is a way to ruin your own reputation and credibility if you are wrong. If you lack credible evidence to back your claim, the accused is under no moral obligation to submit to any sort of detailed DNA analysis by an impartial third party. If they do submit to DNA analysis and your accusation is *false*, then they have solid grounds to sue you for defamation. If they don't submit to DNA analysis, it's just rumors and you're left standing there pointing your finger and looking silly. And they can *still* sue you for defamation of character...

Last, remember that only one Forte (or its genetically enhanced equivalent) is allowed on each Attribute.

Enhanced Immune System - A popular choice, enhanced immune system modifications boost the body's natural defenses against common illnesses. These enhancements are not always effective against alien viruses, bacteria, and other contagions, which often attack humans in unusual ways. *Net point cost: -5A, Price: 5,000Cr, Availability: Illegal.*

Forte(-5A): Boost Health by +1d for resisting infection or disease, including recovery of lost Hits from infection or disease.

Enhanced Intelligence - Some prospective parents are determined to have genius children. Many underground biolabs offer to remove the element of chance, guaranteeing brilliant babies through genetic engineering. Unfortunately, artificially boosting intelligence often but not always upsets the precise neurochemical balance of the brain, producing a tendency toward mental illness. *Net point cost: 0A, Price: 10,000Cr, Availability: Illegal.*

Forte(-5A): Boost Awareness by +1d for all cognitive tasks and skill rolls.

Personality(+5A): The gamemaster gets to assign one level of a personality trait of their choice to the adventurer. This may *not* be bought off with experience.

Low-Pressure Adaptation - Many worlds colonized by humanity have thin atmospheres, requiring inhabitants to wear respirators or other life-support gear when venturing outside. Genetic alterations can produce a person adapted to life in a lower atmospheric pressure, chiefly by enhancing blood oxygenation. Humans with this modification tire slowly in normal atmospheric pressures and can breathe thinner atmospheres, but must act carefully in oxygen-rich or high pressure atmospheres to avoid being poisoned by too much oxygen in their system. *Net point cost: +5A, Price: 5,000Cr, Availability: Illegal.*

Forte(-5A): Boost Health by +1d for all tasks related to endurance and recovery of non-lethal hits.

Weakness(+10A): The adventurer has -1d to all tasks related to endurance and recovery of non-lethal hits in atmospheres above Earth-normal pressure (and does *not* count their Forte in such conditions).

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Clones - Human clones are typically sold as slaves. Biolabs genetic engineer clones for specific uses, enhancing their value. Clones bred for slavery are often completely hairless to make it easier for slavemasters to identify (and recapture) escapees. Underworld biolabs consider their creations easily replaceable property, as do their customers, taking a dim view of clones who escape. Even so, clone slaves sometimes gain freedom through escape or raids by U.W. authorities. While the law forbids human cloning, clones themselves aren't illegal and have the same rights as other humans. Nonetheless, clones still face widespread prejudice.

DATA DUMP

Clone Warrior

Strength 3d+0
Agility 3d+0
Awareness 2d+0
Will 3d+0
Health 3d+0
Fate 1d+0



Fighting machines in human form, clone warriors are bred for combat-oriented roles as bodyguards, pit fighters, street soldiers, and security forces. They are favored by planetary crimelords and other underworld figures not only for their enhanced physiology but also for the in-vitro brain-washing provided by their creators. A clone warrior who gains his freedom may be hunted by his former owners.

Typical Traits include Ambidexterity (Forte on Agility with off-hand), Drug resistance (Forte on Health vs. chemicals), one level of reduced Status (slave/clone), a Secret (genetically modified), four levels of the Personality "loyalty to owner", and distinctive Looks (completely hairless).

Skills typically include Running, Stealth, Martial Arts, a melee weapon of some type, one or more ranged weapon skills and a Knowledge of the owner (to better anticipate and serve their needs). A clone warrior as described would cost around 94A for just the Attributes and Fortes, and a variable amount of S points, depending on experience and training. Most clone warriors worth the investment would have physical stats 1d higher than this and probably a shorter default lifespan as a side effect.

▼ **OCCUPATION TEMPLATES** - A vast number of professions are open to adventurers in a **Fires of Heaven** campaign. These templates present some of the more interesting 23rd-century jobs. Players may use these templates as starting points for creating adventurers, a quick way to dive into **Fires of Heaven** without having to agonize over every detail of making an adventurer. They are only guides for new players, however, *not* a requirement. Gamemasters can devise new templates for additional occupations. Similarly, a gamemaster who wants to encourage particular occupations might sweeten the deal by throwing in a few extra points or adding perks that are only available with a particular template.

Some templates include only skills, while others are packages of minimum required Attributes, Skills, Powers, and Traits. Advanced opportunities are available to adventurers in some fields. Adventurers who begin play with an advanced package are assumed to have progressed through the basic package earlier in their career, which may have taken several years.

The Total Cost is the cost for all listed skills. Points from Traits are listed separately after each one, and Attribute costs will vary, but the level must meet the minimum for the template. Note that Attribute minimums are what the Attribute is bought at, not how it ends up. A Jodoni exploration team wants reasonably strong people, but this is in *Jodoni* terms.

▼ **Note** - Some templates include skill requirements that are full versions of the limited free skills. In this case, the cost of the template is reduced by the cost of the free skills. For instance, if an adventurer has a free skill at a very limited +0d level (which would normally cost 1S), and the template has that skill at +1d (which would normally cost 10S), then the cost of the template is reduced by 1S.

Some templates offer players a choice from a range of skills for their adventurer, representing various specialties within the profession.

EXAMPLE: Amir is designing an ex-StarForces Navy enlisted rating. The Navy Advanced Training: Starship Crew template offers him a choice of Bureaucratics, Shuttle Pilot, Programming, Cryptography, Electronics Tech, Mechanic, Medic, or Weapons Tech. Amir decides that his adventurer served in a damage control party and selects Mechanic.

Some templates have skills listed that are not mentioned elsewhere, but the name of the skill and the template it is used in should give an immediate idea of the nature of the skill, and how it is used.

EXAMPLE: A journalist template has as one of its skills, "Conversation". It is a safe assumption this skill provides a bonus to an Attribute roll (probably Will) when used to socialize, make first impressions and generally aid a reporter in doing his or her job well.

Occupations usually come with common-sense benefits and requirements. For instance, a marshall has authorization to carry a weapon but is under strict guidelines on how it can be used, the crew of an exploration ship has pilot's licenses for their shuttle crews, a journalist has a press pass, and so on. But note that you might lose your job for abusing its privileges, and conversely, losing your job means you might lose its privileges...

Success - The qualifications listed for a template are the *bare minimum* to meet military standards or regulatory qualifications to get the papers needed for professional status. This may get you employed, but will not get you the position you may want. If your best income-generating skill is not 4d+0 or more, you are not generally considered to be a "professional", and for any job that requires official certification (pilots, doctors, etc.), not having a skill roll of 4d+0 or more means you are *not* certified.

EXAMPLE: If your adventurer meets the bare minimums for a ship's engineer, don't even *think* about applying for a job with on an Argo-Cunard liner. On any of those ships, the chief engineer's parrot knows more than you do, and his most junior assistant could out-engineer you while in the middle of a three-day drinking binge. Sure, you can still get a job as a ship's engineer, maybe even *chief* engineer. On a hundred-year old fission rustbucket registered out of some system more concerned about collecting registry fees than in making safety inspections. If you're *lucky*, you can be a junior engineer on a larger vessel that's seen hard times and can't afford to be choosy.

If there is a situation in play where there is a competitive job opening, applicants can simply roll "best three" on the relevant skill and the employer usually takes the high roll, with ties broken by the skill roll with the higher amount of dice rolled.

A lot of templates are fairly inexpensive for the reason that they are *minimum* qualifications. They get you a foot in the door and a way to make a living, while leaving enough points for the player to make the adventurer more interesting. But, to be good or respected within a profession, you will need to be better than this. Having half or more of the skills at 1d more than the minimum will get you some basic respect. Doing this *and* having more than minimum Attributes is universally recongized as competent, and it only goes up from there.

For the expensive templates like Navy Fighter Pilot, that is (or was) your life, and neither the job nor your superiors would tolerate much deviance from it. Meeting just the minimum still doesn't get you much. Your minimum fighter jock does not get assigned to elite squadrons or get to fly the latest hardware or get based off the newest carriers.

For income, **Fires of Heaven** uses the standard **EABA** pay rates, with a few exceptions. Military, police or government positions have a pay based on a skill of 3d+0, with +1d per level of status (i.e. rank). This is regardless of your actual skill. But, military life also covers room & board, and while all your equipment is not necessarily yours, neither do you have to pay for it (or pay to replace it). Also, military pay is increased by one-quarter for any month in which the adventurer is on a "hazardous duty" or on a "hardship assignment".

Anyone who uses a non-military template is assumed to get a "profession" bonus, which means their income is based on their best employable skill plus 1d, as your grouping of related skills makes you more valuable than you would be with just the base skill. Everyone else (those who do not use one of the templates) simply uses their best employable skill for income purposes, possibly with a profession bonus, with gamemaster determined adjustments for local economic or social conditions..

▼ **Note** - The gamemaster can use adventurer templates as a way to shape the campaign. For instance, if the campaign starts on a frontier world, you could say that all adventurers have to meet the requirements of a Frontier, Law Enforcement, PDF soldier or Trade template. The adventurers won't have to be currently employed in those fields, but they will have the skills associated with those backgrounds.

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Frontier Adventurers - As starfaring explorers expand the horizons of the United Worlds, unlocking the secrets of distant suns and finding new homes for humanity, the U.W.'s borders constantly expand.



Explorer:

Typically operating on the frontiers of United Worlds space, explorers seek out new star systems and new worlds for the benefit of humanity and for corporate concerns. An explorer must be part scientist, part businessman, and part soldier to carry out the diverse tasks of their profession.

Most explorers are in good physical condition, since landing parties and other strenuous excursions are part of scouting newly discovered planets. By definition, explorers are *not* homebodies; they are eternally interested in finding out what lies over the horizon.

Explorer Template

Strength: 2d+1 or more

Health: 2d+1 or more

Firearms: +0d

Medic: +0d

Knowledge (frontier systems): +0d

Shuttle pilot: +0d

System Ops (exploration ships): +0d

Cost: 25S

Colonist:

Hardy pioneers on a frontier world, colonist are a combination of explorer, entrepreneur, and soldier. As they strive to learn more about their new home, they also seek to make the colony an economic success by farming, mining, or taking advantage of other natural resources.



All kinds of experts are needed to start a colony. Administrators, farmers, miners, security officers, carpenters, laborers, metalsmiths, stonemasons, civil engineers, exobiologists, physicians, planetologists, and veterinarians are just a few of the people found at a typical early colony. Some colonists are motivated by a thirst for adventure, while others are seeking a new start in life.

EABA

A love or business gone bad, personal tragedy or family dispute could lead someone to sign up as a colonist. The colonist could be on the run, from the law, creditors, organized crime or something else, or they might be fulfilling a lifelong dream.

Colonist Template

Scrounging (choose one): +0d
A Trade or Technician skill: +1d
Area Knowledge (Colony): +0d
Firearms: +0d

Friends (fellow colonists): -5S

Cost: 30S

Law Enforcement Adventurers - While humanity has made tremendous strides, the 23rd century still falls short of a utopia. Peace officers still must be willing to lay their lives on the line to protect their fellow citizens from the predations of criminals.

Marshal:

Agents of the United Worlds Security Force, interstellar marshals enforce the law on the frontier and investigate violations of federal statutes.

The Patrol Division keeps the peace in interplanetary space and colony worlds under U.W. jurisdiction. Other divisions of the security force will investigate violations of federation laws that ban cloning and human genetic engineering, rogue psions, corporate crimes, and an array of other criminal endeavors.



Marshal Template

Strength: 2d+0 or more
Awareness: 2d+2 or more
Agility: 2d+1 or more
Will: 2d+1 or more

Bureaucratics: +0d
Surveillance: +0d
Criminology: +1d
Federation Law: +1d
Firearms: +0d
Martial arts: +0d

Friends (fellow law enforcement): -5A
Enemy (government critics/watchdogs): +5A
Personality (law enforcement mindset): +5S

Cost: 50S

Advanced Training: Patrol Marshal

Marshals of the Patrol Division are among the best known agents of the Security Force, and have earned a romantic popular image as tough but honorable men and women roaming the stars to bring justice to the far-flung corners of the federation. The truth lies not far from the fantasy. Often out-numbered and out-gunned, patrol marshals are typically highly skilled at combat as well as policing.



Advanced Training: Patrol Marshal

Strength: 2d+0 or more
Awareness: 2d+2 or more
Agility: 2d+2 or more
Will: 2d+1 or more
Health: 2d+1 or more

Bureaucratics: +0d
Surveillance: +1d
Criminology: +1d
Federation Law: +1d
Firearms: +1d
Martial arts: +1d
Area Knowledge (criminal underworld): +0d
Interrogation: +0d

Friend (fellow law enforcement): -5A
Friend (criminal informants): -5A
Enemy (important people you've arrested): +5A
Enemy (government critics/watchdogs): +5A
Personality (law enforcement mindset): +5S
Status (one level of law enforcement rank): -2S

Cost: 72S

▼ **Note** - Law enforcement personnel are best utilized in the area they are most familiar with, but as adventurers, it is more useful if they are assigned to a role or duties that allow for travel as part of their investigative duties.

Media Adventurers - News and entertainment help keep the far-flung people of the United Worlds connected with one another. Journalists, musicians, actors, and other professional in dozens of fields keep the populace up-to-date and entertained.

Journalist:

Starfaring journalists file their stories on the net or via holocast instead of in a newspaper, but the job of the reporter remains basically the same: get the facts and convey them concisely to readers or viewers.



Most reporters are assigned to cover a particular topic, or beat. Common beats include crime, government, courts, entertainment, business, politics, education, health, science, military, and interstellar affairs. A few journalists cover a specific geographic beat instead, reporting all the news from a particular city, continent, or world.

Many reporters work for a news organization, whether a colony newspaper, an online news service or an interstellar holoivid network. A few are freelancers who sniff out stories and sell them to news organizations.

Journalist Template

Awareness: 2d+1 or better

Bureacratics: +0d

Area Knowledge (news organizations): +1d

Area Knowledge (area of expertise): +1d

Conversation: +1d

Friend (street contacts): -5S

Cost: 40S

▼ **Note** - Journalists, freelance or otherwise, often work as part of a team, a "face man", a technical person to run the equipment, and a handler who is skilled at getting all the bureaucratic bits in order, like travel permits, scheduling interviews with important people, and so on. As we have seen in recent news, a bodyguard and/or local guide is also useful at times.

Fires of Heaven^{v1.0}

Military Adventurers - The all-volunteer StarForces are the military arm of the United Worlds, its first line of defense against Vorn, pirates and sundry other threats.

Marine Corps(Basic Training):

The StarForces Marines are the ground forces of the United Worlds military. They engage in planetary combat, boarding actions, starbase defense, they garrison colonies, provide security for federal buildings on non-U.W. planets and perform other tasks. They are fully prepared to fight anywhere, anytime. Marines are trained in hand-to-hand and ranged combat. They are able to operate in freefall and a variety of environments. Their skill, discipline, and physical ability make them a force that has gained them respect throughout the United Worlds.



In the 23rd century, the StarForces Marines are fully integrated. Men and women serve side by side in combat and non-combat positions. Almost all marines are human, however, as very few aliens join the Corps. Pride, courage, and loyalty are the chief motivations of Marines. From the moment a marine graduates from boot camp, they never forget that they have joined a select military force with a proud reputation to uphold. This template represents a typical Marine who has gone through basic training and has had enough field experience to round them out. A newbie just out of Basic will only have the first five skills as specialized 1S skills at +0d level.

Marine Corps(Basic Training) Template

Strength: 2d+2 or better

Agility: 2d+2 or better

Health: 2d+1 or better

Firearms: +0d

Martial arts: +0d

Tactics: +0d

Area Knowledge (military procedure): +0d

Short blade: +0d

Scrounging (choose one): +0d

Area Knowledge (current military threats): +0d

Experience (zero-g): -5S

Personality (obey chain of command): +10S

Enemy (StarForces command can disrupt your life and plans): +15S

Friend (StarForces command looks out for its own): -10S

Cost: 40S

Advanced Training: Special Forces

The elite of the elite, Marine special forces are highly trained and highly lethal. Their skills are honed to a fine edge by relentless preparation and drilling. The camaraderie and fighting spirit of special forces units is second to none. Often operating behind enemy lines, these troopers serve as scouts and forward observers.



Other covert missions carried out by special forces include intelligence-gathering, rescues, ambushes, and strikes at key positions such as headquarters units or communications centers. Special forces troopers are selected from among the ranks of conventional StarForces marines. They are almost always combat veterans picked for physical prowess, intelligence, skill, and coolness under fire. The most promising marines are invited to apply for advanced training as special forces recruits. Those who pass the intense medical, psychological, and physical screening process go to a lengthy training camp that typically graduates a third or fewer of its recruits. The remainder return to duty as conventional marines.

Retired special forces members often find work in fields that can take advantage of their skills and determination. Bodyguards, bounty hunters, security consultants and private investigators are examples. Those who left the Marines under questionable circumstances also take these jobs, but for a different set of clientele and to a different code of conduct.

Advanced Training: Special Forces

Strength: 2d+2 or better
Agility: 3d+0 or better
Awareness: 3d+0 or better
Will: 2d+2 or better
Health: 2d+1 or better

Firearms: +1d Short blade: +0d
Martial arts: +1d Stealth: +0d
Tactics: +0d Climbing: +0d
Knowledge (military procedure): +0d
Scrounging (choose one): +0d
Knowledge (current military threats): +0d

Choose one:

Medic: +1d Programming: +1d
Demolitions: +1d Security Systems: +1d
System Ops: +1d Surveillance: +1d
Running: +0d Heavy weapon: +1d
Land vehicles: +1d

Experience (zero-g): -5S
Experience (wearing armor): -5S
Experience (e-suit): -5S
Personality (obey chain of command): +10S
Enemy (StarForces command can disrupt your life and plans): +15S
Friend (StarForces command looks out for its own): -10S
Status (one level of StarForces rank): -2S

Cost: 77S



Navy(Basic Training):

Basic training prepares enlisted personnel for life in the StarForces Navy, emphasizing physical fitness, discipline, and other fundamentals of military life. They are also trained to live and work in freefall. But, no one reports for duty directly from basic training. First they attend advanced training school, which prepares them for their future duty assignment. Advanced training schools normally last anywhere from six to twenty-four weeks, depending on the complexity of the assignment. A newbie just out of training will have just the listed four skills as very specialized 1S skills at +0d level, while their specialty will be whatever cubbyhole the Navy has decided the person is best at. This could be anything from a bureaucrat to shuttle pilot.

The StarForces Navy is fully integrated, with men and women serving side-by-side aboard the starships of the fleet. The Navy attracts a higher percentage of alien recruits than the Marine Corps.

Military life has been described as long periods of tedium interspersed with short bursts of sheer panic. The axiom holds true in the StarForces Navy, where spacers may spend months on routine patrol only to be thrust into a few-hours-long battle against pirates, Jodoni raiders, or a Vorn scout ship.

Navy(Basic Training) Template

Strength: 2d+1 or better
Agility: 2d+2 or better
Awareness: 3d+0 or better
Health: 2d+1 or better

Area Knowledge (military procedure): +0d
Area Knowledge (enemy forces): +0d
System Ops (StarForces vessels): +0d
Choose a specialty: +1d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (obey chain of command): +10S
Enemy (StarForces command can disrupt your life and plans): +15S
Friend (StarForces command looks out for its own): -10S

Cost: 20S

Advanced Training: Starship Crew

Most StarForces Navy personnel fill starbase or ground-based jobs, but starship crews are the assignment most commonly associated with naval service in the eyes of the public. Spacers handle a variety of jobs aboard a starship, from comm to the engine crew. Officers may supervise, but it's the enlisted ratings who do most of the work.



After basic training, spacers bound for duty on a starship or starbase attend an advanced training course for starship crews. They learn the basics of shipboard life and receive instruction in their eventual job aboard ship. Spacers are also cross-trained to handle shipboard system controls and other basic tasks. Finally, they are taught advanced zero-g maneuvers to prepare them for long periods of weightlessness.

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Advanced Training: Navy Starship Crew

Strength: 2d+1 or better
Agility: 2d+2 or better
Awareness: 3d+0 or better
Health: 2d+1 or better

Area Knowledge (military procedure): +0d
Area Knowledge (enemy forces): +0d
System Ops (StarForces vessels): +0d

Choose one:

Medic: +2d	Starship weaponry: +2d
Fusion Tech: +2d	Interplanetary pilot: +2d
Mechanic: +2d	Bureaucratics: +2d
Programming: +2d	Cryptography: +2d
Sensor Ops: +2d	Electronics Tech: +2d
Astrogration: +2d	Antimatter Tech: +2d

Choose one:

Medic: +0d	Starship weaponry: +0d
Fusion Tech: +0d	Interplanetary pilot: +0d
Mechanic: +0d	Bureaucratics: +0d
Programming: +0d	Cryptography: +0d
Sensor Ops: +0d	Electronics Tech: +0d
Firearms: +0d	Brawling: +0d
Carousing: +0d	Antimatter Tech: +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (obey chain of command): +10S
Enemy (StarForces command can disrupt your life and plans): +15S
Friend (StarForces command looks out for its own): -10S
Status (one level of StarForces rank): -2S

Cost: 37S

EABA

Advanced Training: Fighter Pilot

Daring StarForces Navy fighter pilots challenge enemies from small, agile attack craft, engaging foes in deep-space combat using missiles and beam weapons. While more vulnerable than larger starships, fighters are capable of rapidly enhancing the force projection capability of naval vessels.



Fighter pilots, all commissioned officers, undergo extensive advanced training at flight schools before joining an active-duty combat wing. They may be stationed aboard a Battle-class carrier or attached to a naval starbase. Pilots are assigned to squadrons and given often colorful callsigns for comm purposes.

Pilots are typically very physically fit, not only to meet StarForces Navy requirements but because they must withstand tremendous g-forces in combat flying. Human science has not yet progressed to the point of designing inertial dampers to reduce the effects of high acceleration and sudden course changes on pilots.

Pilots have a reputation as brash, somewhat rebellious men and women possessed of a supreme confidence in their own abilities. In actuality, precision, teamwork, and professionalism underlie the devil-may-care exterior affected by many pilots.

Advanced Training: Navy Fighter Pilot

Strength: 2d+2 or better
Agility: 3d+1 or better
Awareness: 3d+0 or better
Health: 3d+0 or better

Knowledge (military procedure): +0d
Knowledge (enemy forces): +1d
System Ops (StarForces vessels): +0d
Shuttle pilot: +2d
Starship weaponry: +2d
Astrogation: +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (obey chain of command): +10S
Enemy (StarForces command can disrupt your life and plans): +15S
Friend (StarForces command looks out for its own): -10S
Status (two levels of StarForces rank): -4S

Cost: 64S

Planetary Defense Force Soldier:

Independent worlds are protected by local defense forces, typically a small core of professional soldiers supported by a militia that can be called to active duty in emergencies. These forces are responsible for ground and near-space defenses, normally defined as extending to lunar orbit or the equivalent. Of course, all worlds can call on the StarForces for assistance as needed.



Often underfunded, many planetary defense forces rely on surplus or outdated StarForces ships, weapons, and other equipment. This template represents a typical planetary defense force enlisted rating. Militia members typically only have specialized (1S) versions of the listed skills and may have less dedication and discipline. PDF soldiers have a sometimes deserved reputation as the bottom of the barrel, rejects who couldn't make it in a core world military force. They have also been heroic first-line defenders against the Vorn, fighting not to defend the federation, but their own homes and families.

Planetary Defense Force Soldier Template

Strength: 2d+0 or better
Agility: 2d+0 or better
Health: 2d+0 or better

Firearms: +0d
Brawling: +0d
Short blade: +0d
Knowledge (military procedure): +0d

Choose two:

Medic: +1d Bureaucratics: +1d
Mechanic: +1d Electronics Tech: +1d
Fusion Tech: +1d Programming: +1d
Running: +0d Firearms specialization: +1d
Cryptography: +0d Stealth: +1d
Land vehicles: +1d Heavy weapon: +1d

Personality (obey chain of command): +10S
Enemy (planetary command can disrupt your life and plans): +10S
Friend (planetary command looks out for its own): -5S

Cost: 25S

Starship Crew Adventurers - Whether a military vessel, independent freighter, or private yacht, every starship requires a crew. A number of specialized positions must be filled in order for a starship to safely traverse the void of space. Like all other specialized jobs, the qualifications listed are the minimums. Barely meeting the specs means you get the marginal jobs (and the marginal employers).

Command:

Command personnel provide the leadership necessary to keep a starship operating. On small ships, the captain often fills this role alone. On larger starships, they may be assisted by several lesser officers who take charge of various departments aboard ship. Command personnel in many cases worked their way up from other positions in a starship crew, so they still have a good amount of background knowledge and can take on many roles in an emergency situation.



Command Template

Awareness: 2d+2 or better
Will: 2d+2 or better

Leadership: +1d
Area Knowledge (starship regs): +1d
Area Knowledge (crew): +0d
Bureaucratics: +1d
System Ops (civilian starships): +0d

Choose two:

Programming: +0d Interplanetary pilot: +0d
Astrogation: +0d Sensor Ops: +0d
Fusion Tech: +0d Starship weapons: +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Status (two levels within spacer community): -4S

Cost: 64S

Fires of Heaven^{v1.0}



Civilian Astrogator:

Astrogators are tasked with plotting safe, fast and usually fuel efficient interplanetary routes and interstellar jumps. Ships with a small crew will sometimes combine navigation and piloting into one job, but on larger vessels this critical chore usually warrants a specialized position.

In addition to navigation skills, astrogators are trained to use computers to help perform the precise calculations necessary for a successful jump. Sensors are needed to determine the exact position of the starship and gather data on gravitic and magnetic fields that could affect formation of a jump singularity. Given the potentially deadly consequences of a misjump, navigators tend to be sticklers for detail.

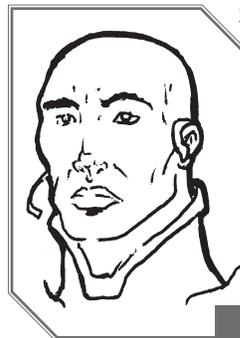
Astrogator Template

Awareness: 3d+0 or better

Programming: +1d
Astrogation: +1d
Sensor Ops: +1d
System Ops (civilian starships): +0d
Area Knowledge (trade routes): +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (methodical): +5S
Status (one level within spacer community): -2S

Cost: 47S



Starship Engineer:

Starship engineers monitor, maintain, and repair all ship systems, from the galley to the power plant. Engineers have a not undeserved reputation as inveterate tinkerers who perpetually strive to squeeze one more bit of efficiency from whatever systems they oversee. They also have a deserved

reputation as people who like to tinker with just about any kind of gadget, and who tend to use ship systems in unauthorized ways ("fusion vodka" being a prime example).

Starship Engineer Template

Awareness: 3d+0 or better

System Ops (civilian starships): +1d
Fusion Tech: +1d

Choose three:

Mechanic: +0d Electronics Tech: +0d
Sensor Ops: +0d Antimatter Tech: +0d
Programming: +0d Scrounging (parts): +0d
Brawling: +0d Carousing: +0d
System Ops (StarForces starships): +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (tinkerer): +5S
Status (one level within spacer community): -2S

Cost: 42S

Roughnecks:

Almost all jobs on a starship require *some* technical training. Some require strong backs, too. Roughnecks are cargo handlers, lower-grade assistants and other crew who are easily hired and easily fired, more often than not because of their own attitudes. But, there are a lot of ports where you don't want strangers unloading your cargo, or where having a few rough-and-tumble types with your ship's insignia on their sleeve is a useful thing. Many roughnecks have a checkered military past, or are two steps ahead of someone who has it in for them.



Roughneck Template

Strength: 2d+2 or better
Agility: 2d+0 or better
Will: 2d+2 or better
Health: 2d+2 or better

Area Knowledge (starport dives): +1d
System Ops (civilian starships): +0d
Brawling: +1d

Choose four:

Programming: +0d Shuttle pilot: +0d
Astrogation: +0d Sensor Ops: +0d
Firearms: +0d Electronics Tech: +0d
Short blade: +0d Cargo exoskeleton: +0d
Mechanic: +0d Carousing: +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Enemy (someone doesn't like you): +5S

Cost: 50S

Trade Adventurers - The business world of the 23rd century offers plenty of excitement, from free traders fighting off pirate attacks to covert corporate trade wars.

Corporate Executive:

The interstellar corporations of the 23rd century wield tremendous influence and power. Executives manage far-flung commercial empires, competing with rival firms and each other to fulfill ambitions both corporate and personal. Wealth and power accrue to the winner, while the loser faces bankruptcy or even a bullet to the head. This template represents a junior exec clawing his way up the corporate ladder.



Corporate Executive Template

Awareness: 2d+2 or better

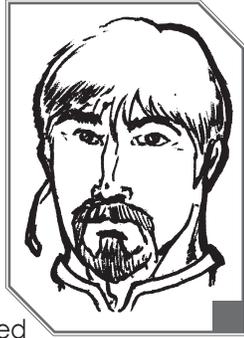
Business Law: +1d
Economics: +1d
Specialization: +1d
Area Knowledge (high society): +0d
Area Knowledge (your corporation): +0d

Personality (ambitious): +10S
Enemy (corporation watches bottom line): +5S
Enemy (someone else wants your job): +5S
Friends (quid pro quo inside the company): -5S
Wealth (one level of direct wealth): -5S
Wealth (one level of indirect wealth): -5S
Status (junior executive): -2S

Cost: 37S

Free Trader:

Free traders have allegiance to neither employers, corporations, or higher authorities. They travel where they want, buying and selling cargo in pursuit of profit in the stars. While the glamorous image of a free trader is an independent starship operator, this is a minority of the free traders. Most free traders are really just skilled cargo brokers, buying goods and then paying a shipping line or other cargo hauler to get the goods to their destination (often going along for the ride to make sure the deal goes through).



Independent freight haulers tend to be rough-and-tumble sorts, always on the lookout for trouble from pirate attack to bar brawl. They set great store in taking care of their own affairs, and are more likely to turn to other free traders for assistance than rely on outside help. Grudges and rivalries abound between free traders, sometimes going back generations, but all disputes are put aside when outside trouble threatens.

Free traders are superior businesspeople. Paying off a starship loan, buying fuel, replacing worn-out components, and meeting other day-to-day needs requires consistent profits and leaves little room for error. Successful free traders excel at sizing up the risks and returns of a venture. Some are scrupulously honest, while others are the lowest cheats. Some tramp freighters belong to so-called "ship families". Several generations live and work together aboard their often-rattletrap ships as they travel from port to port in search of cargoes. A complex, insular society, difficult for outsiders to penetrate, has arisen among the ship families of the federation.

Free Trader Template

Awareness: 2d+1 or better
Agility: 2d+1 or better
Will: 2d+1 or better

Area Knowledge (trade regulations): +1d
Area Knowledge (trade routes): +1d
Economics: +1d

Choose two:

Firearms: +0d Bureaucrats: +0d
Brawling: +0d Shuttle pilot: +0d
System Ops (civilian ships): +0d
Scrounging (ship parts): +0d

Experience (zero-g): -5S
Personality (independent): +5S

Cost: 40S

Fires of Heaven^{v1.0}**Belt miner:**

Often operating solo to trim costs, the zero-g miner spends their time in asteroid belts searching for valuable ores. Once they find a deposit, the miner stakes a claim with the governing authority. They can extract and sell the ore themselves, or sell the claim to a corporation; some prospectors are under contract with mining companies, agreeing to turn over all claims in exchange for a regular salary with bonuses for good finds. Working alone, far from established shipping lanes, means the belt miner has to fill every crew function themselves, since if something goes wrong, no one else is going to be there to make it right. They are often former crew from civilian or military vessels, and may have left those jobs under less than favorable circumstances.



The dream of finding a legendary strike that brings untold wealth has become an obsession with many prospectors. Others enjoy the self-reliant, rough-and-tumble lifestyle of the belts. Belt miners and prospectors have a (not always accurate) reputation for being slightly eccentric if not downright anti-social.

Belt miner Template

Awareness: 2d+2 or better
Agility: 2d+1 or better

Astrogation: +1d
Sensor Ops: +1d
System Ops (civilian ships): +1d
Interplanetary pilot: +1d
Mining: +1d
Firearms: +0d
Starship weapons: +0d
Brawling: +0d
Mechanic: +0d
Electronics Tech: +0d
Fusion Tech: +0d
Medic: +0d

Experience (zero-g): -5S
Experience (e-suit): -5S
Personality (independent): +10S

Cost: 85S

Underworld Adventurers - As in any society, some U.W. citizens choose to pursue lives of crime.



Datathief:

Datathieves work the sophisticated computer networks of the 23rd century, stealing information for clients or just for fun. Some toil for underworld employers, but the best are independent contractors. A few even become security experts for the corporations whose computers they used to infiltrate.

Cybernetic enhancements, particularly brainware, are almost a necessity for netrunners, and have become quite fashionable in the datathief subculture.

Datathief Template

Awareness: 3d+0 or better

Programming: +1d

Hacking speciality: +1d

Cryptography: +1d

Area Knowledge (local datacops): +1d

Area Knowledge (datanets): +1d

Friends (information broker): -5S

Enemy (corporate infosecurity): +5S

Enemy (U.W. infosecurity): +5S

Gifted (neural computer interface): -10A

Cost: 45S, 10A

Pirate:

Pirates prey on commercial shipping for their livelihood. They hijack cargoes by force of arms and sell the ill-gotten goods on the black market. Modern pirates share the romantic, swashbuckling image of their historic predecessors in the eyes of the public, but in truth nearly all are violent, cruel, and depraved. Murder, rape, torture, and other vile acts are routine for freebooters taking a freighter.



The StarForces Navy hunts pirates relentlessly, and those who are captured stand trial in federal court. The death penalty can be invoked for piracy, but this depends on the circumstances of each case. The unwholesome reality of piracy makes this an inadvisable career choice for adventurers. A retired or reformed pirate crew member is another possibility, and the template assumes this.

(ex)Pirate Template

Strength: 2d+1 or better

Agility: 2d+1 or better

Health: 2d+1 or better

Will: 2d+1 or better

Firearms: +1d

Short blade: +1d

Starship weapons: +0d

System Ops (civilian starships): +0d

Area Knowledge (trade routes): +0d

Choose two:

Shuttle pilot: +0d

Astrogation: +0d

Medic: +0d

Mechanic: +0d

Fusion Tech: +0d

Electronics Tech: +0d

Brawling: +0d

Security Systems: +0d

Experience (zero-g): -5S

Experience (e-suit): -5S

Personality (disdain for authority): +5S

Friends (black market traders): -5S

Enemy (StarForces has a file on you): +5S

Cost: 50S

Yakuza Kobun:

Crime syndicate foot soldiers, yakuza kobun are practitioners of traditions dating back more than five centuries to feudal Japan.

The *kobun*, Japanese for "children", are the lowest-ranking members of yakuza syndicates. Modern yakuza recruit people of all genders and ethnic backgrounds, although kobun of Japanese descent often go farthest in the organization. Kobun carry out the criminal enterprises of the syndicate, ranging from gun smuggling to financial crimes to murder for hire.



Yakuza gangsters are intensely loyal and deferential to their superiors. Tattoos, slang dialects, and arrogant behavior remain part of the modern yakuza mystique.

Yakuza street soldiers tend to have an affinity for body modification, especially combat-oriented enhancements. Kobun who are "on their way up" in a syndicate often opt for black-market implants, such as bionic limbs or enhanced senses, to elevate their value to the organization, both in effectiveness and by showing that they have no intention of ever leaving the Yakuza (being equipped with illegal implants does limit your employment opportunities).

The corporate world feeds the lower ranks of the kobun. Especially among corporations owned or influenced by the yakuza, workers who are disciplinary problems, who can no longer be profitably employed due to injury, or who are just plain laid off, can often find work as a kobun (and the "family" pays for any bionic limbs needed. This assistance in time of need is one reason that kobun are as loyal as they are. *Fear is another.*

Yakuza Kobun Template

Strength: 2d+1 or better

Agility: 2d+1 or better

Health: 2d+1 or better

Will: 2d+1 or better

Firearms: +1d

Short blade: +1d

Martial arts: +0d

Language (yakuza slang): +0d

Area Knowledge (their region): +0d

Choose two:

Bribery: +0d Gambling: +0d

Stealth: +0d Carousing: +0d

Surveillance: +0d Land vehicles: +0d

Area Knowledge (yakuza): +0d

Looks (yakuza tattoos): +0S

Personality (loyalty to Oyabun): +15S

Friends (Oyabun): -5S

Enemy (police record): +5S

Cost: 35S

Fires of Heaven^{v1.0}

I was in a bar on Shen Nung a few years back when this guy came in and challenged everyone in the place to arm-wrestle. The stakes were a drink a match. It was a pretty tough crowd, and it didn't take too long before he had a whole line of challengers waiting. He beat everyone in the bar, me included. Didn't even break a sweat.

I ran into him again a few weeks later at some other bar. Bought him a drink and learned his secret - he was an ex-marine who'd lost his right arm in the Interstellar War. They replaced it with a bionic arm four times stronger than a normal one.

He'd mustered out six months before I met him, and hadn't paid for a drink since.

- Harrison Booth, free trader, 2234CE

▼ **POWERS** - Powers are generally used in **Fires of Heaven** to represent abilities beyond human norms. They may be used to create equipment, represent alien abilities or, in certain cases, abilities for human adventurers. Powers have been touched on before in this chapter, in the form of Gifted abilities for an alien race or which are acquired through genetic engineering or mentioned as notes in adventurer templates, but this section will go into detail on what is available, and how it works in case you want to design powers on your own.

Most powers possessed by humans fall into one of two categories: they are either cybernetic or psionic in nature. The handful of psi powers that the adventurer has no real control over are usually bought as being Gifted ([page 5.21](#)), while those which can be controlled, or turned on or off at will are usually bought as powers. Most cybernetics will fall into the latter category.

▼ **CYBERNETIC POWERS** - Medical technology has made possible replacement of lost limbs and organs with mechanical body parts that function identically to their organic counterparts and are in many cases nearly indistinguishable from the real thing. Transplanted cloned organs are a more expensive option that offer some advantages over bionics.

Enhanced models are also available, providing added strength or other advantages. Elective cyberware implants, while less common, are available for those seeking an extra edge over their non-enhanced rivals.

There are some drawbacks to cybernetic devices, such as the inability to heal damage and certain vulnerabilities. While cybernetics are uncommon, they are generally accepted in the United Worlds. Some people may look askance at someone who would willingly mutilate his body for an *elective* implant, and in certain groups cybernetics are abhorred, but for the most part cyborgs face little prejudice.

In fact, in some subcultures, such as the shadowy world of netrunners and datathieves, some cybernetic implants are regarded as highly desirable. A few cybernetic devices have been outlawed by the United Worlds government due to the extreme medical risks involved. Illegal implants can be purchased on the black market at extortionate costs, however.

Purchasing Cybernetic Powers - Cybernetics can cost both character points and money to purchase, depending on the usefulness of the cyberware and when it is obtained. *Skip to page 5.42 if you are just interested in buying cyberware rather than trying to design it.*

As a power, most cybernetics will have the following framework in **Fires of Heaven**:

Type	Requirements	Cost
-	Starting cost	0
■	Special effect (invisible)	+10
◆	Independent focus	+60
■	State-based duration	+15
●	Cannot be altered	-10
●	Requires mundane skill	-5
	Framework base	+70

Some items will fall outside this framework, and their specific modifiers will be listed in the description of that piece of cyberware.

In detail:

■ **Special effect (invisible):** Most cyberware is either internal or designed to be a cosmetic replacement for a lost body part. Cyberware does not ratchet, clank, whir or hum, and unless it is damaged so that its parts show through, it is not readily distinguishable from the real thing. Spotting it would be a Heroic(15) sight Awareness task, or a Hard(11) tactile Awareness task. Cyberware is readily detectable by scanners and any device that can pick up the power sources and other electromagnetic emissions, and most commercial scanners include a regularly updated database of known legal and illegal cyberware and their scan profiles. Cyberware that has this modifier twice is designed to either not show up on scanning devices, or to mask its signature as something other than what it is. Such masking is illegal and fairly difficult, and often relies on questionable interface techniques or other tricks that would not pass a consumer safety audit...

◆ **Independent focus:** Cyberware can technically be used by anyone, with certain obvious limits (like having an empty space to put a bionic arm in). Cyberware is self-powered and can continue to exist and sometimes even function without its original user. Entirely passive devices (like razornails or bonebonding) would use "requires focus (-10 modifier) instead.

■ **State-based duration:** With the exception of weapons, cyberware is on whenever the user wants it to be, as long as they want it to be. In the case of limbs, this is usually all the time. In the case of other implants, activating it is usually only a minor action.

● **Cannot be altered:** Once an item is built, that's what it is. A bionic arm is a bionic arm. Even more, a bionic arm is a right-side bionic arm or a left-side one. Bits and pieces of one type of cyberware might be cannibalized to repair another type, but that is about it.

● **Requires a mundane skill:** Almost all cyberware requires mental training or retraining in order to use it, as mentioned earlier. A person might be let out of rehab with a specialized 1S skill like "walking with bionic leg", but normally at least an overall +0d skill is required for someone to be considered proficient with the cyberware. This means that in addition to the monetary cost, most cyberware effectively costs 5S for a +0d skill at using it.

Other modifiers - In addition to the above, there will be modifiers for the size of the implant or device:

- Small (neural or sensory implants) -0
- Medium (small weapons, hands) -5
- Large (artificial limbs) -10

Remember that this is just the *framework* cost. The modifiers for what the cyberware does are in addition to this. Also note that the facility making the cyberware and the time it takes to make it will reduce the point cost. There is no “mass-market” cyberware. It is *all* fairly sophisticated, and even in the 23rd century requires a medical professional to install and tune it for proper operation. So even while a piece of cyberware may have a large corporate name behind it, the actual size of the industry or division making the items is quite small compared to overall corporate revenues.

The table below is simply an extension of the gadget rules in **EABA**, modified for the time spent. The numbers represent the difficulty of successfully building a piece of cyberware with the appropriate total of modifiers in the listed time.

Gadget points	Success Difficulty	w/6d roll	Time spent	Points
0	0	100%	15min	-20
1	1	100%	23min	-21
2	2	100%	30min	-22
3	3	100%	40min	-23
4-5	4	100%	1hr	-24
6-7	5	100%	1.4hr	-25
8-9	6	≈100%	2hr	-26
10-12	7	≈100%	3hr	-27
13-15	8	≈100%	4hr	-28
16-18	9	≈99%	6hr	-29
19-22	10	≈98%	8hr	-30
23-26	11	≈96%	11hr	-31
27-30	12	≈92%	16hr	-32
31-35	13	≈86%	23hr	-33
36-40	14	≈77%	32hr	-34
41-45	15	≈65%	45hr	-35
46-51	16	≈52%	64hr	-36
52-57	17	≈37%	90hr	-37
58-63	18	≈24%	125hr	-38
64-70	19	≈12%	181hr	-39
71-77	20	≈4%	250hr	-40
78-84	21	≈2%	362hr	-41
≥85	22	0%	500hr	-42

To figure out the difficulty of building a piece of cyberware or a subassembly of a piece of cyberware, simply subtract the time level involved in the construction from the point total of the item and see what the table says. Use of the time level rather than the standard time modifiers (**EABA**, page 6.5) gives you a broader range of possibilities, and the lab modifiers take into account the tweaks needed to make it work in the **Fires of Heaven** universe.

For common and uncommon cyberware, it is guaranteed for time increments with a difficulty of 11 or less (if the roll is failed, they'll do it again at their expense).

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Illegal cyberware is never formally guaranteed, but the reputation of a black market operation may be such that they will back their product, or perhaps charge slightly extra for “guaranteed work”.

Any time level of less than 26 (less than 2 hours), *regardless of the difficulty*, is considered a “rush job”, and will cost double per hour for each time level below 26. A cyberware job *never* takes less than 15 minutes (time level of 20) and any job involved enough to require subassemblies will take at least 2 hours per subassembly. A job that is “whenever” (anything more than a time level of 26 and less than a difficulty of 11) costs half as much per hour per longer time increment (they're doing other people's jobs first and fitting yours into slow periods). It will cost less overall, but it will take longer to get it.

EXAMPLE: You have a piece of cyberware that uses the standard framework numbers (+70), is a large focus (-10), has +50 in normal modifiers, and is built using the factory modifiers for common cyberware (-55).

This gives us:

Framework cost	+70
Subtract lab size	-55
Subtract focus size	-10
Add other modifiers	+50
Result	+55

Then we decide how much time is spent on building it. We want the minimum time that gets us a final difficulty of 11 or less (to get our guaranteed product). A difficulty of 11 is 26 points of gadget, so we use a time level of 55 (raw points of gadget) minus 26 (points for a difficulty of 11) for a time level of 29 (6 hours). So, this gadget (or a subassembly) will cost six hours worth of parts & labor.

If we wanted it in an hour (time level of 24), the final gadget points would be $55 - 24 = 31$, which would be a difficulty of 13, and cost like four hours of parts & labor (double price for each time level below 26).

A job can never cut its points to less than one-third (round down) by the time spent on the job. This fraction is *before* any modifier for subassemblies. As a side effect, this means the maximum points (before subassemblies) for a job that has a final difficulty of 11 or less is 80 (since one-third of 80 rounds to 26, the maximum points for a difficulty of 11).

EXAMPLE: The previous example was the cost of an mil-spec bionic arm, which has -20 in cost from having four subassemblies. *Without this modifier*, the arm would have a cost of 75 points. One -third of this is 25 points, which means you get no benefit from any extra time spent that would drop the final points to 25 or less. Since a point total of 25 is a difficulty of 11, it means we will never be able to get a discount on the price for being willing to wait (since that requires a final difficulty of *less than* 11).

Subassemblies - Some pieces of cyberware are just too complex to build as a single item. You can decrease the number of points by having it built in subassemblies or installed in stages. Each time you double the number of subassemblies, you get a -10 modifier on the cost. Each subassembly is built or installed separately, with its own monetary cost and difficulty to build. You can never cut the points in a piece of cyberware by more than one-quarter by using subassemblies (round to nearest 10 points).

EXAMPLE: If we use the 75 point cyberware from the previous example, we could have it built as four subassemblies for a -20 modifier to cost (one-quarter of 75 rounds to 20), for an adjusted cost of 55. If each one took six hours to build, it means there is a total of twenty-four hours of work and cost involved.

If a subassembly roll is failed, the buyer is only delayed by the time it takes to redo the failed subassembly, and if the work is not guaranteed, they simply have to pay for that fraction of the work to be repeated. In general, incomplete cyberware does not work at all (a car missing its engine is not a working car).

Other notes - The "hits" listed after the name of a piece of cyberware is how many lethal hits are taken as part of the installation surgery (details on [page 5.54](#)). The time is the total build/install time for the item or the sum of its subassemblies.

All cyberware, regardless of how long it takes to build, has a minimum cost of one hour of parts & labor, which covers not only the cost of the item, but the tests required to program the interface and the surgery itself will make up the difference. Illegal jobs or those which are at difficulty 12 or more require payment in advance, and if the cyberware doesn't work properly, you were warned ahead of time and do not get a refund. All costs for the pre-designed cyberware use subassemblies sufficient to drop the difficulty to 11 (or as close to 11 as possible), and have a cost based on total construction time.

Building cyberware - A "common" piece of cyberware will have the following manufacturing parameters:

Type	Requirements	Cost
-	Starting cost	+10
■	Basic lab	-10
■	Only this gadget	-10
■	8x normal size	-20
■	Assistants(16)	-25
	Lab modifier	-55

This will result in a gadget that costs about 300Cr per hour of construction time. The "starting cost" is a system tweak particular to that type of lab and the **Fires of Heaven** universe.

Uncommon cyberware will have a smaller facility and less people involved. On the negative side, the lab modifier is only -30. On the plus side, the cost for the labor is only 150Cr per hour.

Illegal cyberware is usually built by one person and possibly an assistant. The modifier for this sort of lab is only -5, and has a default cost of only 50Cr per hour of work. However, the illegal nature of the work usually multiplies this by a factor of ten or more.

▼ **Note** - As you may have noticed, for any sort of gadget, cyberware or not, the biggest factor in the cost and difficulty is how big a factory is making the item. Even the most absurdly powerful item can be made cheaply in a matter of minutes if you have a big enough economy of scale. However, the economy of scale does nothing for you unless there is sufficient demand for the product to warrant that factory to begin with. In the world where you're reading this, that's why you can buy a small car for 10,000 Credits, but also have to spend that much for a high quality prosthetic limb. For instance, in **Fires of Heaven**, costs for bionic limbs are fairly stable. They were more expensive right after the Interstellar War (there was more demand than supply), but now the demand is fairly flat, and suppliers are meeting it with existing facilities.

▼ **Note** - Everything up to this point is just another way of looking at the standard **EABA** rules for making gadgets (**EABA**, page 6.43), in particular, the difficulty based on the points in the gadget, and now many subassemblies are in the gadget. Note also that the success percentages on the table on the previous page left are based on 5d+2 roll, not a 6d+0 roll, because the +2 lets you reach difficulties of 19 or 20.

Power sources - Cybernetics that are designed to be used on a more or less constant basis (like limbs), and those whose power use is very small (like senses) are typically powered by a combination of integrated systems appropriate to the device in question. Items with a low power requirement may have an osmotic cell that generates electricity from normal blood chemistry. Items with higher power needs can often continually recharge anywhere near a power grid via inductive links, recharge off of thermal differentials between the body and the outside temperature, and may have a very small tritium power cell (15 year lifespan) that can slowly recharge the system if no other source is available. Items like bionic limbs are generally considered to have the same endurance as the adventurer, if for no other reason that they are ultimately limited by fatigue in the muscles and ligaments the limb is attached to.

Weapons and other pulsed power implants will have a number of charges, and the difficulty of making the device will depend on how many charges it holds. You would subtract 15 from the modifier total (removing state-based duration), and then add the modifier for the number of uses.

Other costs - For building a cybernetic gadget, the monetary costs assume a particular size of "gadget lab", which is based on the demand for that type of cybernetics in the **Fires of Heaven** universe. In addition, many cybernetics will have a cost in adventurer points for two reasons:

First, while interfacing a device with the human nervous system is a fairly foolproof process in the 23rd century, it is still not an easy one. The recipient of the cybernetics must train themselves to use the device. Every cybernetic device has a separate Agility or Awareness skill required to use it, like "Bionic right arm use: +0d". Limbs acquired in pairs only require the skill be bought once. Normally, you do not have to roll this skill, but you would have to roll any time that an Awareness or Agility task would be required for a normal body part. That is, a limb or a sense is treated just as though it were part of your real body.

Second, some powers may have the "power costs +3A" modifier in order to make them more affordable, or as a surcharge because they would otherwise be too tempting for adventurers to abuse.

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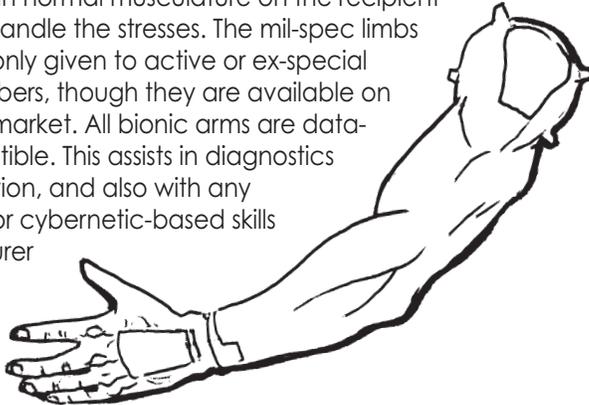
On the other hand, cybernetic powers may as a side effect, give the adventurer points. Specifically, any sort of limb replacement will automatically give the adventurer a 10A or 20A Weakness related to the missing body part or parts, like a Weakness on Health for movement purposes called "missing both legs", which is worth 20A, or maybe a Weakness on Agility or Strength of "missing one arm", which would be worth 10A. This Weakness will be negated when the replacement limb or limbs are in place, and in fact the adventurer's stats may be superior to what they would be with natural limbs.

Acquiring cyberware in play - An adventurer who starts play with cyberware can make up their own story of how they got it. Getting it in play is another matter. Worlds without at least a Beta-class starport probably will not have the facilities to make or install cyberware other than DIY projects, though such facilities and expertise could be imported if enough Credits were tossed around.

So, adventurers needing restorative cyberware or wanting elective cyberware have to go to where it is available. Generally, there will be half a dozen to a dozen specialized medical facilities that deal with cyberware on a planet. These medical facilities generally do not manufacture the cyberware, they just install it. A prospective buyer has to set up an appointment, where all the biomeasurements and readings are taken and then forwarded to the manufacturer of the cyberware, who then makes the item to order and programs it to a usable baseline. It is then shipped by courier to the medical facility. The buyer then comes back to have it fitted, and program tweaking done. After this, there is a schedule of physical (or mental) therapy to acclimate the user to the cyberware (and vice versa). This takes about a month, with weekly visits and time spent at home practicing. After this, the user is marginally capable of using the cyberware. For instance, they might be able to walk with a bionic leg, but have difficulty running. Aside from one specialized task, all use of the cyberware will be at -1d until a full +0d skill is developed. Adventurers who already have the experience points saved up for this can acquire the +0d level of skill in three months, and if they choose to get a higher level, they can use saved experience at the rate of 5S per three months of game time.

EABA

Bionic arm - Comes in three varieties, normal (2d+0), enhanced (3d+0) and mil-spec (4d+0) strengths. The normal model is limited to 2d+0 Agility, however, which means that the limb cannot use an Agility skill at more than +2d level (maximum skill roll of 4d+0). The other models have an Agility up to 3d+0, but not more than the Agility of the person the arm is fitted to. The more powerful actuators in the high and superior strength limbs require a higher than normal musculature on the recipient in order to handle the stresses. The mil-spec limbs are usually only given to active or ex-special forces members, though they are available on the civilian market. All bionic arms are dataport compatible. This assists in diagnostics and installation, and also with any computer- or cybernetic-based skills the adventurer might have.



▼ **Note** - All cybernetic enhancements paid for by the StarForces are considered StarForces property. While they are not going to come around and leave you limbless, if you are convicted of a crime that involves abuse of StarForces property, they will certain downgrade your limbs with the lowest-grade replacement hardware that still allows you to function.

Normal bionic arm (1 hit/2 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 1d effect	+10
●	Dataport compatible	+5
Total		50
Cost		600Cr

This would be the "basic healthcare" model. No frills, no extra functions. The total of 4d effect in the arm is split between 2d+0 Strength and 2d+0 Agility.

Enhanced bionic arm (1 hit/12 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 3d effect	+30
●	Dataport compatible	+5
●	Requires min. Strength of 2d+0	-5
	Two subassemblies	-10
Total		55
Cost		3,600Cr

This model could be covered by standard health plans, but only with an extra premium. Those with special job needs can get a 7,200Cr model that has interchangeable "tool hands" for special purposes (two extra hands included in this price).

Mil-spec bionic arm (2 hits/24 hours):

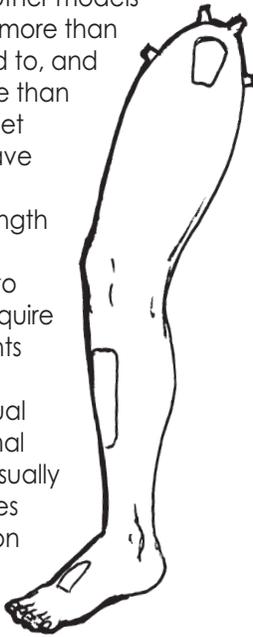
Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 4d effect	+40
●	Dataport compatible	+5
●	Requires min. Strength of 3d+0	-10
●	Tool hands	+5
	Four subassemblies	-20
Total		55
Cost		7,200Cr

This is the strongest commercially produced bionic arm. This model comes standard with removable tool hands for special purposes (usually related to the soldier's mission specialty). It has wireless dataport access in the palm, allowing it to send and receive data from any similarly featured item in the hand (most military weapons have this capability).

Soldiers who do not meet the minimum Strength requirements for this arm would be mustered out with the enhanced arm. Those with a technical specialty would get the tool-enhanced version.

▼ **Note** - Most external cybernetics will have a maintenance cost in normal use of about 10% of their new price per year. Artificial skin has to be replaced, occasional factory diagnostics have to be performed, etc. Failing to keep up with required maintenance will eventually degrade performance of the cyberware.

Bionic leg - Like the bionic arm, it comes in three varieties, normal (2d+0), enhanced (3d+0) and mil-spec (4d+0) strengths. The normal model is limited to 2d+0 Agility, however, which means that the limb cannot use an Agility skill at more than +2d level (maximum skill roll of 4d+0). It also has a Health of 2d+0 for movement purposes. The other models have an Agility of up to 3d+0, but not more than the Agility of the person the leg is fitted to, and a Health of 3d+0 or 4d+0, but not more than the Health of the other leg (you only get enhanced running capability if you have two bionic legs). The more powerful actuators in the high and superior strength limbs require a higher than normal musculature on the recipient in order to handle the stresses, and bionic legs require more durability and power components because they are in use almost all the time. All bionic legs have limited manual dexterity, no more than that of a normal person's toes. The mil-spec limbs are usually only given to active or ex-special forces members, though they are available on the civilian market. Bionic legs are usually not dataport compatible. They have port for diagnostics, but there is less need for them to have the ability to send and receive data compared to bionic hands.



Those in zero-g environments who need bionic legs may opt for ones with prehensile toes. Using tools with the feet is handled by the usage skill with the limb, and the cost of such a bionic leg would be the same as for a bionic arm (note that it would use punch damage in combat instead of kick damage).

Normal bionic leg (1 hit/4 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 3d effect	+30
●	No fine manipulation ability	-5
	Two subassemblies	-10
Total		50
Cost		1,200Cr

This would be the "basic healthcare" model. No frills, no extra functions.

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Enhanced bionic leg (2 hits/8 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 7d effect	+70
●	No fine manipulation ability	-5
●	Requires min. Strength of 3d+0	-10
■	Power costs +6A	-20
	Four subassemblies	-20
Total		50
Cost		2,400Cr

This leg has 4d+0 Strength, and up to 3d+0 Agility and Health. The enhanced leg does not provide any movement ability faster than the Health in the other leg.

Mil-spec bionic leg (2 hits/128 hours):

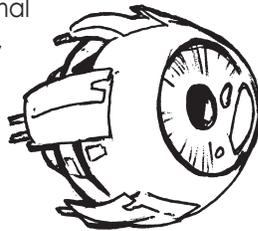
Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(300Cr/hr)	-55
●	Large focus	-10
■	Acts as an Attribute	+30
●	Increased 9d effect	+90
●	No fine manipulation ability	-5
●	Requires min. Strength of 3d+0	-10
■	Power costs +9A	-30
	Four subassemblies	-20
Total		60
Cost		38,400Cr

This leg has 5d+0 Strength, and up to 3d+0 Agility and 4d+0 Health. The enhanced leg does not provide any movement ability faster than the Health in the other leg. Even for special forces, this leg is only an option if *both* legs were lost in combat, so an adventurer wanting a pair needs 18A and either the money, or to be built on a special forces type of adventurer template and have an unusual background to explain how they lost their legs and why they were deemed worth the investment by the StarForces. And it *still* costs 18A.

▼ **Note** - Not everyone who needs a bionic limb needs a whole limb. Hands, feet, forearms and lower legs may need to be replaced due to accidents or combat damage. In general, these partial replacements have a modifier total about 2 points less and a monetary cost of about half the normal model (they are smaller, which makes them more costly, but less capable, which offsets this and then some). Their Attributes are limited to a subset of the possible uses. For instance, a bionic forearm does not have the enhanced shoulder musculature needed for a full-strength punch, but it does have its full Strength for gripping purposes. Most partial limb replacements are not available in mil-spec versions.

Cybernetic senses - The normal senses can be lost or damaged as easily as limbs, often more so. Especially for sight in an era where laser weapons are common, even with protective eyewear. However, the advent of regen therapy means that most injuries to delicate neural membranes can be repaired, making cybernetic replacement unnecessary in most cases.

Bionic eye: These come in three varieties: normal, quality and enhanced. The normal eye provides a 3d+0 sight Awareness roll, and compensates for a lost eye, nothing more. The quality version has up to a 4d+0 sight Awareness roll, and the enhanced version provides a 4d+0 sight Awareness roll, plus abilities outside the normal visible spectrum.



Normal bionic eye (4 hits/8 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
●	Only for sight Awareness	-5
	Four subassemblies	-20
Total		50
Cost		1,200Cr

Older StarForces field hospitals could install these in fairly short order, with an interchangeable set of different sized eyes, colored irises and a standard sensor package. Even without the skills provided by physical therapy, most people can regain near-normal sight in a few hours, though the bandages are normally not removed until the injury is nearly healed. Note that newer field hospitals usually have regen tanks as well, so unless the eye is completely destroyed, regeneration is the preferred option.

Enhanced bionic eye (4 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
●	Increased 1d effect	+10
●	Only for sight Awareness	-5
	Four subassemblies	-20
Total		55
Cost		3,600Cr

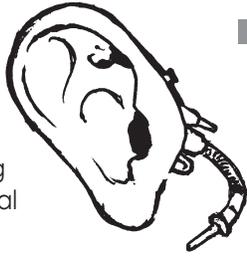
The enhanced eye has no special abilities, but its 4d+0 Awareness roll gives it an acuity which a trained user can take advantage of in marginal situations.

Mil-spec bionic eye (4 hits/128 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
●	Increased 1d effect	+10
■	Special effect	+10
●	Dataport compatible	+5
■	Power costs +3A	-10
●	Only for sight Awareness	-5
	Four subassemblies	-20
Total		60
Cost		19,200Cr

The mil-spec eye has either low-light or thermal capability (each with benefits and limitations), and can send and receive optically-encoded dataport information. This also allows it to work with a neural interface, allowing the eye to be used as a camera which some other piece of cyberware can store or transmit the information from.

Bionic ear: This is a similar implant, and comes in two varieties, normal and enhanced. The normal version provides excellent hearing (3d+0 hearing Awareness roll), and the enhanced version extends this hearing range above and below that of normal humans, plus is dataport compatible.



Normal bionic ear (2 hits/4 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
●	Only for hearing Awareness	-10
	Two subassemblies	-10
Total		50
Cost		600Cr

Enhanced bionic ear (4 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
■	Special effect	+10
●	Dataport compatible	+5
●	Only for hearing Awareness	-10
	Four subassemblies	-20
Total		55
Cost		3,600Cr

Bionic nose: Not all that common, but it exists and is legal. It gives the user a 3d+0 smell Awareness that also operates in a particular range of scent that humans normally are unaware of. This could be something like human pheromones, explosives, narcotics, carbon dioxide, etc. This would be chosen when the implant is bought and normally cannot be changed.

Bionic nose (4 hits/8 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
■	Special effect	+10
●	Only for smell Awareness	-10
	Four subassemblies	-10
Total		50
Cost		1,200Cr

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▼ **Note** - For those who do not object to having noticeable bionics (and there is a cyborg sub-culture), removing the special effect from the modifier total allows these individuals to pack in extra capacity. Parabolic bionic ears that swivel to pinpoint sounds, telescopic eyes with zoom lenses and so on. At the moment, these are looked down on by "straight" **Fires of Heaven** society much like 20th century types might look down on piercings and tattoos.

EM sniffer: This is a specialized sense that is "patched in" to the nerve pathways of another sense, (usually sight) giving the user a 3d+0 Awareness roll to detect them. It is designed to pick up a particular band of the electromagnetic spectrum, like radiation, low, medium or high radio waves, or even just the "noise" that most types of unshielded electronic devices emit. The implant trades fine resolution for range, and normally operates by putting direction cues at the fringes of vision, color-coded to match intensity. Looking directly at the source would give equidistant indicators from all directions, allowing you to easily pinpoint the source. The actual sensors are usually mounted *inside* the face and take up a small part of the sinus cavities. Note that the directional indicators work directly on the nerve pathways, and so can provide indications even in darkness or if the user is blinded.



EM sniffer (4 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
■	Special effect	+10
●	No fine detail	-5
■	Power costs +3A	-10
	Four subassemblies	-20
Total		55
Cost		3,600Cr

EABA

Neural interface - This bit of cyberware simply allows limited thought-based commands to be given to cyberware and external devices, and it also acts as a hub to allow different pieces of cyberware to interact with each other. For instance, a person with a bionic eye and a transceiver implant or memory implant could not transmit or store pictures without a neural interface. It can also scroll text across the bottom of a person's field of vision via a patch to the optic nerve. In game terms, it can act as a means to link or program your own cyberware, or to receive input from external devices.

EXAMPLE: If you wanted to be a hacker who could plug directly into a network and issue commands by thought alone, you would need a neural interface (probably the advanced model).

Task	Difficulty
Link two pieces of internal cyberware	5
Link to external dataport device	7
Add time-based command	+2
Add complex action	+2

EXAMPLE: If you had a bionic eye that you wanted to link with a transceiver implant, you would roll your skill with the interface and try to get a 5 or more. If you wanted to link the bionic to an external dataspoke, and have it start recording an hour from now, that would be a difficulty 9 task (external link plus time-based command). Once you make the roll, the function you have activated remains until you make another roll to disconnect it.

Neural interface (8 hits/4 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
◆	Conveys information	+15
●	Dataport compatible	+5
	Two subassemblies	-10
Total		50
Cost		600Cr

The advanced model has a medium resolution patch to the optic and auditory nerves, which allows the user to see and hear information or its symbolic representation in their head without resorting to headphones or external displays.

Advanced neural interface (8 hits/64 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
■	Acts as an Attribute	+30
◆	Conveys information	+15
■	Power costs +6A	-20
●	Dataport compatible	+5
	Two subassemblies	-10
Total		60
Cost		9,600Cr

▼ **Note** - A neural interface is *not* required if two implants are to be permanently linked together in some pre-determined way. For instance, a loyalty implant connected to a cortex bomb...

Psych implant - Most of the time, psych implants are ordered by the U.W. courts as part of a parole or release requirement in cases where a genetic or induced psychological condition is the contributing factor to an individual's problems with the law. Each 1d of effect (3d for the normal implant) counters one level of a particular type of Personality.

Psych implants are usually triggered by a combination of nerve activity in a particular region of the brain, and chemical signatures associated with that type of behavior (stress, nervousness, etc.). *It is not an exact science.* Some behaviors cannot be treated at all, while treating others may have unwanted side effects on innocuous behaviors. The courts generally defer to the judgement of U.W. medical professionals when deciding on requests for parole or early release based on psych implant therapy. Parole officers can read the status of the implant with a handheld wand, and check how often it has triggered, when and to what level.

Psych implant (8 hits/64 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
◆	Subverts Attribute	+40
●	Only vs. a particular disorder	-10
	Two subassemblies	-10
Total		60
Cost		9,600Cr

Yakuza and other criminal organizations may have their own version of psych implants, designed to take away the fear of death, or reduce disloyalty. However, old-fashioned methods like mind-altering drugs and making an example of traitors are still the preferred ways to deal with such problems. *Very few disloyal people are so useful to the Yakuza that they need to be kept around...*

Memory implant - A memory implant allows storage of up to a dataspike's worth of info, usually by way of a neural interface. It is also connected to vocal nerves, allowing the user to make voice notes that can be recalled at a later time. However, the normal use of the implant is as an adjunct to the user's own memory. It does not substitute for or give any inherent skill, but it provides the benefits of a complementary skill (**EABA**, page 2.7). This would be +1d to an *existing* Awareness skill roll of 6d+2 or less. Imagine having an entire rack of reference texts on a subject that you can mentally riffle through when you need them, or an entire customer database or corporate personnel roster. In addition, it gives a second opinion on things like astrogation calculus, lets you split a bar tab seven ways in your head and makes sure you are not getting ripped off when dealing with local currency exchange rates. You can change the contents of a memory implant in about 15 minutes. Time-sensitive database updates (astrogation, stocks, etc.) can be subscribed to for an additional 1000Cr per year.

Memory implant (8 hits/64 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
●	Increased 2d effect	+20
◆	Conveys information	+15
●	Only for a particular skill	-5
	Two subassemblies	-10
Total		+60
Cost		9,600Cr

The combination of neural interface, memory implant and transceiver implant are almost *de rigueur* for upper level executives. Combined with a worn camera, a glance around a room can link to corporate or public databases elsewhere and bring up names, family, pertinent facts and miscellany that the executive can use to good effect in any conversation ("I can't believe he remembered me after all this time...").

Processor implant - A processor implant is very small computer that the user can utilize to perform background mathematical tasks. It is not as capable as a desktop or ship computer, but it can perform the same function as a memory implant for certain real-time skill (Agility instead of Awareness skills). For instance, it can calculate a new point of aim to compensate for changes in local gravity or movement that might affect shooting a gun. It might interface with a vehicle computer to help judge exactly how tight you can take a turn without losing traction, or exactly how close to the ground you can get before pulling the cord on a parachute.

Fires of Heaven^{v1.0}**Processor implant (8 hits/64 hours):**

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
●	Increased 2d effect	+20
◆	Conveys information	+15
●	Only for a particular skill	-5
	Two subassemblies	-10
Total		60
Cost		9,600Cr

Both memory and processor implants are meant to help with a *particular* skill, and are connected to neural pathways and memory chains particular to the way you have learned *that* skill. As a result, while it *could* be reprogrammed for a different skill, it would not work as well. If it worked at all, it would only provide a +1 benefit instead of a +1d benefit.

▼ **Note** - Not all skills are legal to enhance with these implants, or are only legal for particular types of backgrounds. In particular, combat-related skills. These can be installed by black-market clinics, but usually at a difficulty greater than 11.

Transceiver implant - This provides a limited two-way audio and video communication capability. The user can sub-vocalize to talk privately, or patch auditory input so that everything they say and hear is transmitted. They hear incoming transmissions via a patch to the auditory nerves. Similarly, the user can see transmissions and send what they see, though at lower quality.

Transceiver implant (8 hits/64 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Small focus	-0
◆	Technological range	+25
◆	Conveys information	+15
●	Reduced 1d effect	-10
	Two subassemblies	-10
Total		60
Cost		9,600Cr

The implant acts as a 2d+0 audio transceiver for purposes of range and cutting through interference. This is reduced to 1d+0 for visual images. Transceiver implants are usually dedicated to one frequency range or are set to standard videophone protocols. Both have basic encryption, but is readily cracked by those with the knowledge and hardware (though this is illegal without a wiretapping warrant).

Internal organs - Most internal organs can be replaced with stem cell-based clone organs. These can take months to grow, or due to technological limits on the frontiers, simply be unavailable or your health plan might not cover the extra cost. The cybernetic replacement organs are supposed to be simple replacements, but if cloned organ replacements are unlikely, the user usually manages to get some extra capability built in.

Most artificial organs have several unique effects. First is that of replacing an internal organ. You cannot say one organ is particular to any one Attribute, but this is bought as "creating a living item" with a total of 6d in effect, enough to support a person with a Strength and Health of up to 3d+0 each. For the heart, the special effect provides a one row shift for all purposes relating to exertion in non-standard conditions (provided a skill roll is made to access these functions). The last limitation is pretty obvious. For organs other than the heart, the effect is just as fatal, but not quite as immediate.

Artificial heart: In addition to performing its normal duties (without requiring a skill roll), a person who knows the right biocues can accelerate or decelerate its function, allowing them to program a torpor that uses less food, water and air, or automatically increase blood flow to compensate for thinner atmospheres.

Artificial heart (8 hits/8 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Medium focus	-5
◆	Creates living item	+10
●	Increased 3d effect	+30
■	Special effect	+10
●	You immediately die without it	-15
	Four subassemblies	-20
Total		50
Cost		1,200Cr

Artificial liver: This provides short term energy storage for the body, and also filters certain toxins from the system. Artificial livers are not uncommon among explorers, who are exposed to unusual alien toxins or microorganisms, and may find it easier for a shp's doctor to simply "change their filters" than travel back to a high-tech world for a cloned replacement liver.

Artificial liver (8 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(150Cr/hr)	-30
●	Medium focus	-5
◆	Creates living item	+10
●	Increased 3d effect	+30
■	Special effect	+10
●	You die without it	-10
	Four subassemblies	-20
Total		55
Cost		3,600Cr

A customized liver provides a 1d bonus to Health for resisting, offsetting or recovering from a *particular* toxin. For instance, filtering alcohol out of your blood, or giving you an inherent resistance to a certain kind of venom. It can also, on command, dump energy reserves into the bloodstream, which can shift an exertion category by one row, once (cannot repeat until you recover all lost non-lethal hits, or at least an hour).

The same template is used for artificial lungs and kidneys.

Artificial lungs: In addition to extracting oxygen from the air and expelling carbon dioxide, the lungs can also filter some gaseous toxins from the blood, allowing them to be expelled when you exhale. Customized lungs can provide a 1d counter to a particular airborne toxin or provide a one row shift to offset an increased or decreased environmental pressure or altered oxygen content.

Artificial kidneys: These serve a filtering function like the liver, but also help regulate fluid balance. Customized kidneys can provide a 1d counter to salt- or metal-tainted water, or a bonus to Health when the body needs to conserve water.

Illegal implants - Because implants are readily detected, ones that are illegal by U.W. law have to have the "sanitized" modifier (+10), which makes them undetectable by normal scanners.

The cost in credits for illegal implants assumes that the implant is made in subassemblies that are only Hard(11) to complete. You can alter the cost and difficulty at your own risk.

Most people accept the prices of legal cyberware because the price and results are guaranteed. Since illegal cyberware does not have this sort of guaranteed consumer protection, one can choose the level of risk desired. Most illegal outfits that are concerned about their reputation will guarantee any "full price" work they do. All their business comes from word of mouth advertising, so happy customers are desirable. *One must still be wary.* Some outfits with good reputations have them because their failures never leave the operating table (dead clients don't complain).

Illegal implants that require a skill to use are left to the end user. A dataspine and maybe a virtual reality program are provided, but the outpatient care that is available to those getting legal implants just isn't available.

Enhanced organs - These are cybernetic replacement organs that have some capability whose use has some inherent dangerous side effect, or which has no apparent legal use. These are mostly replacements or augments to the stress, fight or flight responses of the body.

Adrenaline pump: On command, it floods the body with hormones associated with fighting or running for your life. Until the high wears off, the user gets a temporary boost to their strength, endurance and willpower, allowing them to do tasks that would otherwise be impossible.

Adrenaline pump (8 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(500Cr/hr)	-5
●	Small focus	+0
■	Adds to an Attribute	+30
■	Sanitized	+10
●	Damages user's hits	-10
●	Works on self only	-5
●	Damage happens <i>after</i> effect	+5
■	Power costs +6A	-20
	Four subassemblies	-20
Total		55
Cost		12,000Cr

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When the pump is activated, the user gets a +1d to their Strength, Health *and* Will for all purposes (which can at gamemaster option include the hits they can take). The effect lasts one minute (instead of being state-based). At the end of the minute, the user takes 1d+0 non-lethal hits from the stress placed on their system. The adrenaline pump does not have a cumulative effect, but it can be re-activated before the old effect wears off. Damage can be delayed by continuing to activate the implant, but all the side effects will accumulate and happen simultaneously when the effect wear off. Assume you cannot handle more consecutive uses than your number of normal Health + Will dice.

Endorphin pump: On command, this implant pumps the user full of natural painkillers. It doesn't prevent the person from *taking* damage, but it does prevent them from *feeling* it.

Endorphin pump (8 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+70
-	Lab modifier(500Cr/hr)	-5
●	Small focus	+0
■	Special effect (+3 hit brackets)	+30
■	Sanitized	+10
●	Damages user's hits	-10
●	Works on self only	-5
●	Damage happens <i>after</i> effect	+5
■	Power costs +6A	-20
	Four subassemblies	-20
Total		55
Cost		12,000Cr

Giving a person +3 hit brackets makes an average person almost twice as hard to take down. Like the adrenaline pump, the effect lasts a minute. When it wears off, the euphoria fades and is replaced with a temporary funk or depression that saps the user's strength (1d+0 non-lethal damage). This effect can be delayed by continuing to activate the implant, but all the side effects will accumulate and happen simultaneously when the endorphins wear off, just as for the adrenaline pump. In addition, the user has to make a roll appropriate to the highest damage threshold they have crossed without the effects of the implant.

EXAMPLE: A normal person takes a -1d penalty at 5 hits. Under the influence of a endorphin pump, this would be increased to 8 hits. If the person took 6 hits while "under the influence", they would take no game effect, but when it wears off they are counted as having just crossed the -1d threshold.

EABA

Cortex bomb: A cortex bomb is just that, a small explosive device planted in the brain. It would be designed to activate if triggered by another implant (like a psych implant), by receiving a coded radio signal, or after a certain amount of time if it does not receive a coded radio signal. A person in danger of a cortex bomb going off gets a mental buzzing whenever it is triggered, and has six seconds to alter the circumstances that triggered it (if this is possible at all).

Cortex bomb (8 hits/12 hours):

Type	Requirements	Cost
-	Lab modifier(500Cr/hr)	-5
◆	Independent focus	+60
●	Consumed focus	-20
●	Small focus	-0
■	Special effect (invisible)	+10
■	Lethal damage	+40
■	Sanitized	+10
◆	Triggered power	+10
●	Power lasts an instant	+0
●	Six seconds to activate	-5
●	Works on self only	-5
●	Cannot be altered	-10
■	Power costs +9A	-30
	Two subassemblies	-10
Total		55
Cost		6,000Cr

The effect of a cortex bomb is a 3d+0 lethal attack inside the user's skull. This would normally be increased to 4d+0 for the location, and is almost certain to be fatal.

▼ **Note** - It is extremely common for the 9A cost of this implant to be paid for by gaining a Personality that tends to make the implantee avoid situations that would tend to set it off...

Neurolash: This is similar in concept to a cortex bomb, but not as quickly fatal. It is wired directly into the pain pathways of the body, rather than to the brain itself. The controller can zap the implanted individual for any amount of non-lethal damage they want (0d+1 to 2d+0), to virtually any part of the body, whenever they want (within range of the transmitter). If the victim takes all their hits, extra damage is counted as lethal damage. This implant requires no skill to use.

Neurolash (8 hits/24 hours):

Type	Requirements	Cost
-	Framework base	+75
-	Lab modifier(500Cr/hr)	-5
●	Medium focus	-5
■	Special effect (invisible)	+10
■	Non-lethal damage	+20
■	Sanitized	+10
●	Reduced 1d effect	-10
◆	Triggered power	+10
●	Works on self only	-5
●	Touchy	-5
■	Power costs +6A	-20
	Four subassemblies	-20
Total		55
Cost		12,000Cr

Immunity: An illegal immunity is an implant designed to counter some tool normally used by U.W. law enforcement. This could be chemical sprays, stunners, truth drugs, etc. It might even be something like altering a person's joints so they can more easily escape restraints! An "immunity" only provides a benefit against one of these problems, not all of them!

Immunity (4 hits/12 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Requires a focus	-10
●	Medium focus	-5
■	Special effect (invisible)	+10
●	Prevents an effect	+30
■	Lethal damage	+40
■	Sanitized	+10
■	State-based duration	+15
●	Cannot be altered	-10
●	Only vs. a specific attack	-10
	Two subassemblies	-10
Total		55
Cost		6,000Cr

The net effect is a 3d protection against that particular specialized attack. Exactly how this is implemented depends on the nature of the immunity. This implant does not require any skill to use.

Bone bonding: In this process, high-strength ceramics are fused into the person's bones, and genetically engineered microfibers are woven around the muscles, joints and ligaments. The result is a person who is physically much harder to hurt and disassemble with damage. They get an overall armor of 3d+0, and their Hit Brackets (**EABA**, page 2.19) are increased by 1. This armor will layer with any worn armor for increased effect. The armor effect is increased by +1d on the head.

Bone bonding (16 hits/24 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Requires a focus	-10
●	Large focus	-10
■	Special effect (invisible)	+10
●	Prevents an effect	+30
■	Lethal damage	+40
■	Sanitized	+10
■	Special effect (+1 hit bracket)	+10
■	Enhanced	+5
■	State-based duration	+15
■	Power costs +3A	-10
●	Cannot be altered	-10
	Four subassemblies	-20
Total		55
Cost		12,000Cr

While the components for bonebonding can be made in small labs, the surgery simply cannot be done in any normal black market clinic. Routing the entire nervous system through and around the implants is extremely complicated and not always successful. It requires the facilities of a larger outfit, usually a legal one that for some reason or another has fallen under the sway of a criminal organization, through debt, blackmail or intimidation. The illegal bone bonding surgery usually takes several procedures and is usually done with waldos while the recipient lies comatose in a regen tank. Quite often, it will require the work of several specialists for particular parts of the procedure.

▼ **Note** - The normal way of handling the side effects of bone bonding (and paying the 3A cost) is to take a Weakness on Health of "compromised immune system", which gives the person -1d on Health when exposed to or recovering hits lost to disease or infection. Another possibility is a Weakness of "decreased sense of touch", which would be a -1d to Agility when trying to do delicate work.

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Weapon implants - All cybernetic weapon implants are either illegal or the realm of special U.W. intelligence agents or undercover operatives. The preferred weapon location is the arm, but space is still very limited. There are three particular weapons used in most of this specialized category.

Razornails: For this implant, the fingernails and their growth cuticles are removed and replaced with ceramic edges that are anchored to the finger bones and which appear as nicely manicured nails. This basically allows the user to do a lethal slashing or cutting attack. Each nail is a separate armor-piercing 1d+1 lethal attack, and any successful hit does three such attacks to the same part of the body (apply them each in turn for total damage effects, as damage thresholds may be crossed).

Razornails (2 hits/4 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Requires a focus	-10
●	Small focus	+0
■	Special effect (invisible)	+10
■	Lethal damage	+40
■	Shotgun effect	+10
■	Special effect (armor-piercing)	+10
●	Increased +1 effect	+4
●	Melee range	+0
■	Sanitized	+10
●	Requires mundane skill	-5
●	Power lasts an instant	+0
●	Cannot be altered	-10
Total		54
Cost		2,000Cr

Razornails require two mundane skills. The first is whatever unarmed combat skill the user applies them with. This can be martial arts, brawling or whatever, and you can have a specialization in "razornails". The other skill is to make sure you don't give yourself away by doing things like punching holes in touchscreens, digging divots out of elevator buttons or emasculating yourself every time you zip up your pants. And don't even think about running them down your lover's back...

A much less expensive and painful option is to have the normal nails burned off (they can be regenerated later at the price of a few hours with your hands in regen tank), and have the nails simply sewn or bonded to the underlying tissue. This would be a "consumed focus" with sixteen uses (they will eventually tear loose!). These cheaper versions only cause 1 hit for the surgery and cost 500Cr.

Wristlaser: This is a normal laser pistol with its components made more compact and distributed in the arm and chest cavity. The beam burns a hole through a desensitized piece of skin on the palm when the weapon is fired. This can be covered with a patch of synthetic skin or bandage, and will heal over naturally in a day or so in most cases. Wristlasers are designed to be inductively recharged using the same method as consumer electronics, and it can recover a few shots per minute in the presence of a normal power grid or most running electric vehicles.

Wristlaser (2 hits/24 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Consumed focus	-20
	16 uses	+0
	Easily replaceable	+10
●	Mediumfocus	-5
■	Special effect (invisible)	+10
■	Lethal damage	+40
●	Reduced 1d effect	-10
●	Technological range	+25
●	Accuracy of +2	+10
■	Sanitized	+10
■	Special effect (ext. recharge)	+10
■	Special effect (laser)	+10
■	Power costs +3A	-10
	Four subassemblies	-20
Total		55
Cost		12,000Cr

A wristlaser has a number of special effects in addition to doing 2d+0 lethal damage. First, it is both concealed from casual view, and from most scanning devices. Second, it can be externally recharged. Last, it has all the special effects of any other laser weapon (see [page 10.10](#)).

The bay in which the laser is installed can be reconfigured to accept other weapons or improvements if they become available.



Nanowire garrote: A small spool of retracting nanowire has one end anchored through the thumb bones and into the wrist. The other end is attached to a false thumbnail. Reinforcement between the first and second fingers of the other hand provides an anchor for this nail, and the result is a perfectly concealed and extremely effective garrote. On a successful grab to the throat, on the following turns the attacker can do armor-piercing lethal punch damage, which can have special effects for the head location if these are used (**EABA**, page 4.8) and cause crippling injuries (**EABA**, page 5.8). As long as the grab is not broken, the damage each turn is automatic.

Monowire garrote (1 hit/6 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Requires a focus	-10
●	Small focus	+0
■	Special effect (invisible)	+10
■	Lethal damage	+40
■	Special effect (armor-piercing)	+10
●	Melee range	+0
■	Sanitized	+10
●	Only up to punch damage	-5
●	Requires mundane skill	-5
●	Requires grab maneuver first	-5
●	Power lasts as user wills	+15
Total		55
Cost		3,000Cr

Bodybomb: This is even less common than the other implanted weapons, though it has been used to good effect by the Angels of the Apocalypse so often that most government buildings and starports have upgraded their sensors to pick out just this one type of implant (only possible because of its size).

Basically, anything you can live without for twelve hours is removed and replaced with high explosives, fragments, chemical or biologic agents or some combination of the above, triggered by a timer, a dead-man switch on their heartbeat *and* a mouth clacker (click SOS on your teeth, go boom!). The incision is then sewn shut, the suicide bomber is pumped full of painkillers and stimulants and sent on their way.

Bodybomb (4 hits/12 hours):

Type	Requirements	Cost
-	Lab modifier	-5
●	Consumed focus	-20
●	Large focus	-10
■	Special effect (invisible)	+10
■	Lethal damage	+40
●	Increased 6d effect	+60
■	Power fills up to 31m radius	+70
●	Explosion effect	-10
◆	Triggered power	+10
■	Sanitized	+10
●	Power lasts an instant	+0
●	Cannot be altered	-10
■	Power costs +24A	-80
	Two subassemblies	-10
Total		55
Cost		6,000Cr

The +24A cost is usually paid by taking on crippling Weaknesses on various Attributes that will eventually result in the implantee's death (like having no digestive system). The net effect of the implant is a 9d+0 lethal explosion (9d+0 within 1m, 7d+0 out to 3m, 5d+0 out to 7m, 3d+0 out to 15m and 1d+0 out to 31m. Gases or other dispersed agents would probably adjust damage and radius, but simply fill an area rather than drop in effect with range.

Bodybombers may work alone, or as part of a larger plan, like a distraction, to take out a particular access route, power line or security system. The only real way to deal with them is to knock them out so fast they can't set off their bomb, and then get them to someplace where it won't do any real damage when it does go off.

Rumors that up to a few milligrams of Navy antimatter stockpiles are unaccounted for and the recent arrest (and subsequent suicides) of several suspected Angels have not yet been connected by U.W. Marshals...

▼ **Note** - A five microgram chunk of antimatter could generate a 12d+0 normal explosion. A five milligram amount would be about 22d+0 (roughly .1 kiloton yield).

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▼ **INSTALLING CYBERWARE** - So far, cyberware has just been a matter of adventurer points and credits. There is also a cost to be paid in flesh and blood and pain. Any sort of invasive procedure will result in temporary injury. Even replacement parts like bionic arms have to be anchored to flesh and bone.

In general, each subassembly in a piece of cyberware is going to result in the adventurer taking 2 lethal hits. This is doubled for anything that involves tampering with the brain (including senses), and is quartered for replacement parts. This means replacing something that is missing and has already healed. Cutting out and replacing something that is merely damaged (like an organ transplant) does not count as "replacement". At gamemaster option, removal and replacement of *part* of an extremity can count as "replacement parts", as can something that just displaces normal tissue.

EXAMPLE: A mil-spec bionic leg is four sub-assemblies, which would result in taking 8 hits, but since it is a replacement part, this is quartered to 2 hits. An enhanced bionic eye would be 8 hits, doubled to 16 hits for tampering with the brain, but quartered to 4 hits for being a replacement part. Chopping off a perfectly good hand and replacing it with a bionic one would probably count as replacement parts, but a conscientious outfit would let the wound heal before doing the replacement surgery.

Surgery normally takes 1 hour per hit of damage in the procedure. Normally, anything that does more than 4 hits is split into two or more procedures, each bit being tested before the next bit is added. This also allows the patient to recover lost hits faster than if they took all the damage at once. However, virtually any cyberware can be installed in one procedure if requested. Most illegal cyberware is done all at once, just to minimize the exposure of the provider.

Installing cyberware correctly is a Hard(11) medical task. Failing the roll may indicate the surgery has to be performed again, or that it was successful but complications resulted in the person taking extra hits from the surgery.

▼ **Note** - Remember that the cost you pay for cyberware normally includes installation.

Damaging cyberware - Cyberware normally is just “there” for most people, but adventurers are not “most people”. Things get abused and damaged all the time. Most cyberware has a fairly standard armor rating based on what it is expected to do:

Item	Armor	Hits
Cyberware of .5kg or less	1d+1	1
Cyberware of 1kg or less	1d+1	2
Cyberware of 2kg or less	1d+1	3
Cyberware of 4kg or less	1d+2	4
Cyberware of 8kg or less	1d+2	5
Cyberware of 16kg or less	1d+2	6
Bionic arms	1d+2	5
Bionic legs	1d+2	6
Bionic eyes	1d+0	1
Most small items	1d+0	1
Mil-spec equipment	+1	+1
Implanted (bionic ear, etc)	-1	-
Parts (bionic forearm, etc.)	-	-1
Pervasive items	n/a	n/a

EXAMPLE: A mil-spec bionic arm would have an armor of 2d+0 and 6 hits. If it were only the forearm, it would only have 5 hits.

The armor of an external piece of cyberware will layer (**EABA**, page 4.9) with any worn armor to get the total protective effect.

If a piece of cyberware takes hits, it has to make an Easy(5) roll, and gets 1d for this roll for each full 3 hits it has when undamaged (and +1 or +2 for any extra if the gamemaster allows). Remember that if the item has more than 5 hits, it will take a -1d penalty on this roll just like an adventurer would. And when an item has lost all its hits, it is destroyed beyond repair.

EXAMPLE: A bionic arm with 5 hits takes 1 hit in damage. It gets a “Health” roll of 1d+2 and has to roll of 5 or more to keep working. Otherwise it folds up under load just like a crippled limb would. If this had been a mil-spec arm with 6 hits, it would have gotten a 2d+0 “Health” roll to do this.

Damaged cybernetics can be repaired at a cost proportional to their lost hits. Purely functional repairs usually take about an hour and are only an Average(7) task. Poor facilities will either increase the time or the difficulty. Repairs that involve cosmetic repair of external cyberware usually take at least eight hours (+6 time levels), though these can be exchanged for extra difficulty (like +3 time levels and +3 difficulty).

Special modifiers - Not all cyberware is created equal. *Especially the illegal kind*. The generic bonuses and penalties in power construction can be used to good effect here, as well as a few of the other modifiers that have been ignored until now.

These modifiers can help represent obsolete or experimental cyberware, illegal modifications, black market reprogramming and all the other fun things gamemasters want to do. These modifiers will alter the total points in the cyberware, which in turn may adjust the cost or difficulty unless the total of the benefits is offset by an equal amount of limitations.

EXAMPLE: An adventurer wants a pair of mil-spec bionic legs, which is normally 60 points of gadget and a lot of money. The gadget has a 30 point reduction in its cost because it costs +9A (it would be a 90 point gadget without this modifier). This is the part the adventurer doesn't like, because it means a cost of 18A for the pair! The adventurer instead uses a 20 point reduction for “costs +6A” and takes the other 10 points in “readily visible”. Their mil-spec cyberlegs are just as functional as anyone else's, but all the synthetic skin and padding has been stripped off. Even in long pants, anyone who even brushes into the adventurer will know they have bionic legs, though only those with military experience will know them on sight as mil-spec models. A pair of them only costs 12A, which the adventurer has more than covered by the Weakness of “missing both legs”, which is worth 20A.

Another use for the special modifiers is to offset the injury taken from installation of the cyberware. Offsetting -10 in “subassembly” modifiers halves the injury taken as well as halving the cost.

- **Additional +1 effect (+4 modifier):** This is just a smaller version of the "additional 1d effect" modifier and can be used to tweak power costs. This can be done twice, but any amounts or multiples of +3 would have to be an "additional +1d effect" modifier.

EXAMPLE: A piece of cyberware with an additional 1d+2 in effect would have a modifier of +18 on its point cost.

- **Armored (+5 modifier):** The cyberware is made of or encased in higher strength materials than normal. It gets +2 on its armor rating. This does not improve the ability of any armor provided to the user, but only counts towards protecting the cyberware itself.

- **Delicate (-5 modifier):** The cyberware is exceptionally easy to damage. It has 2 hits less than normal. This modifier cannot be taken unless the item normally has 3 or more hits.

- **Do-it-yourself (-10 modifier):** In some cases, cyberware can be built as "one size fits all", a standard item with only minor adjustments possible. That is, a kit that includes everything needed for assembly (but not installation) of the cyberware. Think "mail order bionic arm". It may not be a perfect match for skin tone, and the hands may be a different size than yours, but it still works. Colonists who need a bionic limb but can't afford a trip to a core world to have it custom-fitted may use this option. It makes the cyberware significantly cheaper (and easier for a local doctor to install), but it has its limits. A DIY cybernetic implant may also be cheaper because it is used. Legitimate core world clinics often have people come in with an older model item and want an upgrade. The old item is often donated to charity as a tax write-off, the clinic refurbishes it (also a tax write-off) and then makes it available at low cost to the needy.

- **Enhanced (+5 modifier):** One aspect of the cyberware is +1d more than normal. Think of it as if the cyberware had a Forte. This bonus usually can combine with a similar bonus the adventurer has naturally. This can normally only be done once on a given piece of cyberware.

EXAMPLE: A Yakuza thug who already has a Forte on his upper body Strength (+1d to punch or throw) has a bionic right arm with enhanced strength (+1d to punches). This Yakuza throws punches that are +2d more than normal!

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- **Neural feedback (-20 modifier):** This is the same as a side effect, and is only applicable to cyberware that has a skill roll to use. Failing this skill roll means they take 2d non-lethal damage or a -2d Weakness to a particular aspect of an Attribute that could result from cyberware malfunction.

EXAMPLE: Lame colonist Bill Johnson got a second-hand bionic leg cheap because it was an old model subject to neural feedback. If he fails a skill roll when using it, it starts jerking uncontrollably (-2d penalty to all his Agility rolls until he regains control of it). Bill is now known to the other colonists as "Crazy Legs" Johnson.

- **Power costs +1A (-3 modifier):** This is just a smaller version of the "power costs +3A" modifier and can be used to tweak power costs. This can be done twice, but any amounts or multiples of +3 would have to be the "power costs +3A" modifier.

- **Readily visible (-10 modifier):** This simply means the cyberware does not have the "invisible" special effect. It is probably an older model that does not cosmetically blend in, or one whose cosmetic covering has been removed for one reason or another (Yakuza with enhanced cyberlimbs often strip the cosmetic coverings in order to both intimidate people and pack in extra capabilities).

- **Reduced -1 effect (-3 modifier):** This is just a smaller version of the "reduced 1d effect" modifier and can be used to tweak power costs. This can be done twice, but any amounts or multiples of -3 would have to be a "reduced -1d effect" modifier.

- **Requires gestures (-5 modifier):** This is not applied to things like bionic limbs, but can be applied to anything that requires a significant motion of the limbs to bring into play.

EXAMPLE: Razornails are just really hard and sharp fingernails. But if you have a short sword tucked inside your forearm, and you have to sling your arm down to lock it into place, then that is something that could qualify for the "gestures" modifier.

- **Requires min. Attribute (-variable):** If a piece of cyberware requires a natural level in a particular Attribute as a pre-requisite for successful use, you can get a -5 modifier for a minimum Attribute of 2d+0, a -10 modifier for a minimum Attribute of 3d+0 and a -15 modifier for a minimum Attribute of 4d+0. This usually applies to things like powerful bionic limbs that require a strong musculature to attach to, but it could also apply to mental enhancements that require a high intellect to take advantage of.

- **Sanitized (+10 modifier):** Normal cyberware is only visible to sensors. Sanitized cyberware is only detectable by sophisticated military, medical or academic sensing equipment. That is, it requires sensors that would normally detect that cyberware, *and* have the "extraordinary range" modifier. These sensors are not in common use because they are more difficult to use properly, and significantly more expensive.

EXAMPLE: A weapon/metal detector at a starport already has an "extraordinary range", since it can see guns in your luggage or under your jacket, provided it or its operator made their skill roll. This detector would not even get a roll against a sanitized implanted weapon. A high-resolution weapon scanner would get its normal roll to pick up such a sanitized device, and this roll would be based on the distance of the scan and the size of the device, just as for a regular scan.

- **Total concentration (-10 modifier):** The user needs to concentrate exclusively on using the cyberware and can do little else. Failing to maintain their concentration will trigger neural feedback if the cyberware has that limitation as well.

- **Touchy (-5 modifier):** The cyberware is limited in that it only works about half the time or in half the conditions the user would like it to. Imagine a bionic leg that isn't watertight, or a bionic arm that frizzes out when it gets cold. Anytime the cyberware is exposed to a condition it is touchy in, it loses 1d of capability or the user takes a -1d penalty that is related to the cyberware's touchiness.

- **Worn (-2 modifier):** The cyberware is simply old. It has 1 hit less than normal, either because it is an older model, or because it can no longer be fully repaired. This modifier cannot be taken unless the item normally has 2 or more hits. Cyberware cannot be both worn *and* delicate.

Cyberware in the world - Cyberware presents fascinating questions about the nature of man vs. machine, medical ethics, and potential abuses of biotechnology.

In a game setting, cybernetics provides an interesting twist to an adventurer or extra. Along with giving adventurers a leg up over the ordinary people around them, cybernetic powers can lend some defining detail to the character. For example, an enemy so extensively modified that people question whether he's still human at all makes not only a dangerous but fairly sinister foe for the adventurers.

Cyberware also offers a way to salvage a badly injured adventurer. Rather than writing them off and starting over, the player and gamemaster could decide to refit the adventurer with cybernetic replacements for lost limbs and organs. The returned adventurer and his compatriots will have to deal with some interesting personal issues.

As we mentioned before, even minor tweaks in cyberware can make a huge difference in the cost and difficulty of building it. If you make up your own cyberware, keep in mind the potential market for it, the penalties if it is illegal, and a practical minimum time it will take to build. If you want to discourage adventurers (or anyone else) from overdoing it, insist that all cyberware have the "costs +3A" modifier, and these 3A are lost if the cyberware is removed and replaced with something else. Or, stipulate that anything added to the nervous system has a minimum surgery time, which is added to the cost, increase the difficulty of a successful surgery, the penalties for failure, or both.

As is, the **Fires of Heaven** universe is accepting and tolerant of most types of cyberware, and it is readily affordable to those who think it will enhance their professional lives. Low level cyberware is no more commented on than a hearing aid or a pair of glasses. Signs that might once have said "proximity to this equipment may be hazardous to individuals with pacemakers" now say the same thing about cyberware.

The common nature of cyberware and the possibility that even legal forms can be abused gives law enforcement special powers regarding cybered individuals. Legal cyberware can be remotely detuned, deactivated or jammed at close range, by court order or automatically in some cases. If court proceedings do not allow photographs, your bionic eye won't be taking any pictures. If you're making a getaway on anything but mil-spec bionic legs, don't be surprised if they fold up under you.

These tactics can also be used by the criminal world to good effect, but this is more often done as a defensive measure. And, equipment of such a specialized nature is less likely to be found once you leave the core worlds. Military cyberware is not subject to remote deactivation, but it can be jammed.

There are a number of inescapable problems associated with cyberware. Cybernetic surgery is complex, and almost always involves invading the brain to place neural implants. Despite centuries of medical advances, surgeons are still wary of tampering with the brain. Patients encounter the additional risk of rejecting the cybernetics, which can result in life-threatening complications. Flesh heals, but cybernetics must be repaired when damaged. Some cybernetic devices also require routine maintenance.

Like all electronics, any sort of active cyberware shuts down during interstellar jumps due to the reality-bending effects of jump travel. Automatic restart programs built into cybernetic implants usually make this little more than an inconvenience (make an Easy(5) skill roll to reactivate as a major action), but in an emergency a non-functioning bionic arm or other implant could be a serious problem.

Most cyberware is designed to be unobtrusive, but a display of artificially enhanced strength or super-leaping abilities will certainly attract attention. In addition, some people are equipped with obvious cybernetic gear out of either choice or necessity; a patient on a poorly supplied frontier world may have to accept outmoded implants bare of any cosmetic extras, for example.

In certain societies or religions, cybernetic implants are regarded as abominations that disgrace the human form. Cyborgs may face discrimination or prejudice in these cultures. Other human subcultures are infatuated with cyberware, and cyborgs may find themselves attracting all kinds of unwanted attention (maybe not all of it unwanted).

Individuals with extensive cyberware sometimes suffer psychological trauma, often revolving around a fear of losing their humanity or becoming a freak.

Authorities normally refrain from seriously penalizing people with illegal implants (aside from removing them if possible), preferring to target suppliers and physicians behind the black market cyberware trade, but people with those cybernetics could still face legal difficulties and complications.

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▼ **PSI POWERS** - Psionics are an undeniable, if uncommon, fact of life in the 23rd century, after a symbiotic alien spore native to the watery world of the Ethereans awakened the psionic potential of a handful of human hosts.

Once viewed with suspicion by scientific thinkers, psionics are now a recognized (if still incompletely understood) phenomenon in the United Worlds. Despite the establishment of numerous foundations and institutions devoted to studying psionics no way to determine which humans are likely to be adequate hosts for the spores has been found.

Psions inspire fear and distrust among some individuals and groups, the same fear of the different, the unknown or the uncontrollable that has caused endless grief through the centuries. The concept of someone being able to read their inmost thoughts or control their very minds still frightens some people in the United Worlds. Most, however, are fascinated by psi powers and psions. Concern over prejudice or unwanted attention drives some human psions to keep their abilities secret. Certain alien races also possess psi powers.

Purchasing Psi Powers for Humans - Humans with psi powers are considered rare. Perhaps one in every five million people is an adequate host for the psi-awakening alien spore (about five thousand in the U.W. as a whole). There is no known way to artificially induce psionics in humans, though many have tried.

Psi powers must be purchased with points. They need not be purchased when the adventurer is initially created, however - a character thought to have no mental powers may actually possess latent psi abilities discovered later in the campaign. Note that an adventurer who does not start play as a psion will not get points for any psi-related Traits if they become a psion later in the campaign.

To buy any psi power really requires two things, spending enough points to have a Fate of 8+, and getting the skills needed to use the power. This would be the overall skill "Psi use", which is a Awareness-based skill that represents the mental control needed to access psi abilities, and then another skill for each particular power the adventurer has. All such skills need to be at a normal +0d level or more. So, a psion adventurer needs to spend at least 5\$ for the overall "Psi use" and at least 5\$ for each power they want to have.

EXAMPLE: If an adventurer wants the ability to psionically levitate, they need to have at least the skill "Psionics" at +0d (a cost of 5S), and then spend at least 5S more for "levitation". This would let the adventurer try to activate the ability using their normal Will roll. Having either or both of these skills at a +1d level would add to the Will roll for activating the power.

As a power, most psionic powers will have the following framework in **Fires of Heaven**:

Type	Requirements	Cost
-	Starting cost	0
■	Special effect (invisible)	+10
◆	Requires minimum Fate of 8+	-10
●	Damages user's Attribute	-10
	Framework base	-10

In detail:

■ **Special effect (invisible):** As for cyberware, the action of most psi powers is not immediately visible, though its effects often are. If a refrigerator is levitating its way across the room at you, you can guess a psi power is involved, but if there are a dozen people in the room with you, you have no immediate idea who is doing it. Psi powers can be "seen" by those with the "mental awareness" power, and the real-world side effects of some powers can be traced back to their source by certain scientific instruments, but with the exception of energy blasts they cannot be seen with the naked eye.

◆ **Requires minimum Fate of 8+:** All psi powers require the user have a certain potential, as represented by their Fate Attribute. Some powers might require more than the minimum, but all require at least a 8. Only one person in several million has this potential, and this is with the influence of the Etherean spore. The chance of it occurring naturally is so rare as to happen only once or twice in each generation. Adventurers can meet this minimum with a Forte on Fate of "psi potential", which would be the equivalent of +3 to Fate for meeting this requirement (so a normal Fate of 5, plus this Forte, meets the requirement).

▼ **Note** - As with cyberware, a lot of information here is mostly for those who eventually want to design their own psi powers. To see the powers available, skip to page 5.62.

● **Damages user's Attribute:** All active psi powers use the person's energy reserves, which fatigues them, doing 1d+0 non-lethal damage each time a power is successfully activated. Maintaining a power once activated does not usually cause any additional fatigue. The Ethereans somehow avoid this limitation, perhaps by spreading the effort across the Unity, though lone Ethereans seem no more tired by psi use than those encountered in groups. Human psions may have powers that are more draining than this, and some even take lethal damage from using their powers, but all human psions must have at least this level of limitation.

In addition, most psi powers with range will have "technological range". In this context, it means any line of sight that can see the specific target without resorting to electronic devices. You could target someone at long range with an optical telescope, but not with a television camera. You might be able to target a starship you can see several kilometers off with the naked eye, but not a person staring out of an observation bubble on that ship (unless you had an optical telescope).

Classes of Human Psi Powers - Human psi powers are rated as either latent or operant. This describes the degree of both power and control possessed by the psion. Latent powers tend to be weak and unreliable. In essence, they are raw natural abilities yet to be refined and focused by their possessor. Most human psi abilities begin as latent powers and are brought to operancy through intense training. Some psi powers never progress beyond latency. A special class of latent powers are those which seem to operate outside the conscious control of the psion. Certain types of extrasensory perception or gestalt abilities are apparently psi-based, but are even less understood than normal psi powers (see page 5.21).

Latent psi powers are those where the psion almost has to use Fate dice (as luck) to get the power to activate, or they have to use modifiers such that crisis use of the power is extremely unlikely (extra preparation time, concentration aids, etc.). Latent psi powers may also have triggering conditions that are outside the control of the psion, like extreme emotional stress.

Operant powers (at least as defined by the Institute of Psionics) are those where the psion can reliably manifest the power in a few seconds, even if not at full potential.

Psions are treated differently under the law, depending on the nature of a particular ability. Operant psions are assumed to be in full control of their ability for legal purposes, while latent psions often get a little slack if a power manifests uncontrollably (at least the first time). Use or misuse of powers is handled accordingly. Latent psions are prohibited by law from using their ability as part of a job, nor is any evidence collected with the aid of a latent power admissible as evidence. It is much the same as the legal qualifications for an "expert witness".

A psion who wishes to have one or more abilities classed as operant merely needs to find a branch of the Institute of Psionics or a U.W. Marshall or judge familiar with the qualification procedure, then demonstrate the ability, pay a processing fee and wait for the paperwork to clear.

Using psi powers - Powers can be activated at any time, subject to the modifiers on them that would limit or prevent it. The powers listed in the suites have a default modifier list that defines the power, and this total gives the difficulty of activating the power.

Points in power	Success Difficulty	w/4d roll	Time spent	Points
0	0	100%	1sec	-0
1	1	100%	1.4sec	-1
2	2	100%	2sec	-2
3	3	100%	3sec	-3
4-5	4	100%	4sec	-4
6-7	5	100%	6sec	-5
8-9	6	≈100%	8sec	-6
10-12	7	≈98%	11sec	-7
13-15	8	≈95%	16sec	-8
16-18	9	≈91%	23sec	-9
19-22	10	≈84%	30sec	-10
23-26	11	≈75%	42sec	-11
27-30	12	≈63%	1min	-12
31-35	13	≈50%	1.4min	-13
36-40	14	≈38%	2min	-14
41-45	15	≈26%	3min	-15
46-51	16	≈16%	4min	-16
52-57	17	≈9%	6min	-17
58-63	18	≈5%	8min	-18
64-70	19	≈2%	11min	-19
71-77	20	≈1%	15min	-20
78-84	21	0%	23min	-21
≥85	22	0%	30min	-22

The adventurer may have other modifiers to adjust the final total, and can spend extra time concentrating to adjust the total by the appropriate amount.

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EXAMPLE: Emotion Sense has a modifier total of 40, which means it is a difficulty of 14 to activate. The adventurer can choose to spend six seconds concentrating on the power, which drops the total to 35, which is only a difficulty of 13.

As for the chart for cyberware, the chance of success is based on a 3d+2 roll, which gives a higher maximum roll than 4d+0. Psion adventurers might not have a chart in front of them, but they will have a good gut instinct on how likely they are to be able to activate a power in most circumstances.

EXAMPLE: If the psion in the previous example had a skill roll of 3d+2, they would know that by spending the extra time they could increase their chances from about a third to fifty-fifty.

Psi gadgets - As far as the general public knows, there are no gadgets that can manipulate or generate psi energies. In secret, there are still no devices that can generate psi energy, but there are those which can amplify existing psi powers.

Psi booster:

Type	Requirements	Cost
●	Extremely large focus	-20
◆	Independent focus	+30
●	Increased +3d effect	+20
■	Neural feedback	-20
●	Delicate	-5
●	Total concentration	-10
Total		+5

This bulky machinery increases the modifier total for the power affected, making it more difficult to use, but it amplifies the psion's power by a factor of eight. See [page 5.56](#) for information about the last three power modifiers. Tightly compartmented sub-branches of U.W. Intelligence have experimented with such devices (perhaps with the assistance of the Institute of Psionics), and the Order of the Mind probably has done its own experiments at the upper levels of its hierarchy.

▼ **Note** - Operant psions with a commercially useful ability can typically add their effective Fate to their other job skill to determine their salary. A bodyguard who can psionically scan for hostile intent is worth more, as is a corporate negotiator who can sense when someone is lying, or a special forces commando who can sense danger or a doctor who can psionically heal injuries. These people are rare and highly paid.

Psi drugs - There are no specific 'psi drugs', but through experimentation some psions have found that certain cocktails of stimulants, psychoactive compounds and stress hormones can boost psi abilities or temporarily block unwanted side effects. These drugs do not so much boost psi ability as they artificially create conditions that overcome a psion's limitations.

EXAMPLE: A psion whose powers only work under extreme emotional stress might take drugs that mimic the body's response to such stress, perhaps elevating pulse and blood pressure to dangerous levels.

The same drugs that work for one psion might give another one seizures, and there are not all that many psions who are willing to risk it. More than likely, if encountered at all, it will be in the hands of a sub-threshold psion who needs them simply to have any abilities at all.

The two drug categories are known as 'burners' and 'blockers'. The first will boost a psion's effects by +1d. It is bought as a focus (a pill, patch or nasal spray) that simply adds modifiers to existing psi powers.

Burner:

Type	Requirements	Cost
●	Consumed focus	-20
◆	Independent focus	+30
●	Increased +1d effect	+10
■	Lasts one hour	+24
●	Takes a minute to activate	-12
●	Power cannot be altered	-10
●	Damages user's Attribute	-20
Total		+4

The jitters caused by the cocktail may make power use slightly more difficult (usually by 1 point of difficulty), but it doubles a psion's power (+1d doubles an Attribute or effect). The down side is that the psion takes a 2d+0 non-lethal "crash" when the effect wears off. Potential psions with a Fate of less than 8 sometimes find that burners will temporarily boost their potential enough to allow them to use a power (make the booster give a +1d to Fate for a particular power). This is a slightly different effect, but the drugs that can induce a temporary Fate bonus are perhaps the more dangerous of the two.

The other way a burner cocktail works is not to boost ability, but to facilitate it. Simply remove the "increased +1d effect" modifier, and the total goes to -6, which makes psi use at normal power levels easier (usually by 1 point of difficulty).

Blockers will counter (or reverse) 1d of fatigue (non-lethal damage) from using psi powers. Not 1d per power use, but just 1d total. This is not so much a modifier on powers as a custom mix of mood-altering drugs and stimulants tailored to counter the specific fatigue of psi use. Blockers also take about a minute to kick in, and last about an hour. When a blocker wears off, the psion takes the original damage that was prevented, and an additional 1d (so they take a 2d+0 non-lethal hit).

Long-term use of either burners or blockers tends to cause permanent brain damage and personality change. Normal psions might have heard of a blocker or burner recipe from 'a friend of a friend' and have some on hand 'in case of emergency', but will probably never use it. Which is probably a good thing.

The first time either type of drug is used, the psion has to make a Challenging(9) Health roll. If they make it, that particular drug combination works for that psion. If they fail, they have a very bad trip (the details of which they won't remember) or a very bad drug reaction that puts them in the emergency room (4d+0 half-lethal damage).

There is no specific black market for psi drugs (the market is too small), but most of the drugs that a psion would make a burner or blocker from are either illegal or available by prescription only, so they would be acquired through the same channels as illegal drugs, with the same risks of unsavory characters and substandard merchandise endemic to this particular trade. Both burners and blockers are increasing in use among older psions, who use them to help counter the long-term debilitating effects of the Ethereal spore on the human mind. While this may be a short-term solution, it probably speeds neural degeneration in the long run.

There is a sporadic and dangerous thrill-seeking adventure known as a "psi-party". It has many of the characteristics of an early 21st century "rave", except it is entirely done with burners. The idea is that in a large enough crowd of normal people, someone using a burner could manifest a previously unknown talent. The burner cocktails used at a psi-party tend to be a little less effective than the very serious ones a known sub-threshold psion would use, but the side effects are also a bit less. Psi parties are of course illegal, but that does not keep rebellious teenagers from going to them...

Human Psi Suites - In humans, psionic powers seem to develop in categories of closely linked powers known as suites. With the exception of Enhanced Senses: Mental Awareness (which is apparently learnable by all psions, human and otherwise) and Mental Defense (which is almost as common), most psions have powers from one (or at most two) suites, although in rare cases wild talents possessing powers from several suites emerge (this might require an Unusual Background)

Players are encouraged, but not required, to purchase powers for human psi characters in suites. A psion whose powers defy the suite conventions will be an oddity subject to curiosity and interest from other psions and psionics researchers. Also, only psi powers from a single suite would be able to take advantage of a "hierarchic power structure" modifier.

Powers will be described in terms of how they work, but the exact combination of modifiers a player or gamemaster uses to generate the effect is up to them. Expansion on or limitation of powers is usually possible.

EXAMPLE: The first power listed is "mental defense", which has "work on self only". The user can only shield their own mind. An adventurer might want to be able to shield someone else's mind, and would buy this power without that limit, but the power still works in the same way.

The gamemaster may decide that adventurers may only buy a Forte on their Fate for one of these suites, rather than as a general Forte for psi use. This would mean a psion with a Fate of less than 8 can still use abilities if they have a Forte on Fate, but it would mean they could only purchase abilities *within one suite*.

EXAMPLE: A psion with a Fate of 5 and a Forte on Fate might choose "ESP" as a suite. This means they meet the "minimum Fate of 8" requirement for ESP powers, but do not have sufficient Fate for any other psi ability. This is, in fact, the most common sort of psion, a person with a Fate of 5, 6 or 7 and a Forte in a specific sort of power.

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▼ **BASIC PSI SUITE** - This is the most fundamental of psi abilities, and includes mental defense and mental awareness. If a psion only has powers from one suite, it is usually this one.

Mental Defense - Mental defense is any increased ability to ward off mental attacks. Since mental attacks are resisted by Will, a Forte on Will can be a mental defense. For powers, "prevents an effect" is the main modifier involved. This can be a Gifted ability, or one that the adventurer has to activate when they want to use it.

Mental defense:

Type	Requirements	Cost
-	Framework base	-10
●	Prevents an effect	+30
■	Lasts as caster wills	+15
●	Works on self only	-5
Total		30
Difficulty to activate		12

This power does not affect damaging powers such as pyrokinesis, but does subtract the user's Fate roll from the effect of any attempts at mind reading, mind control, mental illusions, and indirect effects like invisibility. Novice psions may have "reduced 1d effect" on this power to make it easier to activate.

EXAMPLE: If you had a Fate roll of 2d+2, you would subtract 2d+2 from the dice of any attempt to influence your mind, just like armor would subtract from the damage of an attack.

Once the power is activated, it remains in place as long as the user wants. It can be dropped as a minor action, and automatically drops if the user is stunned or loses consciousness. At gamemaster option, this or any other power which can be left on in the background is a -1 penalty to other skill rolls to reflect the small amount of concentration needed to keep it active. A continuous ability that is the result of the Gifted Trait does not have this penalty (since it is always on, no concentration is required to maintain it). However, since it is always on, the adventurer cannot turn it off even if they want to lower their defenses for something like psi healing.

Mental Awareness - An adventurer with mental awareness can "see" mental powers. That is, they have a power with the modifier "acts as an Attribute" (Awareness) that can sense mental powers in operation. This can be a Gifted ability, or one that the adventurer has to activate when they want to use it.

Mental awareness:

Type	Requirements	Cost
-	Framework base	-10
●	Acts as an Attribute	+30
■	Lasts as caster wills	+15
Total		35
Difficulty to activate		13

This ability to see psi powers is handled just as if the source of the powers were glowing. You could see it in the dark, but not through a door. Clothing is not normally going to block it, but a bulky e-suit might. Novice psions may have "reduced 1d effect" or even "requires touch" to make the power easier to access.

▼ **EXTRASENSORY COMMUNICATION** - This suite involves benign forms of mental communication. Mind link cannot be used on unwilling subjects, and any use of mental powers on others without their consent is one of the greatest fears the average person has about psions (and this fear adds greatly to the difficulty of making it happen).

Mind Link - A mind link is a connection between two minds that does not convey verbal or visual images, but simply gives a sense of presence and condition. You could send and receive feelings, usually without even trying to. Interpreting feelings you receive is a roll of your Fate against the difficulty or subtlety of the transmission. The other difference between mind link and telepathy is that mind link is distance-independent. A mind link requires contact to be placed, but once set, the link remains over anything less than interstellar distances (a Rohzkov jump severs the link). Sleep or non-traumatic unconsciousness will not normally sever the link.

Mind link:

Type	Requirements	Cost
-	Framework base	-10
◆	Conveys information	+15
◆	Extraordinary range	+20
■	State-based duration	+15
●	No details	-5
●	Requires willing subject	-5
Total		30
Difficulty to activate		12

An adventurer can be using multiple mind links at one time, or be the subject of multiple mind links. While the user of the power may take a -1 penalty for maintaining the link in the back of their mind, the *subject* of the mind link suffers no such penalty.

Clairsentience - This is the ability to see and hear at distant locations as though the psion was there. This ability is usually only mastered by the most powerful of human psions, who can trade 1d of effect to get a -2 to the difficulty, and still have sufficient Fate remaining to act as a reasonable Awareness roll.

Clairsentience:

Type	Requirements	Cost
-	Framework base	-10
◆	Acts as an Attribute	+30
◆	Extraordinary range	+60
■	Lasts as user wills	+15
■	Power costs +6A	-20
●	Requires total concentration	-10
●	Only to places they can visualize	-10
Total		55
Difficulty to activate		17

The extraordinary range is taken three times to represent that the psion bypasses material barriers, distance and time. The psion sees and hears what is happening at the target location, when it happens, without any delays caused by the limits of the speed of light. The psion must be able to visualize the area to be viewed. Either they must have been there before, or it can be described in such a way as to make it unique, otherwise the psion might see any of the possible locations in the galaxy (and possibly the universe) that match the description.

Some psions have more limited versions of this talent, with only two or one of the extraordinary range modifiers. For instance, a psion who could simply see and hear through a wall or door might have:

Limited clairsentience:

Type	Requirements	Cost
-	Framework base	-10
◆	Acts as an Attribute	+30
◆	Extraordinary range	+20
■	Lasts as user wills	+15
●	Requires total concentration	-10
Total		45
Difficulty to activate		15

This same description might allow a psion to project their senses to someplace they can see, but which is out of range of their mundane senses, like listening in on a conversation taking place a kilometer away.

Danger Sense - This is usually a Gifted ability, but it may be a talent that has to be turned on. Once it is activated, the psion can get a feel for the *possible* futures, with a maximum time level of their Fate. This can give a bonus to any sort of evasive or defensive maneuver of up to their Fate. For situations where the adventurer rolls dice, you add the Fate dice to the roll (like melee combat). For situations where the difficulty is fixed, you add the numerical value of the Fate to the difficulty (like ranged combat).

However, the practical upper limit is based on the fraction of *good* outcomes that are possible. That is, if someone is going to take a shot at you, there are a lot of ways you can make them miss. If you sense the ship you are on is about to break up during re-entry, there isn't a lot you can do about it. In general, if the ability is used during combat, reduce the maximum possible effect by 1 for each extra die of total skill roll any foes have over the person with the danger sense. This reflects that the worse the situation is, the fewer the possible futures where the adventurer can avoid all the nasty bits.

Danger sense:

Type	Requirements	Cost
-	Framework base	-10
♦	Conveys information	+15
♦	Extraordinary range	+20
■	Lasts as user wills	+15
●	Works on self only	-5
Total		35
Difficulty to activate		13

EXAMPLE: Your adventurer has a Fate of 3d+0 and danger sense. If the adventurer has a martial arts skill roll of 5d+0 and is facing two people whose skills are 4d+0, the foes have a total of 8d to your adventurer's 5d, for 3 points of difference. There are fewer possible futures where your adventurer's skill can help them, so the benefit of the 3d+0 of danger sense is dropped by the 3 points of difference to an extra 2d+0 on their skill roll for defensive purposes.

Danger sense also gives an adventurer a sort of "get out of jail free" card. In any circumstance where the player can plan a course of action, they can make an appropriate skill roll ahead of time (up to the limits of their danger sense), and then base their actions on the result of that roll.

EXAMPLE: Harna Calitto has danger sense and is being chased across a rooftop. There is a gap between buildings and the player thinks about having Harna jump it to evade pursuit. The game-master lets the player roll for Harna's jump ahead of time. Harna botches it, and it's a *long* drop. The player decides that maybe they'll try something else instead...

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Emotion sense - The psion who has this discipline can see and interpret auras. This usually gives an indication of mood and health, and on a Fate roll against the subtlety of the aura, the psion may be able to get a better idea of the underlying reason for the aura. You would never get an identifying detail like "rattlesnake venom", but an aura of "poor health" could be narrowed down to "poison", "illness" or "stress". Successfully interpreting an aura is usually good for a 2 point difficulty shift in skills where this knowledge would be helpful (medical, negotiation, interrogation, leadership, etc.).

Emotion sense:

Type	Requirements	Cost
-	Framework base	-10
♦	Conveys information	+15
♦	Sensory targeting	+20
■	Lasts as user wills	+15
Total		40
Difficulty to activate		14

A psion with emotion sense can detect general auras on anyone they can meet eyes with (a subtle connection of mental states), but their roll to interpret these auras will be affected by range, so close is better. Novice psions may have this ability requiring bodily contact (drop "sensory targeting"), which is a modifier total of only +20 (a difficulty of 10).



▼ **MENTAL MANIPULATION** - This suite involves the manipulation of or interaction with the mind of another person in ways beyond passive perception.

Mind scan - This is the ability to "feel out" an individual in an area or crowd based on some *unique* knowledge that individual has, or which the psion knows about the individual. Non-unique information simply means the psion picks up anyone and everyone that matches that profile.

EXAMPLE: A psion could search for a person who is thinking about "killing Governor Tatea", or a person whom the psion knows has chronic pain from a knee injury.

The psion sees minds rather than people, so this ability can work in darkness or with your eyes closed. It also ignores the first physical barrier, allowing the psion to sense people who are concealed (or invisible). The psion senses around them, using their Fate as an Awareness against a difficulty based on the range and how obvious the mental signature is. Mental fireworks would probably be 4 points easier to spot, while a very subtle thought or characteristic might be 4 points harder. It normally takes one action to scan one person, though the powerful Ethereans have been known to scan large areas at a glance.

Mind scan:

Type	Requirements	Cost
-	Framework base	-10
■	Acts as an Attribute	+30
◆	Extraordinary range	+20
■	Lasts as user wills	+15
Total		55
Difficulty to activate		17

Mind scanning is not an invasive procedure and does not convey actual memories or thoughts like telepathy might. It is still generally illegal to do, though there are law-enforcement exceptions, and exceptions for individuals like bodyguards for important U.W. personnel. The criminal element finds use for mind scanners as the ultimate sort of doorman (looking for anyone with hostile intent to their employer).

Telepathy - The psion can read the thoughts and tamper with the memories of the person whose mind they target.

Telepathy:

Type	Requirements	Cost
-	Framework base	-10
◆	Power subverts Attribute	+40
●	Resisted by Will	-10
■	Lasts sixteen seconds	+8
■	Special effect (alter memory)	+10
Total		38
Difficulty to activate		14

The psion's effect (their Fate roll) is reduced by the Will of the target. Any remainder is used by the psion as an Awareness to riffle through the target's mind. The difficulty of finding any given piece of information depends on how close to the surface it is and how much the target wanted to hide it (as represented by their Will). A genuinely willing target would be considered to have a Will of 0d+1.

Once the psion is in the target's mind, they have sixteen seconds to ask their questions and get answers, though this is usually at twice the speed of speech. Answers can come in the form of feelings, images, words, or sensory impressions, depending on the question and the way the person remembers it. An interrogation skill might be complementary to this ability and could provide a +1d to the roll. Once the duration of the power is reached, the victim's mind builds up enough resistance to eject the psion, or the recollections build up to a confusing level and the mind has to clear before another attempt can be made. As usual, the power and limitations vary widely among psions.

Information is	Difficulty
Surface thoughts	3
Recent memory	7
Distant memory	11
Repressed memory	15
Personality traits (per level)	±2
Other circumstances	±1 to 2

Telepathy can be used to alter memory as well as just reading it. False memories can be implanted, and existing ones can be enhanced or repressed. The psion's effective Fate is rolled and the result *adjusts* the difficulty to remember something, or becomes the difficulty to realize a memory is false.

EXAMPLE: A psion with an effect on a person's mind of 1d+1 rolls a total of 5. They could make it 5 points easier or harder for that person to remember a *particular thing*, or could plant a memory that seems real until the person has reason to challenge it *and* makes a Will task at a difficulty of 5.

Mental Domination - The psion attempts to coerce the will of a target, forcing or manipulating them into doing things they normally would not.

Mental domination:

Type	Requirements	Cost
-	Framework base	-10
◆	Subverts an Attribute	+40
■	Technological range	+25
●	Thresholded	-5
●	Requires total concentration	-10
■	Lasts as user wills	+15
Total		60
Difficulty to activate		17

The power is targeted as any other ranged psionic ability. If it hits, the psion chooses an initial command or action the target is supposed to take. The Fate of the psion is rolled and compared to the *current* Will roll of the target, modified by the nature of the command (these are 'best three' rolls). If the psion wins the roll, they gain control of the victim's mind until conditions change that would alter the roll in the target's favor, like the psion crossing a damage threshold, or making a command that is more easily resisted.

If the target of the ability wins the first or any subsequent roll, the mental domination fails and the effect of the power ends.

Command	Will roll
Something target agrees with	-1d
Something target is neutral about	+0d
Something target is against	+1d
Something target is violently against	+2d
Personality traits(per level)	±2

Self-preservation usually falls into the +2d to Will category. The psion cannot read the mind of the target, but can sense what the target senses, and thus knows what the target is experiencing. This is the main reason it requires total concentration; you are experiencing someone else's life in addition to your own. Talented psions have passed beyond this level, and can simply give an idea that is to be obeyed, and as long as the psion maintains the power, the target will attempt to carry out the idea.

EXAMPLE: A psion who wanted a target to kill their companions would have to command each hostile action. A psion who did not have the 'total concentration' modifier could simply say 'attempt to kill your companions with the best means at your disposal', and then move on to other mischief, knowing that the target would be compelled to act on that command without further input.

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The drawback of an unattended compulsion is that the target gets to make choices which might not be the ones the psion wants. Someone who is ordered to "attack" their companions could choose any means within the spirit of the command (no feather pillows). They could choose to punch instead of use a gun. Someone with a gun who is commanded to "shoot" their companions is compelled to use the gun, but is not compelled to aim for vital locations. The gamemaster is easily justified in saying that it takes about half as long to implant a command as it does to say it.

EXAMPLE: "Drop your gun!" might be a command that takes the single action of activating the power. "Go into the cafe and shoot anyone wearing a red shirt." might take a few turns to get crammed into some poor victim's head.

The Psion Made Me Do It! - First

DATA DUMP

attempted (unsuccessfully) in 2191CE, this is the long-shot legal defense that states the defendant is not guilty because they were under malicious psionic influence at the time of the crime. The fluke of law enforcement luck that allowed such a proposition to be documented in 2195CE led to the first legal precedents in dealing with how psi powers are treated in evidentiary terms.

In general, the rarity of psions, and further rarity of those with the ability and inclination to manipulate minds, places the burden of proof squarely on the defense in such cases. In a few cases, significant circumstantial evidence has been enough to sway a case, such as the still-unexplained sequential rash of homicidal behavior by seven otherwise law-abiding citizens of London (Earth) in 2233CE. Even so, the best a defendant can hope for is a reduction of charges. For instance, in the London incident, four of the defendants were eventually convicted of manslaughter instead of murder.

Uncommon Law for the Common Man - reference lg290333.290923.872884 - .05Cr

Mental blast - This is a psionic attack that disrupts the electrical impulses of the target nervous system, causing pain and disorientation. Too much of it, or doing it on top of an existing system shock, can be fatal. The effect is a non-lethal blast of the psion's Fate roll minus 1d.

Mental blast:

Type	Requirements	Cost
-	Framework base	-10
●	Non-lethal damage	+20
●	Reduced 1d effect	-10
●	Technological range	+25
◆	Extraordinary range	+20
■	Lasts an instant	+0
●	Cannot be aimed	-5
Total		40
Difficulty to activate		14

Mental blasts are targeted with the same skill used to activate it. The difficulty to hit is based on the range, as for other ranged attacks. However, since the blast exists only in the instant it is targeted, the psion cannot aim it ahead of time, nor activate it and then aim. Novice psions with this power may have another "reduced 1d effect" on the power, and some psions are known to only be able to use the power at near-contact range. The latter tend to be more powerful than normal.

Mental blasts move at the speed of perception, and are not normally affected by motion, gravity, wind or other combat modifiers. Mental blasts are also unaffected by worn armor or transparent barriers.

Some psions, particularly the Ethereans, are able to target mental blasts under extraordinary circumstances, presumably using mind scan or other powers to acquire their targeting information.

Invisibility - Psionic invisibility does not render the psion invisible, it renders them 'unseeable'. There is a difference. People's minds just do not register the presence of the psion, even though the image is going into their brains. It is a mass hallucination that the psion "isn't there". Robots and sensing devices will register the psion, and can act independently on this knowledge, but devices that require human action will not be acted on:

Guard 1: "Motion sensor in corridor 4A tripped again."

Guard 2: "Anything showing up on the security cameras?"

Guard 1: "Nope."

Guard 2: "Put in a call to maintenance. That's the third time it's happened today."

Invisibility does work through any medium the psion is observed through, but images will still be recorded by devices, and if viewed by themselves, will show the psion's presence. That is, you might not see the psion on camera, but if you look at the recorded video log sometime after the power is turned off, the psion will clearly be visible.

Invisibility:

Type	Requirements	Cost
-	Framework base	-10
◆	Subverts an Attribute	+40
■	Sensory targeting	+20
●	Thresholded	-5
■	Lasts as user wills	+15
●	Primary sense only	-5
Total		55
Difficulty to activate		17

Since psionic invisibility works on the mind, it is independent of any vision enhancement capabilities a person might have. However, it only works against the *primary* sense that person or species uses. A person with sight could hear an invisible psion, but a blind person could not. In play, it is fairly simple. If the psion's Fate roll exceeds the Awareness roll of a potential viewer, the viewer does not see the psion. If the roll does not exceed their Awareness roll, they do see the psion. Mistakes on the part of the psion can adjust the Awareness roll of a target or give them another roll. Making a loud noise, visibly opening a door, bumping into someone, etc. For large groups, simply assume the psion is invisible to anyone their effect exceeds the Awareness of.

EXAMPLE: Instead of rolling for each viewer, the gamemaster can say an invisible person with a Fate of 2d+2 is automatically invisible to everyone with an Awareness of 2d+1 or less.

Mental Illusions - The psion can create a full sensory hallucination in the mind of one person. They cannot control exactly how the person will respond to the illusion, save that they will believe it is real to the extent of its credibility. That is, it does not alter the rationality of the person significantly, it just puts something in their realm of perception that isn't really there.

EXAMPLE: Seeing the ghost of a dead friend would be distracting, but not believable *unless the person believed in ghosts*. On the other hand, seeing a illusory foe pop up from behind cover to shoot at you would be quite believable if you were already in combat.

Mental illusions:

Type	Requirements	Cost
-	Framework base	-10
♦	Subverts an Attribute	+40
■	Technological range	+25
●	Thresholded	-5
■	Power costs +3A	-10
■	Lasts as user wills	+15
Total		+55
Difficulty to activate		17

The power is targeted as any other ranged psionic ability. If it hits, the psion chooses a specific illusion the target is supposed to believe. The Fate of the psion is rolled and compared to the *current* Awareness roll of the target, modified by the nature of the illusion. If the psion wins the roll, they create a fully believable illusion in the victim's mind until conditions change that would alter the roll in the target's favor, like the psion crossing a damage threshold, or where believing the illusion would result in grave consequences (like walking off a cliff or taking a spacewalk without a spacesuit).

Illusion	Awar. roll
Perfectly consistent with conditions	-1d
Consistent with conditions	+0d
Inonsistent with conditions	+1d
Very inconsistent with conditions	+2d
Personality traits(per level)	±2

If the target of the ability wins the first or any subsequent roll, the illusion fades and the effect of the power ends.

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Illusions *can* do damage to a person in the form of psychosomatic stress. The person affected by the illusion may think it is lethal damage of some kind while under the effect of the illusion, and will act accordingly, but the *actual* effect is non-lethal, and cannot exceed the Fate dice in the effect. This damage may only be done multiple times per illusion, but decreases by 1d per attack.

EXAMPLE: A 3d+1 illusion could do 3d+1 non-lethal damage, then 2d+1 non-lethal damage, then 1d+1, then 0d+1.

Note that an illusion which does damage has to enter the target's perception first, which gives them a chance to react to the perceived threat. That is, an illusion cannot damage someone by surprise.

EXAMPLE: You cannot hit someone with an illusory sniper's bullet until *after* they have seen the illusory sniper taking aim at them, which gives them a chance to duck behind cover. If the psion wants the "sniper" to hit the person for damage through the meter-thick cement planter that the target dove behind, then the target gets another roll to disbelieve the illusion, since it has now become inconsistent with the nature of the sniper's weapon.

As with mental domination, some psions can generate a self-sustaining illusory concept, which will act and react as the target expects it to (add the "uncontrolled" modifier). This may result in an illusion self-terminating (such as if you defeat an illusory foe), or terminating due to accumulated inconsistencies.

▼ **MOLECULAR MANIPULATION** - This suite of psi powers involves direct interaction with the real world. It may be as subtle as cellular manipulation, or as direct as a thrown brick.

Boost - The psion has the ability to manipulate their body chemistry and can alter respiration, heart rate, and hormone secretion to give a temporary bonus to their strength, endurance and pain tolerance. Burning this much energy in a minute has its cost, however, and the psion is drained like they had just sprinted a hundred meters, in addition to any other effort expended in their enhanced state.

Boost		
Type	Requirements	Cost
-	Framework base	-10
■	Adds to an Attribute	+30
●	Damages user's hits	-10
●	Works on self only	-5
●	Power lasts one minute	+15
●	Damage happens <i>after</i> effect	+5
Total		25
Difficulty to activate		11

When the power is activated, the user gets a bonus equal to their Fate roll, split between their Strength, Health and Will for all purposes (which at gamemaster option increase the hits they can take). The psion cannot boost any one Attribute more than half its normal level. Talented psions can generate this ability with extra dice, temporarily turning themselves into physical powerhouses.

The effect of this power lasts one minute. At the end of the minute, the user takes 1d+0 non-lethal hits from the stress placed on their system. This ability does not have a cumulative effect, but it can be re-activated before the old effect wears off. When the ability is dropped, damage taken is cumulative and taken as one damage effect. Remember that *activating* the power normally does 1d+0 non-lethal hits. Damage when the power expires is separate from this.

EXAMPLE: If you maintained this power for three minutes, at the end you would take one 3d+0 hit, not three 1d+0 hits. This is in addition to the three 1d+0 hits you would have taken from activating the power three times.

More powerful psions do not have the second "damages user's hits" modifier, so they only take damage when the power ends (instead of when it is activated).

Regeneration - The psion can manipulate the rate of cellular regeneration in themselves and others, though some psions can only heal themselves, while some can only heal others.

Regeneration		
Type	Requirements	Cost
-	Framework base	-10
■	Reverses an effect	+30
■	Lethal damage	+40
●	Maximum 1d effect	-20
■	Special effect	+10
■	State-based duration	+15
Total		65
Difficulty to activate		19

Most human psions with this ability have to devote all their concentration to it (the "requires total concentration" modifier) and spend quite a bit of time preparing.

The amount of healing possible is very limited (it can't be applied more than once to a given set of injuries). The special effect is that it can turn most crippling injuries into normal ones for later healing purposes. So in cases where all other medical treatment has failed, psionic regeneration can provide hope. However, it cannot replace lost body parts (except possibly fingertips and toes), and it cannot reweave delicate nerve linkages severed by severe head or spine trauma. It might heal the visible damage, but cannot reconnect the wiring.

Ethereans have more powerful regeneration abilities, but they feel no moral compulsion to help non-Ethereans, and no Etherean has ever been hired or compelled to provide healing services, even by the wealthiest or most powerful individuals. In the instances where Ethereans have offered their services, these services were offered rather than requested, as though the Ethereans knew the injury was going to happen and that the person needed to be whole in order to fulfill some larger destiny the Ethereans glimpsed in the possible futures.

▼ **Note** - The "fortuitous Etherean healer" gimmick is something a gamemaster might get away with once to save a dying adventurer, but then you have to come up with some later campaign reason that would have made this extraordinary rescue reasonable. That is, the adventurer's miraculous survival has given them a unknown destiny of sorts, which the gamemaster now has to figure out how to integrate into the campaign.

Energy Blast - The psion can project energy as a concentrated blast. It is typically in the form of heat, but may be visible light, a kinetic punch, radiation or even the removal of heat (cold blasts). It varies with the individual, though a psion's blast will always be of one type (not all of them).

Energy blast:

Type	Requirements	Cost
-	Framework base	-20
■	Half-lethal damage	+30
■	Technological range	+25
●	Accuracy of +2	+10
■	Lasts an instant	+0
Total		45
Difficulty to activate		15

Psi energy blasts are normally half-lethal damage, but some psions have demonstrated lethal levels of energy concentration. Some energy blasts will have special effects (+10 modifier) for the particular type of energy blast they have. Psionic energy blasts are treated just as any other form of beamed energy. Unlike most other psi powers, they are highly visible and traceable to their source.

Novice psions with this ability often find it convenient to use gestures to help manifest their power ("requires gestures" modifier), and might only be able to project lower levels of energy (a "reduced 1d effect" modifier).

Flight - This power is a limited form of telekinesis that only works on the psion. In some psions it is an obvious manipulation of wind to loft the psion upwards, while in others it is a reactive force against nearby objects, and a few psions can apparently manipulate local gravity fields. There are many variations on this ability, and it may be that no two psions do it the same way.

Flight:

Type	Requirements	Cost
-	Framework base	-10
■	Acts as an Attribute	+30
■	Conveys movement	+15
■	Lasts as user wills	+15
●	Works on self only	-5
Total		+50
Difficulty to activate		16

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Treat the psion's Fate as a Strength. As long as this "Strength" is high enough to lift the psion and anything they are wearing or carrying, the psion can fly at up to 7 meters per turn. As an option, in vacuum, the psion can accelerate or decelerate up to 7 meters per turn.

EXAMPLE: A psion of minimum potential (Fate roll of 2d+2) could "lift" up to 80 kilograms, so if they and their clothing weigh more than this, they cannot get off the ground!

A player can buy the power with +1d effect and drop the movement rate to be able to lift more, but move slower. Note that even if the psion cannot get off the ground, they can negate their lift from any worn or carried encumbrance, and might be able to perform feats like walking on water. It would also reduce any falling damage by its level. A psion who cannot lift themselves can still use this ability to get +1d on any unarmed or melee skill, because they can negate enough of their weight to perform maneuvers normal people cannot manage (think of special effects in martial arts movies). One who can actually fly can use it for a +2d bonus against a non-flying opponent.

EXAMPLE: If the psion in the previous example weighed 80 kilograms from the knees up, they could levitate across water at knee depth, since the water compensates for any amount below its surface. Since most people weigh about 80 kilograms, this psion could also negate their extra weight from being in a 2g environment.

Normally, the psion can change facing once and change movement direction once per turn (they don't have to fly in the direction they are facing).

Novice psions may have a weak effect (a "reduced 1d effect" modifier), a slower rate of movement or may need more effort to focus on it (a "requires total concentration" modifier). A few have even been known to flap their arms as a way to get aloft ("requires gestures" modifier).

Force Field - The psion can generate a field that impedes the flow of any matter and energy that exceeds a certain threshold over any given point on its surface. This does not interfere with normal light and sound, but will impede all forms of physical or energy attacks (other than purely psi attacks like mental blast). The effective armor rating of the ability is the psion's Fate, and this armor will layer with any conventional armor worn. For purposes of any particular special effect, the psion may choose to have the force field inside or outside worn armor.

EXAMPLE: If in vacuum, you might want the protection *outside* your e-suit, but if you don't want people to see bullets bouncing off your street clothes, you would want the force field next to your skin.

Force field:

Type	Requirements	Cost
-	Framework base	-10
■	Lethal damage	+40
●	Prevents an effect	+30
●	Works on self only	-5
■	Lasts as user wills	+15
Total		+70
Difficulty to activate		19

This is one of the harder disciplines to master because of both the energy involved and the subtlety of manipulating it. Most human psions must spend significant time preparing and often use meditative techniques during the process (a "requires vocalization/gestures" modifier). Others may have it at very weak levels ("reduced 1d effect" modifier) or suffer painful kinetic side effects from failing to activate it properly (a "side effect" modifier). When a force field is activated, the user specifies how permeable it is to air. Normally, it is set to allow normal passage of air across the boundary, but it can be made "hard" enough to *almost* provide an e-suit level of protection. It would leak air across the boundary in a vacuum, but would be sufficient to offset about half an atmosphere of pressure, allowing the user to get by with a source of carried air inside the force field.

Force Wall - This ability is very similar to a force field, but the psion surrounds an area with an easily visible shimmering effect, and everything within that boundary is protected. The psion can set the threshold low enough that normal light, sound and motion are impeded. This will not totally darken or silence an area, but it will be noticeable. This power has a high threshold of ability, and psions whose Fate is less than 11 cannot even attempt it.

Force wall:

Type	Requirements	Cost
-	Framework base	-25
■	Lethal damage	+40
●	Prevents an effect	+30
■	Fills a three meter radius	+40
■	Boundary effect	-10
●	Reduced 1d effect	-10
●	Requires total concentration	-10
■	Lasts as user wills	+15
Total		70
Difficulty to activate		19

The effect is a wall or dome-like protective field with an armor rating of the psion's Fate minus 1d. Neither force fields or force walls protect against radiation, though variants of this ability have been shown to do so (add a "special effect" modifier). Novice psions with this ability often have further reduced ability (an additional "reduced 1d effect" modifier) and suffer much the same side effects as psions with the force field ability (a "side effect" modifier).

Life Support - This is a combination of several effects. The psion creates a force barrier around themselves to retain a breathable atmosphere, while simultaneously altering their metabolism to sequester or minimize harmful waste products. It is not entirely a self-contained system, but it is better than not having it at all.

Life support:

Type	Requirements	Cost
-	Framework base	-10
■	Acts as an Attribute	+30
◆	Extraordinary range	+20
■	Lasts ten hours	+30
Total		55
Difficulty to activate		17

The power acts as Health in conditions where Health would normally be useless for long-term survival, like underwater, in vacuum or in tainted atmospheres. It does not normally protect against radiation, but variants of this ability have shown this talent (add a special effect). Psions of greater ability can increase the duration, while those of lesser ability usually have to reduce it.

Missile Deflection - This is actually a specialized variant of danger sense and telekinesis. The psion unconsciously sees a fraction of a second into the future and creates a telekinetic deflection of any projectile that would strike them. However, if their psionic power is not strong enough, the projectile will not be diverted sufficiently and will still strike at full force. The power does not work against zero mass or negligible mass particles, so it won't stop laser fire, blasters, p-beams or radiation. It won't stop the blast of a grenade, but it could deflect the fragments (makes a lethal explosion non-lethal). It also does not work against large objects, so it won't stop a punch or a speeding truck.

EXAMPLE: Lance Fulton has a Fate of 2d+2 and missile deflection. Since the power has a built-in +1d effect, he can automatically deflect bullets and other small projectiles with a damage of 3d+2 or less. However, those with a damage of 4d+0 or more will hit him normally. The gamemaster might be generous enough to say that called shots against Lance instead hit a random location (the shot was *partially* deflected).

Missile deflection:

Type	Requirements	Cost
-	Framework base	-10
♦	Prevents an effect	+30
♦	Lethal damage	+40
●	Increased 1d effect	+10
●	Only very small targets	-10
●	Thresholded	-5
■	Lasts as user wills	+15
●	Works on self only	-5
●	Only against matter	-5
Total		60
Difficulty to activate		18

Few psions can use the ability without some sort of handicap. Many use meditation techniques (a "requires gestures/vocalization" modifier) to get into the proper frame of mind necessary to successfully invoke this psionic ability, while others have it at lower levels of power.

▼ **Note** - One major underworld figure is reputed to have a bodyguard who can missile deflect for a third party. This is not actually the case. What they have is a bodyguard who can psionically shield their employer against energy weapons, which is of course what a potential assassin would use against a target who was "known" to be able to deflect bullets... This is an example of how the largely unknown nature of psi is sometimes used to baffle and misdirect. There are a handful of con men with no psi powers whatsoever, who use sleight-of-hand and gadgets to make people believe they do have paranormal powers.

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Telekinesis - The psion can exert their will in physical form over any distance they can see. They can strike like an invisible kick, or pick up, use and hurl objects. Their only limit is that they cannot pick up themselves.

Telekinesis

Type	Requirements	Cost
-	Framework base	-10
■	Acts as an Attribute	+30
●	Reduced 1d effect	-10
■	Technological range	+25
■	Lasts as user wills	+30
●	Cannot be used on self	-5
●	No fine manipulation	-5
Total		55
Difficulty to activate		17

The psion has a Strength at range equal to their Fate roll minus 1d. This can be used like Brawling (with the psion's skill with the power). They can grab, lift, punch or wield simple items with the power, though with a level of manual dexterity as though they were wearing heavy mittens. Also, any skill used at range takes penalties for the range.

EXAMPLE: Attempting to telekinetically grab, punch or swing a sword at someone at a range of 8 meters would take penalties like a ranged attack at 8 meters. Note that any sort of power use that does *not* involve a weapon treats the defender as an Easy(5) target, since they can't see it coming. A defender can use the overall dodge bonus against this unseen attack.

Some psions are more adept at using their existing skill set with telekinesis ("requires a mundane skill roll" modifier), and many novice psions find it takes all their effort to focus the energy in usable form ("requires total concentration" modifier).

▼ **LIMITS & LIMITATIONS** - Development of psi powers is far from an exact science. Many facets of human psionics are still a mystery to researchers and all attempts to artificially induce psi powers have failed. Some techniques for training psions in their powers have proven effective, although they depend greatly on the strength of the psi abilities and dedication of the psion, and training only reduces (not eliminates) the unreliability of some psions' powers.

Modifiers - Most psions who have an ability they can maintain with little effort will often activate it in the morning. Using concentration aids and extra time, they activate it upon rising, suffer the fatiguing effects, and then recover most or all of the non-lethal hits over a quiet breakfast. This leaves them primed and ready for the day.

With the exception of time spent preparing, modifiers on powers are part of the power. You cannot decide to just not use a particular modifier, nor add one just because it suits the situation. Adjusting a psi power costs 1S. This lets you alter, add or subtract one modifier on the power and represents the effort and time you have spent mentally retooling the delicate balance that is your psionic potential. Many of the modifiers listed at the end of the cyberware section are usable for psi powers as well, though with different interpretations.

● **Damage happens after effect (+5 modifier):** For powers that tend to have some physical letdown when they expire, you can have 1d of damage happen after the power ends, rather than when it is invoked. In effect, you have the following two options:

- Damages hits when activated -10
- Damages hits when ended -5

For powers that can hold off taking damage until their duration ends, each time the power is renewed adds to the final lump of damage that will be taken. Normally, you cannot use this modifier on powers that can be maintained as the user wills unless that use requires total concentration. For consecutive use, assume you can do this a number of times equal to your full Will dice.

EXAMPLE: If you have a Will of 3d+2, then you can activate a power three times in succession before coming down hard and taking a 3d+0 hit.

● **No range (+0 modifier):** Many of the listed powers have significant range, but not all psions have that advantage. Some powers only work at ranges where the psion can reach out and touch the target. This may or may not require actual contact, but would be automatic on contact, otherwise count it as a ranged attack at a range of zero.

■ **Power is visible (-10 modifier):** Sometimes, a psionic power that is normally invisible will have some energy spillover into the visible spectrum or as sound. This simply negates the "special effect (invisible)" in the power framework.

● **Primary sense only (-5 modifier):** For powers affecting perception of reality (Awareness), they usually affect or interact with *all* the senses. A power that only interacts with a being's primary mode of sensing the outside world would take this modifier.

■ **Requires gestures/vocalization (-5 modifier):** Meditative techniques, mnemonic devices or the psychological crutch of a physical gesture or something like a martial arts *kata* are used by many psions to focus their concentration.

● **Requires focus (-5 modifier):** Infrequently, a psion uses a physical object as a means to focus their power, not as a conduit for the power, but as a something that helps them into the right frame of mind. If you don't have it, the power is activated at +2 to difficulty.

EXAMPLE: The lucky rabbit's foot you were holding the very first time you made your power manifest. If you don't have it on you, your self-confidence sags, and it is harder for you to make the power manifest.

◆ **Requires min. Fate of 11+ (-15 modifier):** On occasion, a power will exist that cannot even be manifest unless the psion is quite powerful. This modifier would take the place of the "minimum Fate of 8+" in the power framework.

● **Requires total concentration (-10 modifier):** For some, bringing a psionic power into being and maintaining it requires total concentration. Most psions begin their learning at this level, but some never progress beyond it. Some powers seem to always require the total focus of the psion.

■ **Requires willing subject (-5 modifier):** Sometimes a power requires the right frame of mind by the recipient or target of the power, or the psion will subconsciously rebel against using the power on an unwilling subject.

Virtually all of the other modifiers can be used if desired and the gamemaster approves, with at least the following limits:

1. There are no independent psionic items other than those mentioned.
2. No power has ever been observed to take more than hour to activate (which is a -24 time modifier).
3. Only scattered reports of psions capable of transferring matter via the power of the mind have been recorded. Experimentally, the process has not been confirmed for anything more substantial than photons or sub-atomic particles (which *would* allow missile deflection against energy weapons).
4. Psychokinetic abilities powerful enough to alter molecules and atoms, transmuting elements and creating almost anything the mind can imagine, are *theoretically* possible, but have not appeared in any known psions.
5. It is impossible to create something out of nothing, even with psionic powers. This includes creations, summoning and altering the size of an item. Anything resembling "magic" is not allowed.

Liabilities - Nearly a half-century since the discovery that an alien spore had awakened the psionic potential in some humans, medical and psi researchers are now uncovering evidence that the spore exacts a terrible price on its human hosts.

The Ethereans, from whose planet it originates, have evolved in tandem with the spore for eons, but human carriers of the symbiotic spore lack such evolved protections. Symbiosis between the spores and humans is imperfect, resulting in progressive neurological damage.

This may manifest as memory loss, personality changes, motor-control damage, or other tangible symptoms of brain injury. The speed and degree of the damage may be related to the scope of the psion's powers, with greater power resulting in earlier and worse injury.

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In **EABA** terms, being an active psion is a small Curse (**EABA**, page 2.12). Instead of taking extra damage or being allergic or vulnerable to something innocuous, the effects are more insidious. Simply, anytime the adventurer suffers a loss of A or S from aging, at least half must be from Awareness or Agility (and skills associated with those Attributes). This represents the slow and insidious neurological damage that the Etherean spore wreaks on the human mind, driving them to dementia while their body is still strong. The adventurer can delay this by taking a Weakness on Agility or Awareness instead of losing points directly off the Attribute.

EXAMPLE: An adventurer might take "absent-minded" on Awareness or "tremors" on Agility to represent aspects of neural degeneration.

Regeneration therapy *does not* restore these losses, though if done before the losses take place, the effects can be staved off for as long as the adventurer can afford the yearly treatments. All adventurers who have or develop a psi power or psi-based Gifted ability *must* have this Trait and gain 10A for it if they start play as a psion.

▼ **ALIEN PSIONS** - Some of the non-human races in **Fires of Heaven** also possess psi powers. The nature, degree, and power of psionic abilities differ from race to race - in some cases all powers are predetermined. Aliens purchase their psi powers the same way as human adventurers.

Ethereans - The enigmatic Ethereans are psions of immense power and intricate control. Each is easily capable of feats far beyond even the most powerful human psion (they typically have a Fate roll of 6d or more). Unlike humans, Ethereans all possess the same set of psi powers. The range and depth of their psi abilities more than makes up for any lack of diversity, however. Etherean powers are listed on [page 5.6](#), and the gamemaster can assume that an Etherean in normal circumstances will roll 5d+2 to activate an ability (against difficulty of 14), and they keep the "best five" on their roll (they're *real* good). In addition, Ethereans can mentally link with the shipcreatures they use when circumstances compel them to travel in space. The minds of these creatures can amplify an Etherean's natural ability, and the Etherean can use their psi ability to target the creature's natural weaponry with uncanny precision (psi powers can track objects *without* light-speed delays, and a precog can see where a ship is going to be and aim accordingly).

The Unity functions as a permanent mind link with every member of the Etherean race, with no line of sight required to establish communication. Feedback causes every person in the link to feel pain when a linked person is injured. They take 1 hit of non-lethal damage on any turn an Etherean is injured (not counting any feedback damage). The Unity does not work over interstellar distances, but Ethereans away from the homeworld are linked to other Ethereans in their particular star system.

Vorn - The Vorn are a psi-blind race. They never develop psi powers of any kind, and possess a natural, unconscious resistance to psi powers of other races. While far from impenetrable, this shield confers some protection against attempts to use psionic powers on Vorn. This is bought as a small Blessing, and simply reduces by 1d the effect of all psi powers used against a Vorn. This does not affect powers whose psionic energy is converted to normal energy away from the Vorn's body.

EXAMPLE: A Vorn would subtract 1d from the telekinetic Strength of someone trying to lift them, but not from the damage of a telekinetically thrown rock.

Other Aliens - The Nutoa and D'eira have no known psions. There are reports that some female Jodoni are skilled psychic healers capable of using psychokinetic manipulation to repair physical wounds or telepathic powers to ease psychological traumas, but these stories are unconfirmed. While Nutoa and D'eira have no psionic powers, it is possible for them to have Fortes that help them resist things like mental manipulation. D'eira in particular, with their mathematical and pacifist mindset, are more likely to resist attempts to make them violent, and may be better at spotting inconsistencies in illusions or even in their own memories.

▼ **PSIONICS IN PLAY** - Unlike robots, starships, or other high technology, psi powers in the **Fires of Heaven** setting are incompletely understood and not always reliable. This uncertainty keeps players of psions on their toes. Adventurers without psionics are also often unsettled when they suspect psi powers are at work. A full psion can be a highly memorable adventurer, of course, but even a minor psi talent can lend spice to an otherwise ordinary character. Psions are also fascinating extras, particularly as enemies or rivals to non-psionic heroes. Imagine having to outwit a foe who can read your mind!

Finally, the presence of alien races with psi powers (some breathtakingly powerful) further differentiates extraterrestrials from humans.

Alien Minds - Thought structures, memory patterns, and mental signatures vary from race to race. While psions can contact the minds of races other than their own, they have a harder time achieving certain effects. A psion trying to affect the mind of an alien makes a normal roll, but any resistance or threshold the alien has is increased by +1d. For instance, a psion invisible to almost all human minds might still be easily seen by a D'eira. Not only does the D'eira get +1d on their Awareness roll, D'eira have an Awareness 1d higher than the average human to begin with!

EXAMPLE: Osayande Nkruma, a human psion, tries to read the mind of a Jodoni trader. He makes contact normally, then rolls his Fate dice to determine the level of effect, while the Jodoni rolls his Will dice *plus 1d* to resist. Nkruma rolls a 13, but the Jodoni rolls a 10, giving Nkruma only a 1d+0 Awareness to riffle through the Jodoni's mind. Recent memories are a difficulty of 7 to access, not possible for a 1d+0 roll, so Nkruma has to settle for reading surface thoughts.

▼ **FINAL NOTES** - This has been a long chapter, but a lot of it is information that most adventurers will not need (cybernetics and psionics), and some special information on new skills and Traits for the **Fires of Heaven** universe. The gamemaster and players should not expect to do any playing on the first game session unless everyone had a copy of this chapter and did adventures in their spare time. But when the players (and gamemaster) have finished, a number of things should be fairly well determined, both from an individual and a group standpoint:

1. **Where you are from.** Everyone has a planet of origin. Within that, everyone has a family and a native culture, and while these might not be things a min-maxing player cares that much about, they are important background aspects that can be used to drive plots and adventures.
2. **Where you are.** The **Fires of Heaven** universe has lots of planets. Adventurers are going to be starting on one of them. And like where they are from, they will be starting in one particular place on that planet. It is possible that this could be a starship, space station or a scientific, exploration or military outpost. A campaign that starts on a new colony off the beaten path means that early adventures will be far different than if everyone starts in a big city on a core world.
3. **Who you are.** You have a background, beliefs, skills, friends, enemies, employers or subordinates. Who you are and where you are add up to "why you are there". At the start of a campaign you are at where you are at for a reason, doing something, getting ready to do something or just having finished doing something.
4. **Who you know.** This is part of who you are, but at the very start of a campaign it may also explain how you know other adventurers and your relationship to them. **Fires of Heaven** can start off with "you're all in a tavern when a mysterious stranger walks in", but it is much more likely that there is some sort of previous acquaintance that links the adventurers, if not directly, then through one other. For instance, everyone might have been part of the crew of a starship that just got repossessed, and the crew fired *en masse*. And an adventurer who is the odd person out might be a passenger who is now stranded but who had struck up a friendly acquaintance with a crew member before the ship was seized.
5. **What you want.** Some players have a long-term goal for their adventurer from day one. Others just take life as it comes, and some develop a long-term view during play. Everyone should have some idea of what they want, regardless of the time frame.

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Stuff - Adventurers can own a totally amazing amount of stuff. Take a professional who is several years into a professional career and they can easily fill a house with possessions and accumulated junk. And unless you happen to own a starship, you can't carry it all around with you. It is fairly safe to say that adventurers with a lot of assets available at the start of the game have most of them stored away somewhere, whether this is a home or storage container or several of them on multiple worlds. An exact detailing of all personal possessions is not required or expected, just the useful stuff that they consider worn, carried or luggage. After that, they should have a generic pile of "stuff" appropriate to their skills and background, stored locally. If they want it stored off-world, then they can have it on their planet of origin at no additional charge if they are regular travellers. A reputable storage unit will cost about 2,000Cr per e-year and will hold a small to medium vehicle or about 40 cubic meters of stuff (20 cubic meters of easily accessible stuff). Having such storage on multiple worlds will cost about 5,000Cr per storage location to take into account the original cost of setting it up and transporting things.

Having a secure apartment to live in on any particular world will cost between 5KCr and 20KCr per year, depending on the type of world, and of course the sky is the limit in terms of rents. But 20KCr per year should be able to get you a *nice* space on any world, though it may not be located in the most prestigious cities on that world. An actual house will be about double this amount, or it could be owned outright as an asset, in which case it will cost about 1% of its value in fees and taxes per year, as well as having robots come over and mow the grass occasionally.

Cost of living - Adventurers can spend as much as they want to on how they live, but a professional or social circle will generate certain expectations. Corporate executives do not bring bag lunches to save money. If you are travelling, spend 50Cr per day for subsistence needs, 100Cr for a moderate standard of living, 200Cr per day for a nice standard of living and 400Cr and up for luxury facilities. Double this on core worlds or orbital facilities. If you have a place to call "home", then expenses are much reduced, but if you can't meet the minimum requirements, there are homeless people in the **Fires of Heaven** universe. Orbital facilities often require a bond from visitors to guarantee they can be booted off at their own expense if they become indigent and can't pay the required life support taxes.



POWER BLOCS



"I don't give a damn about what your duty assignment will be, where you're going to be stationed or what kind of fancy training you're supposed to be getting after boot camp. No one here gets out of my camp until they pass basic infantry school. Everyone in the corps, from the cooks in the mess to the commandant herself, knows how to fight. Eventually, you will, too, but I'll believe that when I see it."

- Sergeant Jozsef Antall, StarForces Marine Corps drill instructor, 2234CE

▼ **INTRODUCTION** - There are a number of private, governmental and criminal entities that do most of the moving and shaking in the **Fires of Heaven** universe, and the lines between these entities blur and merge in ways that generally make the universe an "interesting" place...

In general, **Fires of Heaven** has a "space opera" feel, and that means that the good guys are generally good, and the bad guys are generally bad. There is not as much moral ambiguity as there might be in a "dark future" kind of setting. Yes, sometimes good people will make bad decisions and good organizations will have bad apples, but by and large the good guys want what is best for the U.W. and the bad guys want what is best for themselves.

These two goals usually conflict with each other on most fronts, and are in agreement a minority of the time. For instance, OmniCorp might be under near-constant investigation by the U.W. for bribery, corruption, extortion, anti-trust violations and the like, but it also supplies the StarForces with the weapons it will need to fight the Vorn.

Like we said, it makes life interesting.

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▼ **THE MILITARY** - The StarForces are the interstellar military of the United Worlds. Consisting of the Navy and Marine Corps, the StarForces protect the systems of the federation against alien powers and lawlessness in the starlanes.

▼ **STARFORCES HIGH COMMAND** - The ultimate military authority within the United Worlds armed forces, High Command oversees the operations of both branches of the military and coordinates with the civilian agencies charged with control of the StarForces.

The StarForces commander leads the High Command and, by extension, the entire military force of the U.W.. The commander reports directly to the federation president and only the president (designated commander-in-chief by the United Worlds Charter) outranks the commander. The president appoints the commander, traditionally alternating between the Marine Corps and Navy with each appointment.

Below the commander, the High Command consists of admirals, generals, and staff officers who plan overall strategies, set policies, prepare budget allocation requests, advise civilian leaders, coordinate joint military actions, and handle a thousand other tasks.

▼ **STARFORCES MARINE CORPS** - The StarForces Marine Corps is the close-combat branch of the United Worlds armed forces. They have responsibility for ground operations, boarding actions, and military security. The Navy can cripple enemy ships or bombard enemy ground positions, but it is often up to the crack troopers of the Marine Corps to go in and finish the job.

Marines are stationed aboard all StarForces Navy ships as security personnel, and serve as military police for both branches of the StarForces. The Marine Corps is designed for rapid deployment, employing highly mobile forces of expertly trained, well-equipped soldiers rather than large standing armies.

Admiral Isao Kajiwara - Head of the StarForces High Command, Admiral Isao Kajiwara has earned a near-legendary standing in the interstellar military community. His commitment to duty, not to mention his capable leadership, has provided badly needed stability to the Star-Forces during his unprecedented fifteen-year service as commander.

DATA DUMP



A native of Japan, Kajiwara graduated from StarForces Academy to enter the Navy officer corps. As he rose through the ranks, Kajiwara commanded a number of individual starships, then task forces, and entire fleets. After several years as chief of naval operations, Kajiwara took the post of StarForces commander in 2222CE.

He led federation defenses during the Interstellar War, and in the years since Kajiwara has guided the StarForces through an ambitious reconstruction program aimed at recouping the losses of the war. He has remained at his post at the special request of two successive United Worlds presidents, despite his private desire to retire.

Kajiwara possesses tremendous organizational and political skills that have been put to the test in the long drive to rebuild the StarForces. His often-grandfatherly demeanor masks an iron will and cagey intellect.

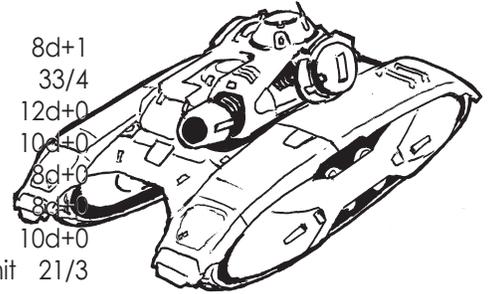
Kajiwara, 78, ceased antigeria treatments following the accidental death of his beloved wife in 2232CE. He stands a thin 172cm tall. Kajiwara has closely cropped iron-gray hair and brown eyes.

Who's Who in the United Worlds - reference ww109423.149786.058344 - .05Cr

Marine Corps Vehicles - StarForces ships convey StarForces Marine Corps units to their destinations, but once there, troopers need smaller vehicles to help them accomplish their missions. Tanks, armored personnel carriers, and reconnaissance vehicles (which tend to be fast-moving hovercraft), are the most commonly seen Marine ground vehicles.

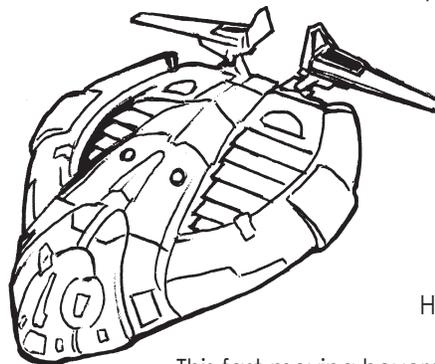
M-5A Drake LBT

Strength	8d+1
Top speed/Acc	33/4
Front armor	12d+0
Right/left armor	10d+0
Top armor	8d+0
Bottom armor	8d+0
Rear armor	10d+0
Hits/Damage limit	21/3



The M-5A Drake light battle tank combines firepower with strong defenses and superior mobility. The polysteel-armored tank mounts a powerful (15d+1) particle beam cannon and an autolaser turret (8d+0) for anti-personnel or missile defense capability. A fusion-powered, tracked vehicle, it has a top speed of 119kph and can be sealed against vacuum for deployment on airless worlds. Its energy-based weaponry means that it only needs fuel and life-support supplies, a strong logistical advantage.

The M-5A Drake has a three-person crew: a driver, a gunner, and a commander who also handles communications, threat analysis, and sensor tasks. The Drake can run at full power for about a week before needing refueling, and for several months on standby power.



M-9 Rostov GEV

Strength	9d+1
Top speed/Acc	44/7
Front armor	7d+0
Right/left armor	7d+0
Top armor	5d+2
Bottom armor	5d+2
Rear armor	6d+2
Hits/Damage limit	15/4

This fast-moving hovercraft carries a compact fusion plant, light armor, and a low-powered (11d+0) particle beam cannon for defense. The three-person crew consists of a driver, gunner, and observer. It also has a "mission bay" for carrying specialized loads. For instance, there is an "electronic warfare" variant. If empty, the mission bay can carry a fire team.

Capable of swiftly crossing land or water, the "Rosty" typically fills a force reconnaissance role in Marine Corps ground operations on worlds with atmospheres. It also sees use in forward or flanking operations for advancing ground forces.

Phoenix-class fighter

Strength
19d+1
Top speed/Acc
782/30
Front armor
6d+2
Right/left armor
3d+0
Top armor
3d+0
Bottom armor 6d+2
Rear armor 3d+0
Hits/Damage limit 16/4



An atmospheric craft, the rough-and-tumble Phoenix-class VTOL fighter provides ground support and air cover for ground troops. Lightly armored, the Phoenix hefts a plasma bolt cannon (14d+0) and optional pod of eight missiles (9d+0 fragmentation). Its maneuverability is greater than the airframe can handle, and many Phoenixes are retired due to structural fatigue. A Phoenix's fusion-powered turbines do not need oxygen, only an atmosphere of sufficient density. While it can be deployed from orbit, it has very limited space maneuverability, relying on reactor exhaust for directional control and minor orbital maneuvering. A Phoenix cannot reach orbital velocity, but it can make suborbital hops, and can reach anywhere on an Earth-size planet in less than four hours.

Phoenix-class fighters are launched from ground bases or dropped from orbit to support Marine units on the ground. With fusion power and plasma bolt armament, Phoenix-class fighters can loiter in the combat area for longer than their pilots endurance. While a Phoenix can fly for a week at a cruising speed of Mach .9, it only has an endurance of about ten hours at its atmospheric top speed of Mach 2.7. Their two-person crews need to resist tremendous g forces and are known throughout the armed forces for their grit. While the Phoenix may not be the most advanced craft in the StarForces and they need a high amount of maintenance to keep in service, Phoenix pilots regard them with perverse affection. The Phoenix entered service in 2223CE.

Note - For game use of auto-threat detection or crew-assisted scanner use, the tank and fighter have sensor rolls of 5d+0 and the GEV a roll of 4d+0, the fighter ignores the first 20 range levels and the ground vehicles the first 15 range levels. The tank costs about 6.5MCr, the GEV about 600KCr and the fighter about 3.5MCr. Try not to wreck them...

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Marine Corps Command - The Marine Corps Command is the supreme authority within the corps. The commandant and her staff oversee all corps operations, planning, logistics, and interaction with the rest of the StarForces.

General Devora Roth - The commandant of the Marine Corps, General Devora Roth epitomizes the hard-line public image of her corps. Tough-willed and intensely loyal to the U.W., Roth seeks to prepare the Corps for a second round with the implacable Vorn.

Raised on hostile Hachiman, Roth followed a family tradition by enlisting in the StarForces Marine Corps. ID'd as a potential officer early in her career, Roth excelled at officer candidacy school. Her personal discipline and hard-charging style won Roth a rapid series of promotions, eventually making her the youngest general in the history of the StarForces Marine Corps.

She commanded the besieged ground forces in the Sigma Draconis system during the Interstellar War. Outnumbered, outgunned, and cut off from reinforcements, Roth and her troopers fought courageously against Vorn raiders on Tin Hau and Shen Nung. By the time of the cease-fire, Roth's forces had dwindled to a handful of battle-hardened survivors.

Awarded the United Worlds Medal of Honor for her valor, Roth was a natural choice when the post of commandant of the Marine Corps came open after the war.

Her wartime experience taught Roth the value of total readiness and eternal vigilance. Roth fully expects the Vorn to renew their attack on the United Worlds and dedicates her every effort to preparing the corps for that eventuality.

A human of Israeli descent, Roth, 50, stands 175cm tall and has an athletic build. She has short brown hair and brown eyes. Roth lost her left eye in the fighting on Shen Nung during the Interstellar War, and for reasons known only to herself has never had a cybernetic replacement implanted. Roth normally wears a patch over the missing eye. A scar cuts across her left eyebrow before disappearing under the patch.

DATA DUMP

Marine Corps Ranks - The StarForces Marine Corps has a rank structure divided into enlisted personnel and officers. New personnel start at the bottom of either track, working their way up the ladder by earning promotions for solid performance at their assigned task. A non-commissioned officer cannot be promoted directly to the commissioned officer track; if they want to advance past sergeant major they must be go through OCS and start their career over at the bottom of the other track.

StarForces Marine Corps Ranks

Enlisted Personnel

Private	
Private First Class	▲
Lance Corporal	▲▲
Corporal	▲▲▲
Sergeant	▲▲▲▲
Staff Sergeant	▲▲▲▲▲
Gunnery Sergeant	▲▲▲▲▲▲
First Sergeant(1)	▲▲▲▲▲▲▲
Master Sergeant	▲▲▲▲▲▲▲▲
Master Gunnery Sergeant	▲▲▲▲▲▲▲▲▲
Sergeant Major(2)	▲▲▲▲▲▲▲▲▲▲

Officers

Second Lieutenant(1)	
First Lieutenant	
Captain(2)	
Major(3)	●
Lieutenant Colonel	●●
Colonel(4)	▼
Brigadier General(5)	◆
Major General	◆◆
Lieutenant General	◆◆◆
General	◆◆◆◆

▼ **Note!** - The numbers in parentheses indicate the approximate levels of the Status needed for that rank. Reputation and other intangibles may affect this somewhat. It is as much about the respect your troops (and your superiors) give you as it is about who has to salute whom. In addition, remember that even though there may be no "status" difference, a higher rank is *still* a higher rank for purposes of giving and taking orders, and officer ranks trump enlisted ranks for status purposes. A player who sets aside points towards rank (with gamemaster permission) but does not have enough to reach a particular level, may instead have a rank between the levels of status. For instance, a player who has spent points between that needed for Second Lieutenant and Captain might have a rank of First Lieutenant.

Marine Corps Organization

Fire Team: A fire team consists of five soldiers commanded by a lance corporal. In addition to combat skills, each marine on a fire team possesses specialized training in a particular field. Each team has a designated fire team leader, medic, communications and system ops expert, scout, and weaponsmith. Armed with a grenade launcher, the weaponsmith also serves as the team's heavy weapons expert.

Squad: Two fire teams comprise a squad, a ten-person unit commanded by a supernumerary corporal or sergeant.

Platoon: An infantry platoon consists of four squads, with forty-four personnel commanded by a supernumerary second lieutenant (one level of military Status). Most StarForces Marine Corps platoons incorporate three rifle squads and a heavy weapons squad.

An armored platoon has four tanks, one commanded by a second lieutenant (one level of military Status) who also serves as the platoon commander.

Company: Infantry companies are composed of four platoons, or one hundred eighty marines, commanded by a supernumerary first lieutenant or captain (two levels of military Status). Armored companies also have four platoons, or sixteen tanks plus one for the company commander. Normally, three platoons in a company are of the same type, either infantry or armor, while the fourth consists of heavy support weapons or other special equipment which are not normally deployed independently.

Battalion: Five companies constitute a battalion, a unit of nine hundred five infantry personnel or eighty armored vehicles. Battalions are commanded by supernumerary majors or lieutenant colonels (three levels of military Status). They are the largest StarForces Marine Corps units to be designated as either infantry or armor formations; brigades and divisions contain a mix of both types of units.

Brigade: A brigade consists of three or more battalions, with smaller units attached for specialized tasks. Brigades are often *ad hoc* formations that are assembled for a specific task. They are commanded by colonels (four levels of military Status).

Division: The largest field unit of the StarForces Marine Corps, a division incorporates three brigades, plus support units including engineers, artillery, and logistics personnel. They are commanded by brigadier generals or higher ranks (five levels of military Status).

Special Forces - Special forces

units exist separate from the normal Marine Corps structure, given their unique mission and tactics. Experts in covert warfare, special forces troopers carry out missions ranging from rescuing captives to collecting intelligence. Often operating behind enemy lines, special forces units are independent of the regular infantry organization.

The Marine Special Forces are organized into four company-sized units. In the field, they normally operate in squads to maximize maneuverability and stealth. They may also have equipment not normally available. While an emphasis is placed on physical abilities, no one would graduate training unless they were also highly intelligent.

The companies are designated Alpha, Bravo, Charlie, and Delta. Rumors persist of a fifth unit, Echo Company, even more skilled and secret than the rest. StarForces officials consistently deny the existence of *this* unit or psionic potential in *any* unit.

UW Newsweekly (Earth edition) - reference nw120720.040222.326101 - .05Cr

DATA DUMP

STARFORCES NAVY - The ships of the StarForces

Navy transport StarForces marines and equipment, and protect the worlds of the United Worlds. Navy personnel are charged with keeping the peace in space. They defend the United Worlds against outside aggression, project military force as required to further federation goals and keep the starlanes safe for civilian travel.

Typical duties of the Navy include maintaining a strong presence on the frontier, interdicting pirate activity, inspecting civilian vessels to ensure safety and discourage smuggling, escorting supply convoys in hostile space, marking or eliminating potential hazards such as derelict ships, and conveying Marine Corps forces as needed. Science and exploration are secondary purposes of the StarForces Navy fleet.

U.W. worlds will also have a Space Guard, the equivalent of a ocean-based Coast Guard. This service falls under the aegis of the StarForces, but has a strictly defined role, usually related to rescue, piracy interdiction, ship inspection and navigation updates. Most Space Guard ships are not jump-capable, and are generally equipped only with beam weapons.

Independent planetary navies are the space equivalent of the planetary defense forces. These small and usually obsolete ships are solely under the control of the local planetary government and are not subject to StarForces orders.

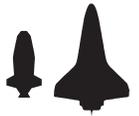
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Navy Vehicles - The StarForces Navy can call on a wide variety of starships to carry out its missions. Frigates, destroyers, cruisers, carriers, and battle-cruisers (sometimes called ships of the line) are the combat craft of the Navy. But the fleet also contains numerous auxiliary starships for transport, reconnaissance, medical care, and other purposes.

▼ **Note!** - For visual reference and approximate scale, the illustration to the right represents the Space Shuttle used by the United States in the late 20th and early 21st centuries.

**Explorer-Class Frigate:**

The smallest of the "ships of the line", the Explorer-class frigates fulfill a variety of purposes in the StarForces and are often assigned as the first commands of promising young officers.



An Explorer is lightly armed and armored, carrying a long-range laser cannon and missile rack for a respectable but far from overpowering offensive punch. Standard Navy tactics rely on the high speed and agility of frigates more than their firepower. A frigate carries a crew of six Navy personnel and one squad of marines. This class of vessel is streamlined and capable of liftoff and re-entry on any habitable world in the U.W.

Intended chiefly for routine patrol, scouting, and courier duties, frigates also serve as task force or convoy escorts in conjunction with larger ships. They are often deployed in pairs except when on routine duty in core systems. They may be sufficient for military-related scientific or archaeological missions, substituting a scientific crew for the squad of marines.

Explorer-class frigates are named for famous explorers from throughout history, and the first entered active duty in 2226CE. The Explorer class masses 800 tons and has maximum acceleration of 3g's. The hull is an ovoid lifting body with stub wings for atmospheric maneuverability and the hull (sans wings) is only about 20 meters long, 6 meters wide and 5 meters high. They are very cramped little ships, packing a Rozkhov Drive, fusion reactor, fusion engine, sensors, life support, weapons and eleven people into a package not much bigger than an early 21st century mobile home. Most are fusion-powered, but anti-matter engine refits are being considered to increase performance and range.

Warrior-Class Corvette:

The quick-striking Warrior-class corvettes convey small Marine Corps rapid deployment units to the latest hotspots and constitute a vital element of United Worlds rapid response strategies.



A plasma bolt cannon allows a corvette to defend itself, and the vessels are streamlined for planetary landings. For landing operations, a Warrior can carry a platoon of marines, a squad of support personnel and either one or two armored vehicles (for an armored platoon) or a second infantry platoon. A recon deployment would be two Warriors, four hovercraft and two infantry platoons, and an armored deployment would be four warriors, four tanks and a company of infantry. However, this class is not meant to be a dropship, it merely demonstrated that capability during the war with the Vorn.

A Navy crew of twelve mans the ship. Developed prior to the development of artificial gravity, Warrior-class vessels have spin hulls to simulate gravity and allow troopers to stay in top physical condition.

Commissioned in 2197CE, corvettes are used extensively on the frontier to react speedily to pirate attacks, Vorn raids, and other flashpoints. They are equally adept at conveying marines to planetary surfaces or conducting boarding actions.

Warrior-class corvettes bear the names of famous soldiers, pilots, and naval personnel. The Explorer class masses 3200 tons and has maximum acceleration of 2g's. The hull is a streamlined dumb-bell with the maneuvering engines on mid-ship pylons. The main hull is about 40 meters long, 10 meters in diameter at the widest point and 20 meters wide to the tips of the pylons.

The StarForces Navy fleet also includes a small number of Landmark-class troopships, capable of carrying a battalion of marines, armored vehicles, heavy weaponry, and the Pegasus-class dropships needed to get them to a planet's surface. Slow and almost defenseless, Landmarks lack the quick reaction time of corvettes, and are typically reserved for planetary invasions or other large-scale operations.

Nation-Class Destroyer:

Designed chiefly as escort and patrol craft, Nation-class destroyers sustained very heavy losses at the hands of Vorn warships in the Interstellar War despite the inspiring courage of their heavily outgunned crews. They were soon joined but not entirely replaced in the battlelines by City-class destroyers. Armed with two ion cannons and a missile rack, Nation-class destroyers were first commissioned in 2200CE. Fast and agile, these destroyers are only moderately armored. They carry a complement of twenty naval personnel and five marines. The Nation-class destroyer masses 5000 tons and has maximum acceleration of 2g's. The hull is a streamlined sphere 30 meters in diameter.



Destroyers are often encountered as escorts to larger StarForces Navy vessels or merchant convoys through hazardous regions. They also carry out pirate or smuggler interdiction missions and routine patrol duties. Nation-class destroyers are named for the nations of Earth and other core worlds.

City-Class Destroyer:

The City-class destroyer, deployed to the fleet just prior to the start of the Interstellar War in 2228CE, wound up in the thick of the fighting alongside the Nation-class destroyers it had been intended to replace. A newer model of this class, redesigned to take advantage of antimatter power plants and artificial gravity systems, joined the fleet in 2230CE.

Armed with a heavy ion cannon and powerful short-range lasers, the City-class packs a powerful wallop for its relative size. A crew of twenty naval personnel and five marines handle the escort and patrol duties to which the destroyers are normally assigned. The City-class destroyer masses 5300 tons and has maximum acceleration of 2.3g's. The hull is a flattened prism 50 meters long, 12 meters high and 20 meters wide. City-class destroyers are not streamlined, but can use their magnetic screens for re-entry purposes and can operate in atmosphere. They also carry a squadron of fighters for additional firepower and tactical flexibility. City-class destroyers are named for the cities of the United Worlds. The City- and other destroyer classes are scheduled to be replaced by the Hero-class destroyer now being designed.



Commander-Class Cruiser:

Commander-class cruisers are the mainstay of the StarForces Navy fleet. More versatile than battlecruisers, yet less vulnerable than smaller starships, cruisers see highly varied duty throughout federation space.

A Commander carries a pair of heavy ion cannons, secondary laser cannons, and missiles. It also has external ports for several small craft, which can include fighters, pinnaces, shuttles, or work pods. Cruisers have crews of up to fifty naval personnel and up to fifty marines for boarding actions or other close combat.

While they are the largest ships normally deployed singly, more often they form the core of small task forces of escorting frigates and destroyers. They handle just about every form of naval duty, from routine patrols to intercepting Vorn raiders reported by fleeing frigates or other scout craft. Commander-class cruisers, commissioned in 2220CE, are named for historical military leaders. The Commander-class cruiser masses 20,000 tons and has maximum acceleration of at least 1g (actual amount is classified). The hull is a modified cylinder 80 meters long and 15 meters in diameter.

▼ **Note** - Some (but not all) of these ships will be given detailed game stats in the **Starships** chapter. For now, think of the ships as political tools and ways to set atmosphere. Just as the presence of a naval carrier group on "routine maneuvers" near a global hotspot sends a message, so does the unscheduled arrival of a fleet of interstellar warships. Does it have anything to do with the larger plot and what the adventurers are up to? Maybe, maybe not, but its presence is something that can't be ignored.

On the side of atmosphere, if a Battle-class carrier comes back to its home port after a several month tour, then you know that a crew of hotshot flyboys is going to be hitting the starport bars. If a StarForces ship doesn't arrive on time at a scheduled port-of-call, people get worried, especially on the frontier. Commodity prices are affected, FTL communications through jumpgates may be preempted for military traffic, or civilian jumpgate traffic may be delayed so that military ships can pass through first. All of which is important if you have a cargo to deliver and bills to pay.

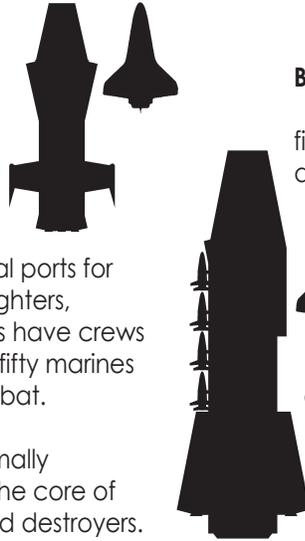
Fires of Heaven^{v1.0}**Battle-Class Carrier:**

Awesomely powerful with its complement of fighters deployed, the Battle-class carrier stands alongside the President-class battlecruiser at the heart of the StarForces Navy fleet. The recent refitting of the fleet's carriers for the recently deployed Shrike-class interceptors has only enhanced their strength.

Armed only with short-range laser cannon, a carrier relies on its complement of fighters for protection and striking power. The Battle-class carrier normally carries forty-eight Shrike-class interceptors and several pods or shuttles in its dual hangar bays or external docking points. The ships also carry complete repair, refueling, and rearming facilities. Built prior to the development of artificial gravity, carriers are in freefall when not under thrust. Carriers have a crew of fifty Navy personnel and two squads of marines for internal security. They also carry one hundred eight pilots, navigators and sensor ops for their complement of fighters, with fifty flight deck personnel including technicians, weapons loaders, and other specialists.

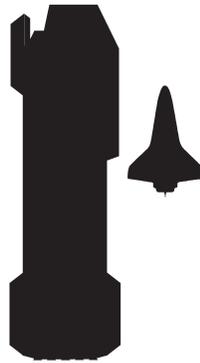
The immensely valuable carriers are never deployed unescorted. Along with battlecruisers, they typically form the core of task forces, always surrounded by protective screens of frigates, destroyers, and cruisers. Added to the fleet in 2218CE, Battle-class carriers are named for famous military engagements. The Battle-class carrier masses 50,000 tons and has stated acceleration of .5g (actual thrust is classified). The hull is a modified slab 120 meters long, 15 meters high and 20 meters wide.

▼ **Note** - Do not let the small size of the silhouettes fool you. First, the Space Shuttle is a huge machine. Nose to nose and wingtip to wingtip, you can only park four of them on an American football field. Second, these starships exist in three dimensions, not two. A ship only needs to be about 30% larger in each dimension to have twice the interior space (e.g. a ship that is a 13 meter sphere has more than twice the interior volume of one that is 10 meters in diameter). If the Commander-class cruiser were a single one-story room (2.5 meters high), it would be 70 meters on a side (1.2 acres or .5 hectares in size). Virtually all military starships are like early 21st century submarines. Thick hulls, cramped quarters, hostile environment outside, self-contained environment inside. Extra space is a luxury, and military ships aren't luxury ships...



President-Class Battlecruiser:

Battlewagons of the StarForces Navy fleet, a President-class battlecruiser packs a powerful punch. Commissioned in 2205CE, the heavily armored President-class carries Ares Devastator particle cannons, with gatling lasers for point defense. The ships are in freefall when not under thrust. Each battlecruiser carries a normal complement of fifty naval personnel and fifteen marines. It may also carry several ancillary craft, either docked or in internal hangars. This can include fairly substantial ships. It would not be uncommon to see a few frigates perched on a battlecruiser like remoras on a shark. Admirals often use President-class vessels as flagships.



Battlecruisers normally are deployed with an escorting force of frigates, destroyers, and cruisers, and (in conjunction with carriers) they often form the cores of task forces. Rarely used for routine patrols or convoy duty due to the expense, battlecruisers are normally dispatched only when heavy combat seems imminent or a show of U.W. force or resolve is necessary.

President-class battlecruisers are named for national, planetary, and federation leaders. The President-class battlecruiser masses 100,000 tons and has a stated acceleration of .5g (actual thrust is classified). The hull is a modified armored slab 100 meters long, 15 meters high and 22 meters wide. The President-class battlecruisers, designed prior to the advent of antimatter drives and artificial gravity, are due for replacement. Trials of the Continent-class battlecruiser are reportedly under way at secret StarForces Navy facilities.

Fighters - The StarForces Navy fleet includes starfighters that can be configured for a number of roles. While some armchair strategists claim fighters are outmoded in space, these craft are a valuable enhancement to the force projection and recon capabilities of the fleet.

Shrike-Class Interceptor:

Heavy starfighters incorporating the latest technological advances, most notably high-thrust antimatter engines, Shrike-class interceptors are being deployed to the fleet as quickly as they can be constructed. The design was commissioned in 2235CE, replacing the sorely outdated SF-102. The Shrike's antimatter engine/reactor takes up a third of the ship, and the fact that it is an antimatter engine makes it expensive to fuel and maintain, so thus far it is only deployed with front-line fleets and at core worlds with antimatter production facilities.



Armed with a plasma bolt cannon, point-defense laser and missiles, a Shrike can handle up to 5g acceleration with a strong maneuverability profile. A cybernetic interface allows the pilot to link directly to the ship, further enhancing reaction time and agility. Well-armored, the fighter also carries redundant systems that render it extremely durable in combat. The Shrike carries a crew of two: pilot and sensor op/gunner. The hull is an armored prism 10 meters long, 3 meters high and 5 meters wide. Shrikes have extended endurance for a fighter, but are not designed for long-duration missions. It has no quarters, no airlock and while it is airtight, the only life support is a hookup to the crew's combat e-suits.

Designed to handle Vorn fighters (though not one-on-one), Shrikes are intended for deep-space service aboard Battle-class carriers, which have been retrofitted for the fighters, or naval starbases. Typical missions include scouting, interdicting enemy fighters, and defending capital ships against missile attacks. Capable of carrying orbit-to-ground missiles, the Shrike can perform low-orbit ground support during a landing operation, or carry recon drones into hostile environments. It is not designed for re-entry, but is tough enough to survive if necessary.

Support Ships - Combat-oriented ships may grab all the glory, but the StarForces Navy could not carry out its mission without the assistance of several classes of support ships.

A handful of Stellar-class hospital ships provide comprehensive medical facilities and a complete medical staff for deep-space task forces, ground actions on hostile planets, or other missions with limited access to conventional medical care.

Galaxy-class tenders carry fuel, provisions, ammunition, and other supplies for vessels on extended duty away from starbases or other supply points.

Nebula-Class Recon Ship:

So secret that the StarForces Navy has thus far denied their existence, these stealthy covert operations ships carry an array of recon drones, long-range passive sensors, and other advanced intelligence-gathering systems. Lightly armed, they rely on concealment to avoid detection and speed to escape pursuit. Self-destruct systems allow the ships to be destroyed to prevent their capture or study.

Crewed by naval intelligence analysts, Nebulas infiltrate space held by rival interstellar civilizations, chiefly the Vorn, to collect data on the capabilities and activities of potential enemies. Introduced into service in 2234CE, Nebula-class ships are limited in number. Individual ships are designated by code sequences, not names.

▼ **Note** - Nebulas and other "low profile" ships have the disadvantage that they can't just pull into any old starport for refueling and supplies. These ships tend to carry everything they are likely to need for a year or more, deploying from and returning to out of the way or secret StarForces installations. Communications are often handled by using military jumpgate accounts, beaming anonymous laser messages from distant parts of an inhabited system. When these arrive at a jumpgate, if authentication is valid for payment of the message charge, the message is forwarded just like any other FTL message traffic. Of course, jumpgate comm technicians quickly catch on that some messages are more unusual than others, but since the messages are one-time encoded and virtually impossible to crack, it is just scuttlebutt around the break table and a source for the occasional rumor.

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▼ **FLEET COMMAND** - The Fleet Command structure encompasses the starships and starbases of the navy.

Starship Organization - Command officers, department heads, and bridge officers (collectively flight officers) are the command crew responsible for the lives of every man and woman aboard. Their decisions determine the fate of the starship.

The ultimate authority aboard every ship rests in the commanding officer, also known as the captain, CO, or skipper. The executive officer (exec or XO) is second in command, overseeing day-to-day operations and ensuring the ship's readiness for any mission it may be assigned.

Next in authority are officers in charge of shipboard departments. These include the chief engineer, astrogator, tactical officer, fire control officer, and chief medical officer. Bridge officers, including the deck officer, helmsman, sensor ops, and other personnel, are the lowest tier of flight officers. Because of the large amount of automation on starships, crews are vastly smaller than on ocean-going vessels of the same size, and a "shipboard department" may consist of only the two or three people needed to make sure a station is manned on all shifts. Smaller vessels may not even have that. Normally, one of these individuals in a "department" will have rank over the others, but on ships with a dozen or less crew, virtually everyone is cross-trained to handle more than one duty and formal rank structure is less enforced.

The Marine officer in charge of a ship's security complement is also a flight officer, although he or she typically doesn't visit the bridge unless requested. Aboard a carrier, the fighter wing commander is in the command crew.

In addition to fulfilling their specific duties, flight officers may also be called upon to offer advice to the commanding officer. The commander has no obligation to follow it, but only a foolish captain ignores the recommendations of the collected experts under their command.

Among enlisted ranks, petty officers carry out the orders given by officers and oversee the work of spacers. Petty officers are also expected to keep order in the ranks. On most ships, petty officers handle minor infractions unofficially, allowing spacers to keep a clean record and freeing the CO from being mired in trivial disciplinary cases.

Marines provide security aboard larger starships, typically a fire team or a squad, though for any deployments where they are expected to be used, they will be doubled and hot-bunked (two groups sharing the same quarters in alternate shifts). The marines form a separate unit of the crew, under the command of a Marine Corps officer who reports directly to the executive officer and captain. The chain of command for the Marine detachment is distinct from that of the ship's Navy complement except at the level of the XO and the skipper; if some other Navy officer issues an order to a junior marine, while the order may be obeyed, if the marine's commanding officer hears about the exchange, the Navy officer will have some answering to do.

Starbase Organization - Naval starbases are organized comparably to starships, but the much larger crew complements mean the level of organization and rank structure is more strictly adhered to. The command crew consists of a commanding officer, executive officer, department heads, and operations personnel, as well as heads of the Marine security detachment and Navy fighter units, if any, attached to the base.

Enlisted ratings, overseen by petty officers and lower-ranking officers, carry out day-to-day tasks on the base. The exact makeup of the crew depends on the purpose of the starbase. Supply depots, repair facilities, shipyards, research outposts, and training centers are just a few examples of StarForces Navy starbases. Some of the particularly vital or large starbases are commanded by rear admirals, though it is generally not an assignment of choice.

Fighter Command Organization

The starfighter forces of the Navy fall under the Fighter Command structure.

Wingman: Starfighter pilots rarely fight alone, each fighter typically flying with a wingman. The pilots of the two pilots work together, watching each other's backs, and using cooperative tactics to accomplish their mission. The senior pilot typically directs the action, following the orders of the squadron leader, if any.

Squadron: A fighter squadron consists of six starfighters. There are eight squadrons aboard each Battle-class carrier, and a varying number at starbases. The squadron commander pilots one fighter, directs the squadron, and communicates with his superior officers aboard ship or back at base. Responsibility for the training, readiness, and conduct of his squadron also fall on the squadron commander.

Most squadrons have colorful, unofficial names in addition to their staid military designations, such as the Jolly Rogers, Top Hatters, and Black Knights. Individual squadrons also often develop unique customs and traditions.

Wing: Four squadrons, or twenty-four starfighters total, comprise a fighter wing. Each Battle-class carrier holds two wings, typically commanded by a captain. The wing commander, who serves in the carrier command crew, has authority and responsibility for all flight operations on the ship. While the wing commander is usually a former pilot, actual inflight operations of the wing are controlled by the senior squadron commander.

Task Forces: Vessels of the single StarForces Navy fleet are organized into task forces for specific operations. A task force may consist of anywhere from two ships to dozens, depending on the mission and expected opposition.

A larger task force is typically commanded by a rear admiral or vice admiral. The ship carrying the task force commander, known as the flagship, remains under the authority of its CO but operates as a mobile command center for the entire force. Battlecruisers or carriers are most often used as flagships.

Once the operation for which it was assembled is completed, a task force normally breaks up with individual starships scattering for assignment to routine duties or incorporation into other task forces.

Naval Command - The Naval Command oversees the operations of the entire StarForces Navy: fleet, fighters, and starbases. Consisting of the chief of naval operations, his staff, and various other personnel, Naval Command constitutes the ultimate authority within the StarForces Navy. All duty assignments, transfers, strategic plans, fiscal management, policy directives, and operations details flow from Naval Command.

Navy Ranks - Incoming StarForces Navy recruits start at the bottom of the hierarchy and work their way up, earning promotions by performing their duties satisfactorily for a given period of time. Poor performance can leave a person stranded at a low rank for years, while exemplary performance may result in a rapid rise through the ranks.

The chain of command aboard a starship depends not only on rank, but on position. In most cases, personnel of higher rank hold positions over those with lower ranks, but occasionally a lower-ranked officer may end up giving orders to one of higher rank. For example, a lieutenant serving as the executive officer on a frigate could assume command upon the death or disability of the captain in battle. Although the chief engineer, a lieutenant commander, technically has a higher rank, the engineer follows orders since the lieutenant is the acting commanding officer.

StarForces Navy Ranks

Enlisted Personnel

Spacer Recruit	
Spacer Apprentice	▼
Spacer	▼▼
Petty Officer Third Class	▼▼▼
Petty Officer Second Class	▼▼▼▼
Petty Officer First Class(1)	▼▼▼▼▼
Chief Petty Officer	▼▼▼▼▼▼
Master Chief Petty Officer(2)	▼▼▼▼▼▼▼

Officers

Ensign(1)	—
Lieutenant Junior Grade	—
Lieutenant(2)	
Lieutenant Commander	●
Commander(3)	●●
Captain(4)	▼
(Commodore)	
Rear Admiral(5)	◆ or ◆
Vice Admiral	◆◆
Admiral	◆◆◆

Fires of Heaven^{v1.0}

DATA DUMP

Admiral J.C. Webb - The chief of naval operations, Admiral J.C. Webb, struggles to balance his hard-learned personal code of honor against the demands of commanding the StarForces Navy.



Raised on Mars, Webb attended StarForces Academy and made a name for himself as an expert fencer. In 2196CE, Webb won the gold medal in fencing at the Olympics while still a midshipman. He joined the Navy officer corps on graduation to begin a rapid climb through the ranks.

As a young officer, Webb carried on a string of affairs at ports-of-call throughout the federation while his loving wife and children waited back on Mars for his infrequent visits. His infidelity eventually led to a painful divorce, and the pain in his children's eyes shamed Webb into foreswearing his reckless ways.

In the decades since, Webb has striven to be morally upright in all ways. The tough choices required of a high-ranking military leader, not to mention the political games attendant with his office, have sorely tested Webb's resolve at times. While fully capable of making snap decisions, Webb agonizes over the propriety and moral dimensions of his actions.

A human of mixed European descent, Webb, 62, has brown eyes, thinning black hair and wears a neatly trimmed goatee. He stands a burly 188cm tall.

Who's Who in the United Worlds - reference ww109423.159486.058450-.05Cr

▼ **Note!** - In the StarForces Navy, "captain" is used to describe both a position and a rank. But while there may be multiple captains on a ship, both Navy and Marine, only one of them is referred to as "The Skipper" or "The Captain" (a term used even if the commanding officer is of a different rank).

The title "commodore" isn't a rank *per se*, but rather a courtesy title used when an officer of captain's rank is put in command of a squadron of frigates or other small starships.

▼ **LIFE IN THE STARFORCES** - Conscription has never been used by the United Worlds, although it could conceivably be instituted in a time of dire crisis, and some worlds may employ the draft for local military forces.

Recruitment centers operate in most population centers on U.W. worlds. Young men and women age 18 to 40, in good health and reasonable physical condition, visit these centers to enlist in either branch of the StarForces. They undergo extensive educational, medical, and psychological testing over a period of one to two weeks, returning to their homes each night. Those who are accepted into the StarForces are typically given a 24-hour leave to wrap up their civilian affairs and ordered to report back for transportation to basic training at the nearest induction center.

A standard enlistment in the StarForces Marine Corps or Navy lasts three years. One can request or try for specific duty assignments, but whether or not you are trained in a field is based on your aptitude and psych profile. For instance, if you are deemed unsuitable for the close quarters and privacy-free environment of a military starship, then any mission specialty specific to starships is out of the question. Extended terms of enlistment are often required of personnel seeking advanced or specialized training. For example, a marine must agree to a six-year term in order to undergo elite special forces training (regardless of whether or not they succeed or wash out of this training).

Personnel who wish to remain in the StarForces after their initial enlistment ends can re-enlist, assuming they have clean records. Depending on the current political climate, StarForces sometimes offers bonuses or choice duty assignments to spacers or marines coming to the end of their terms, to try to retain personnel with valuable skills. Within a term this option may also be available. A person can sometimes deliberately choose a "hardship" assignment for a year or two in order to get a choice of assignments the following years (such as being deployed on the same planet as your family, etc.).

Basic Training - Recruits undergo basic training, still known as "boot camp", at one of several induction centers. Each center consists of a base camp on a reasonably Earth-like world, an orbital station, and ancillary camps on low-g moons or worlds in the star system. This allows training in the varied environments recruits are likely to encounter in their tours of duty.

The Navy and Marine Corps both operate induction centers on Earth and all other core worlds. In basic training, recruits undergo intense physical and mental conditioning and instruction in the fundamentals of military life. Among other lessons, they are taught to obey orders, show proper military courtesy, follow regulations, and conform to long-standing StarForces traditions. Basic training also instills discipline, self-confidence, and team spirit in shaping recruits into suitable military personnel.

Drill instructors, each of whom oversees a squad of recruits, are Marine Corps NCOs. Other Navy or Marine Corps personnel serve as instructors in various classes.

Basic training for StarForces Navy inductees lasts six weeks. StarForces Marine Corps recruits undergo fourteen weeks of basic training, including a basic infantry school that all personnel must pass regard-less of their eventual assignment.

▼ **Note** - In EABA terms, a 14-week boot camp is good for about 5S worth of skills and 3A worth of physical conditioning. Think of it as true full-time training, where none of your time is your own.

Recruits who do not complete boot camp may be allowed to try again, depending on exactly why they did not finish the training - someone forced to leave by an injury will probably get a second chance, but a recruit who simply failed to grasp the essentials of military life likely will not. Those who drop out at their own request may not re-enlist for a period of several years.

After completing boot camp, Navy and Marine Corps recruits go on to advanced training. Here they learn the specifics of their future duties in the StarForces. Advanced courses exist for just about every military specialty, from communications to logistics. The length of the training depends on the subject, but usually falls between twelve to twenty-four weeks.

StarForces officers earn their commissions in two ways. They can be identified as potential officers in basic training or later in their careers and sent to Officers Candidacy School (OCS), or they can earn appointments to StarForces Academy.

"I slacked off a little in my senior year at the academy. One day after I botched an in-class exercise in Advanced Astrogation, Mr. J'jixl told me to stay after class. It said, as near as it could calculate, I would have jumped my ship somewhere to the other side of the Milky Way. I expected to be loaded up with astrogation homework from here to doomsday, but Mr. J'jixl actually forbade me to do any more calculations until I had read the findings of some board of inquiry."

"I went to the library and looked it up. During the war, a freighter full of refugees in 61 Cygni A detected a Vorn ship on the outer edge of the system. They panicked and jumped to Epsilon Eridani, but the astrogator must have made a mistake. The freighter emerged inside the star's photosphere. A Navy ship on patrol nearby picked up their telemetry. It took six minutes for the freighter to burn up. Two hundred-fifty passengers and a crew of eight."

"I didn't fail a single astrogation problem for the rest of the term."

- Ensign Lillia Stamboliski, StarForces Navy, 2237CE

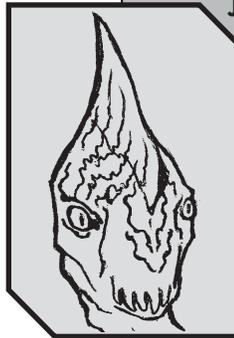
▼ **STARFORCES ACADEMY** - A highly prestigious university, StarForces Academy combines a four-year college education with military training to turn out new Navy and Marine Corps officers. Founded in 2056CE, it is considered the top military academy in the United Worlds and its graduates have an inside track on promotion and advancement.

The academy grounds consist of a cylindrical space habitat orbiting Luna in the Sol system. Auxiliary facilities are found on Luna, Mars, and the asteroid belt.

Competition for entry to StarForces Academy is fierce. Each United Worlds delegate may make two appointments to the academy for each incoming class. Academy administrators select the rest, but hundreds of young men and women throughout the federation are disappointed every year.

Fires of Heaven^{v1.0}

Prospective StarForces Academy attendees must commit to at least six years of post-graduation active duty as officers in the Navy or Marine Corps upon acceptance to the school. While at the academy, they undergo rigorous academic classes as well as physical conditioning and training in all aspects of military operations. Summers are spent in the field learning from StarForces personnel on active duty. Navy students are known as midshipmen, while Marine Corps students are cadets. Graduates earn both a degree and a commission as a Navy ensign or Marine Corps second lieutenant.



J'jixl - A civilian instructor,

J'jixl teaches one of the most dreaded courses at StarForces Academy: *Advanced Astrogation 3055* (including astrogation without computer assistance). More cadets and midshipmen wash out of the academy through failing its course than by any other single cause.

DATA DUMP

J'jixl accepted an instructing position at StarForces Academy in 2223CE after acting in a similar role on its homeworld. J'jixl is renowned for its imperturbability and impartiality. It displays the typical D'eiran reverence for mathematics, and accepts no excuses for incorrect calculations. Its sober, remote presence discourages all familiarity or frivolity, although J'jixl does care for its charges in a D'eiran fashion unreadable to most humans.

Administrators at the academy value J'jixl for its skill at drilling the precision required for astrogation - in which even the simplest error can result in a jump catastrophe - into its students. The resulting pressure-cooker environment helps administrators evaluate how the prospective officers react to stress.

J'jixl, 110, a D'eira, stands 213cm tall and has a gangly build. It has green skin with black and red markings. J'jixl has an adult child - an astrogator aboard a private exploration vessel that's been missing for a number of years.

Who's Who in the United Worlds - reference ww109622.159626.042851 - .05Cr

Officer Candidacy School - Enlistees identified as potential StarForces officers go through basic training with other recruits, but are watched closely for leadership qualities. Those who prove themselves in boot camp are sent to Officer Candidacy School to earn a commission. Some experienced enlisted personnel are also promoted into the officer corps. Sometimes called "mustangs", they also go to OCS.

These schools, operated at most induction centers, train prospective officers in tactics, morale, leadership, military law, and other relevant subjects. The grueling thirty-six week course, which includes short cruises and field exercises, weeds out those incapable of leading others and making life-or-death decisions in combat. Graduates become Navy ensigns or Marine second lieutenants, while those who drop out or fail return to their previous enlisted rank. After OCS, the new officer may be sent on to advanced training in a particular field, such as engineering or astrogation, before receiving orders for active duty.

▼ **TOUR OF DUTY** - The details of each tour of duty are different, depending on the job assignment, capabilities, circumstances, and the luck of the individual. A naval supply clerk on Mars will have a far different military experience than a Marine Corps special forces trooper assigned to the frontier, for example. But certain constants apply.

A recruit is typically assigned to a specific job when they enter the StarForces, and receives advanced training after boot camp to prepare him for this designated military career. The desires of the recruit are taken into consideration when job assignments are made, but the needs of the service are paramount.

Personnel can sometimes receive transfers and training for new assignments, however, they may be reassigned against their will.

Some of these job assignments apply to a specific branch, while others are present in both the Navy and Marine Corps. In general, each branch handles its own needs - for example, the logistics operations are separate entities. The StarForces High Command oversees cooperation and coordination between branches.

Command Staff - The command staff consists of the flag officers in charge of each StarForces branch, their assistants, and the bureaucracy necessary to operate such a massive, far-flung organization.

Fighter Pilots - Glorified in popular books and holovids, starfighter pilots are the daring souls who fly into danger in fast but vulnerable spacecraft. The fact that sensor operators and gunners share the risk on most Navy and Marine Corps fighters seems to have been overlooked in many media portrayals.



Lt. J.G. "Sorcerer" Wylie -

DATA DUMP

A hotshot starfighter pilot striving to live up to the legend of his mother, Lt. Wade Wylie serves in the StarForces aboard the carrier *USS Agincourt*.

His mother, Commander Maggie "Sorceress" Wylie, served with distinction as a Navy starfighter pilot before retiring from the StarForces to start a family. Recalled to duty during the Interstellar War, she perished in a battle with the Vorn.

Seeking a fresh start, Wylie's father moved the family to the frontier colony of Gawaine. Wylie earned an appointment to the StarForces Academy as a naval midshipman at age 18. Despite hijinks that made him legendary among his classmates and nearly cost him his commission, he graduated in 2235CE. Two years of flight school followed, and Wylie recently reported for duty to the *Agincourt* as a newly promoted Navy lieutenant junior grade.

Wylie has a natural aptitude for flying that has earned him, perhaps inevitably, the callsign "Sorcerer". Wylie seems determined to prove his worthiness to the legacy of his mother, at any cost. He flies a Shrike-class interceptor as wingman to experienced pilot Lt. Phaedra Theodopoulos of Earth. Her no-nonsense demeanor has landed Theodopoulos the irony-laden callsign "Prankster", and her superiors hope she can knock some discipline into the talented but rash Wylie.

A human of European-Australian descent, Wylie, 24, has short black hair and merry green eyes. He stands 180cm tall and has a lean, muscular build. A small scar on his chin marks a minor injury received as a child that he hasn't had removed because he thinks it makes him more dashing.

TeenBeat: Hearthrobs 2236CE - reference ds321646.371608.290672 - .05Cr

Infantry - The ground-pounders who comprise the bulk of the StarForces Marine Corps, infantry troopers are close-combat specialists. Whether it be a zero-g boarding action or a full-scale planetary invasion, the StarForces rely on infantry troops to carry it off.

Given the small size of the Marine Corps relative to the vast area of the United Worlds, infantry strategy and tactics stress mobility. Fast-striking StarForces Navy corvettes carry marines to trouble spots. On the ground, infantry units use armored personnel carriers, tanks, and hovercraft recon vehicles to overwhelm enemies with speed and striking power.

Standard Infantry Kit - This is the basic equipment of an enlisted StarForces Marine trooper deployed on a non-hostile world. Quartermasters supply additional equipment, such as respirators, rations, shelters, etc. as needed for a particular mission.

DATA DUMP

Combat Infantry Dress
 Combat Helmet
 M-51A Assault Rifle
 6 clips of 7mm ammunition
 Combat Knife
 Total Weight: 24kg

UW Defenselink Almanac - reference uw653385.452383.245239 - .00Cr

Intelligence - Gauging the readiness, capacity, and possible strategies of potential enemies falls to the StarForces intelligence services. Personnel from these services analyze troop movements, ship designs, captured equipment, economic data, and other information gleaned from myriad sources to smoke out potential threats to the United Worlds. Counter-intelligence personnel try to keep potential enemies in the dark about StarForces activities.

Top-secret Nebula-class reconnaissance ships are the ace-in-the-hole of the StarForces intel services, enabling personnel to covertly investigate reports of Vorn activity in nearby systems, intercept communications, analyze sensor emissions, and attempt to decipher design changes.

The training and skills required by StarForces Intelligence require that all its personnel be of Special Forces or officer level, making it a highly elite service. Eternally vigilant, officers of the intelligence services of the two StarForces branches are the first line of defense for the federation.

Fires of Heaven^{v1.0}

Logistics - Logistics isn't glamorous duty, but starships without fuel or troopers without ammunition don't accomplish much. Logistics personnel from each branch keep their respective starships, starbases, and Marine Corps units supplied with everything from underwear to antimatter. This service also works with civilian contractors to design, test, construct, and deploy new equipment and starships vital to keeping up with the latest tech advances.

Medical - The naval medical corps oversees the health of StarForces Navy personnel, who are sometimes light-years away from the nearest civilian hospital. Every ship has a sickbay and medical officer to provide for the medical needs of the crew (although on small ships like frigates this is perhaps only a cross-trained individual whose main duties are elsewhere).

The fleet also includes full-scale Stellar-class hospital ships, equalling traditional hospitals in their ability to treat the injured and ill.

In the Marine Corps, each squad has one member trained and equipped to perform first aid (this person has the advantage that they are seldom asked to take point position on patrols...). Dropships carry the seriously wounded to field hospitals, staffed by physicians, surgeons, and nurses, operating near the battle lines. Those requiring long-term care or recovery are sent to permanent hospitals found at most Marine Corps bases.

Medical officers usually graduate from OCS with a rank one grade higher than combat officers (e.g. 1st Lieutenant instead of 2nd Lieutenant, or Lieutenant Junior Grade instead of Ensign).

Military Police - MP's keep order on military installations, provide security against intruders, investigate crimes, and arrest those who violate military law. They also have *carte blanche* to, as the archaic phrase goes, "open a can of whoop-ass" on military personnel who get rowdy in public places. Specially trained Marine Corps personnel handle all military policing duties for *both* StarForces branches (Marines are less likely to give trouble to other Marines...).

Special Forces - Elite warriors, StarForces Marine Corps special forces troopers carry out top-secret missions often calling as much for stealth as combat ability. They operate behind enemy lines, cut off from support or sometimes even rescue, as a matter of routine.

Typical missions include strikes at enemy command posts, anti-terrorist actions, intelligence operations, reconnaissance, rescues, and other covert activities. During the Interstellar War, special forces units were dropped onto occupied worlds to fight guerrilla actions against the Vorn.

Special forces units are highly respected both in and out of the military, Their real and imagined exploits are popular holodramas, and action heroes are likely ex-Special Forces as anything else.

Starbase Crew - A starbase posting may be less glamorous than duty aboard a starship, but it's usually a lot more comfortable. Some starbases even have family quarters, and ground facilities may allow off-base housing. While they may work in plusher surroundings, starbase crews have a vital role in keeping the StarForces ready for action. Starbase personnel prepare supplies, repair damaged ships, train new recruits, coordinate military actions, and handle many other mundane but necessary tasks.

Starbase crews had the distinct disadvantage during the Interstellar War that starbases can't run away from Vorn invasion fleets. Assignments to starbases on the frontier are not requested nearly as often as they used to be...

Starship Crew - Contrary to popular belief, more Navy personnel serve aboard starbases and in other supporting roles than aboard starships. Still, the idea that StarForces Navy means starship assignments is firmly lodged in the public mind.

Each crew member has a specific job aboard ship, and many are cross-trained in other specialties for emergencies (e.g., a cook may serve as a corpsman during combat). Marines assigned to starships are responsible for security aboard ship, as well as conducting boarding actions or other close-combat missions. Much of the cross-training duties a starship will require are actually provided by the Marine complement, since in any conflict situations, all normal crew are going to be at stations, while the Marines are only needed for boarding and cleanup operations.

▼ **STARFORCES DAILY LIFE** - For the most part, military personnel follow a daily routine little different than that of civilians, if slightly more regimented. Most work eight-hour shifts when on active duty (though they are on-call at *all* times), and are free to spend the rest of their day sleeping, handling personal chores, or having fun. Of course, these opportunities may be limited on a starship, remote outpost or other non-planetside assignment.

The StarForces recognize the importance of recreation, and even ships on long patrols carry extensive libraries of books, holovids, and virtual-reality programs to keep crews entertained. A certain amount of FTL bandwidth waste is tolerated so that ships and bases can engage in long-term strategy games with each other. These help keep a sharp mental edge, and like mail from home, is a connection to the rest of "humanity".

Some of the personnel assigned to planetary installations are allowed to live off-base, and starbases in peaceful systems may have civilian quarters for families of active-duty personnel.

Regardless of their assignment, all military personnel are expected to keep physically fit. Most work in time for exercise, whether a run, a spell in the weight room, or workout in a zero-g gym, into their daily schedules. Likewise, keeping uniforms and barracks in shape also eats up time each day.

There are other differences between civilians and StarForces personnel. Military personnel can be reassigned at the drop of a hat, sending them to a new job, starship, base, or even to another star system. And, unlike civilians, they don't have the option of quitting to escape the transfer. Naturally, the StarForces try to exercise compassion when cutting new orders for personnel, particularly those with families, but the needs of the services come first.

Failure to follow orders or behaving in an insubordinate fashion (on duty or off), can result in a court-martial with penalties ranging from lost pay to incarceration. Some violations, such as treason or cowardice in the face of the enemy, can merit execution, though in practice this is a political hot potato and is seldom implemented.

And, of course, in times of danger, military personnel are expected to put their lives on the line to protect the United Worlds.

Liberty and Leave - Military personnel do not get vacations *per se*, but can be granted liberty or leave when circumstances and their duties permit.

Liberty is a short-term break from duty, usually one to three days long, that also allows the spacer or soldier to leave his ship, base, or camp. Personnel on leave are granted several weeks away from active duty, giving them adequate time to go off-planet to return home or vacation on other worlds. StarForces personnel on liberty or leave can be recalled to active duty at any time, however. They can also lose these privileges for any number of violations and infractions.

Going absent without leave (AWOL) is a serious violation of military regulations and can result in a court-martial.

Military Justice - The StarForces follow a code of military justice, with a legal system separate from civilian courts. Crimes or other violations by active-duty military personnel are tried, adjudicated, and punished within the StarForces. In some cases, military personnel who violate civilian laws may be turned over to federal or planetary courts for trial, though the military does not like to do this and will generally deny requests to do so unless political pressure is brought to bear.

Commanding officers issue summary judgments in cases of minor infractions. Aboard StarForces Navy ships, these proceedings are known as "captain's masts". More serious violations may require a court-martial, heard by a panel of officers and involving military prosecutors, military defense attorneys, and other personnel.

Minor infractions are typically punished by extra duties, loss of pay, loss of liberties, or restriction to the ship, camp or parts of a base. These infractions will also be noticed when promotion opportunities come around. Penalties for more serious charges, which typically require some form of court-martial, include demotion, expulsion from the StarForces, imprisonment or even death.

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Discharges and Retirement - Individuals leaving the StarForces receive an official discharge freeing them from military service. There are four categories of discharge: honorable discharges go to those who have performed their duty exceptionally well and received no official reprimands, general discharges are given for adequate performance, bad-conduct discharges are given to those expelled from the military for wrongdoing, and medical discharges are granted to personnel whose injuries or infirmities disqualify them from continued active duty.

Some personnel leaving active duty elect to join the StarForces Reserve, or may be required to enter reserve service by the terms of their enlistment. Reserve personnel spend a designated period of time each year on active duty, but are otherwise civilians. They can also be recalled for longer periods of active duty in times of emergency.

Any veteran who has served at least one full term of duty with an honorable or general discharge, or who has been given a medical discharge, is eligible for basic medical care at any Veteran's Hospital, including any continuing treatments or repairs necessary for service-related injuries. This includes maintenance and replacement (if available) of cybernetic replacement parts.

A veteran with twenty years or more of duty, whether active or reserve, is entitled to a StarForces pension. Veterans with medical discharges may also qualify for full or reduced pensions.

Pensions - Standard StarForces pensions are calculated on the basis of percentage of the twenty year term completed, times pay rate minus two competency grades at the time of discharge. **DATA DUMP**

For instance, a veteran at CG6d discharged for medical reasons after ten years of service would receive a pension equal to CG4d pay times fifty percent, while a standard twenty year veteran at CG5d would receive a pension equal to CG3d pay.

UW Defenselink Almanac - reference uw231189.234413.568232 - .00Cr

▼ **ATTITUDES AND TRADITIONS** - Both branches of the StarForces place a strong value on tradition. Military life is replete with customs and practices that serve to reinforce the bonds between personnel and build institutional pride. The Code of Military Conduct, chiefly encompassing ideals first expressed in the United States military and French Foreign Legion, sets forth the expectations laid upon members of the StarForces.

Code of Military Conduct

DATA DUMP

I am a United Worlds citizen, fighting in the forces that guard my world and our way of life. I am prepared to give my life in their defense.

I will respect military traditions and honor my superiors. Discipline and comradeship are my strengths, courage and loyalty my virtues.

Every soldier is my comrade-at-arms, irrespective of his homeworld, gender, race, or creed. I will demonstrate this by straightforward solidarity, which must always bind together members of the same family.

I am an elite soldier. I will train vigorously, I will maintain my weapons as if they were my most precious possessions, and I will keep my body in the peak of condition, always fit.

In combat, I will act without relish of my tasks, or hatred. I will respect the vanquished enemy, and will never abandon my wounded. I will never surrender of my own free will. If in command, I will never surrender the members of my command while they still have the means to resist.

If I am captured, I will continue to resist by all means available. I will make every effort to escape and to aid others to escape. I will accept neither parole nor special favors from the enemy. I will keep faith with my fellow prisoners. I will give no information or take part in any action that might be harmful to my comrades.

I will never forget that I am a United Worlds citizen, fighting for freedom, responsible for my actions, and dedicated to the principles that made my world free.

UW Defenselink Almanac - reference uw012204.661969.420765 - .00Cr

Interservice Rivalry - A long-standing rivalry exists between the Navy and Marine Corps, dating back to their nationalistic precursors on Earth.

The prevailing wisdom in the Corps holds that naval personnel are lazy layabouts on soft duty, sleeping in bunks every night and enjoying hot meals aboard their sparkling ships. They point out the "easy" boot camp naval recruits go through, because they aren't tough enough to handle "the real thing". Naval ratings, on the other hand, tend to regard marines as know-nothing brutes whose only real skill lies in combat. Marines are quite happy to demonstrate the latter to any naval rating who doubts it...

Of course, all interservice rivalries are put aside when it comes to getting the job done. Units of the two StarForces services are capable of working together seamlessly even in high-stress situations. The rivalries are tradition and an excuse for letting off steam rather than any real form of animosity.

Military Courtesy - All StarForces personnel are required to display proper military courtesy while on duty. This includes saluting superior officers, standing when a commanding officer enters the room, using military forms of address, and generally exhibiting a formal demeanor when appropriate. Small and close-knit units are more informal, but usually only among themselves. Rank structure is still maintained, but the formalities are not as enforced.

Violating StarForces rules of military courtesy can result in disciplinary action, up to a court-martial for insubordination in cases of repeated or particularly heinous offenses.

Salutes and other forms of military courtesy are not required during encounters between off-duty personnel, but overt disrespect can still land enlisted ratings and low-ranking officers in official trouble.

▼ **CORPORATIONS & FREE TRADERS** - Access to the vast resources of space and other worlds has fostered the growth of immense, interstellar corporations. These 23rd-century megacorps produce many of the goods and control many of the services used by United Worlds citizens every day.

AMEX

Primary Operations: Finance, diversified holdings

Headquarters: New York City, Earth

Net Worth: 353 trillion Credits

Employees: 8.5 million

Chief Executive: Jonathan D. Phelan, president

Amex, the largest corporation in the United Worlds, has a hand in almost every form of commerce on human worlds. A fixture in the world of high finance for more than two centuries, Amex capitalized on humanity's spread to the stars by putting up funds for early private exploration and colonization efforts. This forward-looking strategy, even today a hallmark of Amex, has kept the corporation on top in the interstellar marketplace.

Amex primarily deals in finance, everything from providing loans to shopkeepers to underwriting pioneer colonies. Insurance and travel are also core activities of the company.

Its vast holdings, while highly diversified, reflect the corporation's continued interest in resource development and expanding the United Worlds sphere of influence.

History - Originally a credit and travel company on late 20th-century Earth, Amex became a key player in humanity's expansion into space during the following century. Financing from the company enabled construction of numerous space habitats and, once government-sponsored expeditions had paved the way, private settlements on Luna and Mars. Countless asteroid-mining ventures obtained startup loans from Amex, as well.

Trusted by both Earth authorities and outworld colonists, Amex officials helped broker the 2078CE peace accord that ended the colonial rebellion and established the United Worlds federation.

The advent of interstellar travel enabled Amex to extend its influence to new colonies orbiting distant suns.

Fires of Heaven^{v1.0}

Continuing its longtime policy of opening new frontiers to development and profit, Amex provided or brokered financing for many early extrasolar colonies, and business ventures on newly settled worlds. As the United Worlds federation grew, so did the fortunes and influence of Amex.

Products & Operations - Amex continues to deal primarily in high finance, with a particular interest in enterprises involving or promoting expansion of the United Worlds.

The institution's consumer banking arm handles personal and small-business accounts throughout the federation, while its corporate banking division provides large-scale financing for other corporations, pioneer colonies, space-habitat construction and so forth. Other Amex divisions handle insurance and travel arrangements.

Its interest in fostering interstellar development notwithstanding, Amex does not lend money foolishly. Applicants for its financial services are screened no less rigorously than clients of other institutions. Primary competitors of Amex include Delta Insurance, Fuji-Daiwa Bank, and Orion Financial Co.

Principal Subsidiaries - Chief Amex subsidiaries include Argus Mining Ltd. and Starways Shipping, along with several interstellar cargo and passenger lines. The firm does considerable business with private explorers, from purchasing survey data to sponsoring expeditions. It is rumored that Amex has several high-level AI's devoted solely to analyzing survey data, though if this is somehow related to his missing son or just datamining for profit potential is widely argued among conspiracy theorists.

Stock - A public corporation, Amex has 7.2 billion shares of common stock on the market. Company president Jonathan D. Phelan owns 12% of the stock, with the remainder of the board of directors controlling 40%. The remaining 48% trade openly. Investors value Amex stock for its consistent returns.

DATA DUMP

Jonathan D. Phelan - President of Amex, Jonathan D. Phelan, may be the richest person in the U.W. federation. His personal worth has been estimated to exceed 42.3 trillion credits. In his youth, Phelan expanded his Starways Shipping into one of the dominant freight-hauling lines in the federation. When Amex acquired the company in a friendly buyout, Phelan received a substantial share of stock in the parent corporation and a seat on the board of directors. In time, he expanded his ownership and influence in Amex to capture the post of president.

His youngest son, 1st Lt. Brian J. Phelan (StarForce Marine Corps), disappeared in the fighting on Shen Nung in the Sigma Draconis system during the Interstellar War. Fragmentary reports indicate that he may have been captured by the Vorn, and the Corps continues to officially list him as MIA.

Convinced his son is a Vorn POW, Jonathan Phelan has spent vast sums of money and pulled every political string in the past nine years to uncover evidence of his whereabouts. Aside from a few sightings of dubious credibility, his efforts have so far been in vain.

Top-flight security surrounds Phelan at all times, utilizing elite personnel, psions, and sophisticated equipment to afford him better protection than most planetary leaders.

A human of Scots-Canadian ancestry, Phelan, 88, has a steely demeanor and the snowy white hair indicative of rejuv treatments. A barrel-chested man, Phelan stands an impressive 185cm tall. He owns several starships, including a several thousand ton interstellar "yacht". Phelan often hosts parties and get-togethers with influential guests aboard this vessel.

Who's Who in the United Worlds - reference ww102202.792541.318782 - .05Cr

ADVENTURE SEEDS

- The Radical Anarchist Front plants a bomb on Jonathan D. Phelan's private yacht. After the plot is foiled, an investigation reveals that an Amex junior executive provided information to the terrorists in hopes of moving up in the corporate hierarchy after his superior, oblivious to the plot, took Phelan's place.
- Jonathan D. Phelan hires former military or intel personnel to investigate rumors that his son may be held in a supposed prisoner-of-war camp in Vorn space. The covert mission entails considerable risk, not only from hostile Vorn forces but from United Worlds authorities wary of inciting the aliens.
- An Amex survey team reports finding possible Progenitor ruins on an unexplored frontier world. The firm assembles a team of scientists, explorers, and security personnel to examine the ruins, who will be accompanied by a U.W. inspector sent to ensure regulations on protection of Progenitor sites are followed.

FUJIHARA-MITSUYA

Primary Operations: Communications, entert., news

Headquarters: Osaka, Earth

Net Worth: 220 trillion Credits

Employees: 10.7 million

Chief Executive: Tashiro Yoshikawa, president

Consistently rated the top communications and media conglomerate in the United Worlds, the Fujihara-Mitsuya family of companies may be best known for producing and operating the interstellar comm arrays found outside most populated star systems. Holocaust networks, manufacturers, holovid studios, and other subsidiaries are also part of Fujihara-Mitsuya.

History - Fujihara-Mitsuya began in the early 21st century as a *keiretsu*, an informal strategic alliance of companies in Japan. Over time, the keiretsu evolved into a closely linked group of corporations in the communications field and finally coalesced into the modern Fujihara-Mitsuya conglomerate.

Legendary company president Nakatsune Yoshikawa built Fujihara-Mitsuya into an interstellar powerhouse in the 22nd century. At his direction, the firm constructed communications arrays outside newly settled star systems at a reduced price, trading short-term loss for long-term profits as Fujihara-Mitsuya cornered the market on critical interstellar communications.

Honoring Yoshikawa's last request, the board named his eldest son, Kanetada, as his successor on his death in 2208CE, but Kanetada proved a very different man than his far-seeing father. Impulsive and petulant, he favored using the hold over communications held by Fujihara-Mitsuya to club rival corporations and even the government into submission. While the board of directors curbed his worst excesses, Kanetada's vindictive nature jeopardized the cordial relations built by his father.

When rumblings of antitrust hearings began in the United Worlds Assembly, the board finally took action. Ousting Kanetada from the presidency in a bitter stockholder battle, directors invited his brother, Tashiro, to take his place - using the continuing magic of the Yoshikawa name to their advantage.

His early reputation as a gadabout youth content to live off investments inherited from his father notwithstanding, Tashiro has grown into a respected leader of Fujihara-Mitsuya. He has managed to heal the wounds caused by his estranged brother's actions as president and return the communications titan to the path set out by their father.

Products & Operations - A dominant force in the fields of communications and media, Fujihara-Mitsuya controls several wholly-owned subsidiaries, each responsible for a different aspect of the market. Each subsidiary firm operates independently, yet follows an overall strategy dictated by the corporate parent.

The largest, Fujihara-Mitsuya Communications, constructs and operates many of the vast arrays providing interstellar communications to U.W. systems. Located outside the gravity wells of stars, the arrays beam messages through jumpgates to knit the United Worlds together.

Fujihara-Mitsuya Hologvision operates holocast networks on numerous worlds, while Fujihara-Mitsuya Entertainment produces holovids, game software, virtual reality programs, and other amusements. Fujihara-Mitsuya Technologies manufactures communications equipment, including radios, vidphones, holo projectors, and so forth.

Chief competitors include Eden Entertainment, FoxCom, and Santiago Consolidated.

Principal Subsidiaries - A collection of wholly-owned subsidiaries comprises most of the Fujihara-Mitsuya conglomerate.

Fires of Heaven^{v1.0}

Stock - Fujihara-Mitsuya, a public corporation, has 6.6 billion shares of common stock. Corporate president Tashiro Yoshikawa controls 19% of the stock. Another 19% rests in the hands of his estranged brother, Kanetada Yoshikawa. The board of directors controls 25% of the stock. Individuals and groups loyal to the board control 8%, and the remaining 29% trades on the open market.



Tashiro Yoshikawa - The second son of a renowned corporate leader, Tashiro Yoshikawa inherited his father's presidency of the Fujihara-Mitsuya conglomerate.

DATA DUMP

A well-known playboy in his youth, Yoshikawa reluctantly took the reins at Fujihara-Mitsuya after the ouster of his brother, Kanetada, in 2212CE. He has since grown into an able businessman respected both within and without the corporate titan. Yoshi-kawa has had no contact with his embittered brother since taking office 25 years ago.

Yoshikawa, like his father, favors a long-range corporate strategy coupled with a low-key approach to steer the powerful company clear of potential antitrust complications.

A human of Japanese descent, Yoshikawa, 58, has black hair and brown eyes. He has a fit build and stands 175cm tall. Yoshikawa displays a quiet, watchful demeanor. He and his wife have two young children.

Who's Who in the United Worlds - reference ww314174.063519.910277 - .05Cr

ADVENTURE SEEDS

- Scheming to regain control of Fujihara-Mitsuya, Kanetada Yoshikawa hires underworld saboteurs to disrupt company operations in the hope of discrediting his brother and forcing the directors to turn once again to him. The total implausibility of this scenario does not occur to Kanetada, whose thirst for revenge has warped his mind. As computer attacks, mysterious equipment failures, and other problems mount, Fujihara-Mitsuya hires outside security firms to protect its assets and investigate the campaign against it.
- Fujihara-Mitsuya communications beacons pick up an encrypted message, possibly a distress call of unknown alien origin, emanating from an uncharted star system. A junior executive hires a party to investigate the signal on the sly in hope of discovering advanced alien technology.

OMNICORP

Primary Operations: Manufacturing, consumer products, armaments, starships, robots

Headquarters: New Detroit, Hephaistos

Net Worth: 284 trillion Credits

Employees: 11.2 million

Chief Executive: Christopher Priest, CEO

An interstellar conglomerate with a finger in nearly every economic pie, OmniCorp has a reputation as a ruthless competitor totally committed to maximizing profitability. The corporation operates as a virtual police state, replete with extensive monitoring of employees and frequent firings for suspected disloyalty.

Despite numerous scandals, censures, and lawsuits, the company's crack corporate attorneys, powerful lobbyists, and expert public relations personnel have thus far shielded it from financial disaster.

Most people outside the business world know OmniCorp best as the manufacturer of an almost infinite array of products; from weaponry to robots to everyday home appliances, chances are it comes from OmniCorp.

History - Unlike most other top-tier United Worlds corporations, OmniCorp did *not* begin in the late 20th or early 21st centuries. The conglomerate originated on Hephaistos in 2145CE as a basic manufacturer of consumer products. Relentless acquisition of promising new firms and hard-charging business practices fueled OmniCorp's rapid climb through the ranks of interstellar corporations.

The ascension of Jason Lancaster, the popular son of a founding investor, to the presidency in 2218CE seemed to signal changing times for OmniCorp. Lancaster felt owners had ceded too much control of the company to hired executives, and sought to redress the imbalance. He and his wife, Amalia Reyes Lancaster, descended from another original investor, vowed to clean up the battered public image of the conglomerate, but a tragic accident cut short their dream. An aircar carrying the couple and their newborn daughter, Rayne, on a combined family vacation and inspection tour on Ryujin crashed in 2221CE. The bodies of Jason and Amalia Lancaster were recovered from the wreckage, and their child was presumed dead.

The untimely deaths threw ownership of 41% of OmniCorp stock into doubt. Suits against the estate by various relatives have rendered the Lancaster shares non-voting until they are resolved. Tangled court cases on a half-dozen worlds ensure the estate will be mired in legal wrangling for years to come. A coalition of investors less interested in control and more interested in immediate profits took advantage of the confusion to install their own president, Werner Koessler. The new board also forced the veteran chief executive officer into retirement, replacing him with Christopher Priest, formerly head of the Consumer Products Division. The new CEO reforged the corporation, never a model of corporate compassion, in his own image - a cold, relentless predator consuming everything in its path.

In 2233CE, OmniCorp was implicated in a defense-contract scandal that brought down the United Worlds president. The firm promptly fired those employees thought to be involved and offered full cooperation to federal investigators. Several former executives linked to the affair have since perished in accidents, suicides, and under other unfortunate circumstances. No evidence tying the scandals to Priest or Koessler has ever been uncovered.

Products & Operations - A highly diversified conglomerate, OmniCorp has literally dozens of divisions, the Defense, Starships, Electronics, and Consumer Products Divisions topping the list in terms of resources, profits, and internal influence. Every OmniCorp chief executive officer began his rise to power in one of these four divisions.

The current CEO runs OmniCorp as a virtual autocracy. He retains direct control over his division heads, and has sacked or thwarted many potential rivals over the years. The corporate security branch functions as his secret police, constantly monitoring the activities of all OmniCorp employees and subsidiaries in addition to protecting the company against outside interference.

Indeed, the corporation is institutionally obsessed with security. OmniCorp facilities are protected by armed guards and the latest security equipment (OmniCorp equipment, of course). Employees must pass identity scans to enter even the most benign workspaces, with the degree of scrutiny rising precipitously for labs and facilities handling sensitive projects. Personnel purges are legendary at OmniCorp. A failed project, lost contract, or even the merest suspicion of disloyalty can result in waves of layoffs. But lucrative pay and lavish benefits keep new applicants coming despite the draconian work environment.

OmniCorp has a two-pronged market strategy: smashing its competitors by any means necessary, and acquiring up-and-coming firms before they become threats.

The conglomerate will stop at nothing to gain a competitive advantage. It has been repeatedly cited by U.W. and planetary authorities for unsound environmental practices, worker safety violations, and sundry other illegalities. Penalties for these violations are simply figured as a routine cost of doing business, and as long as profit margins are maintained, OmniCorp's executives responsible for the violations retain their jobs and stock options. Espionage and sabotage are also rumored to be routine tactics for OmniCorp.

Corporate executives are observing the brewing trade war between Wexler Robotics and Hypercom Integrated with considerable interest. The conflict could present OmniCorp with an opening to seize both corporations and establish a near-monopoly on the computer industry.

Chief competitors of various OmniCorp divisions include the Ares Corporation, Nova Electronics, Rigel Industries, and Wexler Robotics.

Principal Subsidiaries - OmniCorp has very few actual subsidiaries, preferring to either liquidate or absorb acquisitions.

Stock - A public corporation with 6.8 billion shares of common stock, OmniCorp keeps close track of transactions involving its shares. Company president Werner Koessler owns 12% of the stock, while CEO Christopher Priest holds another 8%. The board of directors owns a combined 18%, and the remaining 21% trades on the market.

Ownership of close to 41% of the stock, formerly held by the late Jason Lancaster and Amalia Reyes Lancaster, has been in dispute since their deaths in 2221CE. The contested stock has been rendered non-voting until the courts untangle the innumerable suits over its control. This effectively multiplies the voting value of the remainder, giving Werner Koessler a 20% vote, Christopher Priest 13% and the board of directors 34%.

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DATA DUMP

Christopher Priest - The chief executive officer of OmniCorp, Christopher Priest rules with an iron fist. Born on Hephaistos, Priest earned his business degree on Earth and returned to become a junior executive at a Hephaestean food products company. He moved up the corporate ladder, working for various firms, before being tapped for a vice-presidency at OmniCorp. Priest soon became head of the prestigious Consumer Products Division.



Priest seized control of OmniCorp following the deaths of Jason Lancaster and Amalia Ryes Lancaster in 2221CE. Legal disputes over the Lancasters' shares allowed a coalition of lesser investors to take over the company, and the new board named Priest the OmniCorp CEO.

In the ensuing years, Priest has tightened his grip on OmniCorp and his position seems unassailable now. The president and most of the board are merely figureheads under Priest's command. Priest has infused the conglomerate with his covetous nature and personal philosophy of acquisition at any cost.

Yet Priest has lingering doubts as to the fate of Rayne Lancaster, who, if she survived, stands to inherit the substantial stock holdings of her parents. With the help of old allies still loyal to her family, she could assemble a controlling interest in the conglomerate. Corporate security personnel, as well as datathieves employed clandestinely by the corporation, are eternally vigilant for any sign of Rayne Lancaster, who would now be 16 years old. Other forces inside the corporation may also be seeking the teenager.

A human of European ancestry, Priest, 60, has black hair and brown eyes. His 178cm tall frame is almost cadaverously thin, although Priest enjoys startlingly good health. He has opulent homes on several worlds and space habitats, decorated with the finest art collection in the United Worlds. But Priest seems to derive scant satisfaction from his possessions, losing interest in each soon after its acquisition. Indeed, he has not visited some of his vacation homes in years.

ADVENTURE SEEDS

- An ambitious OmniCorp executive seeks to ruin a rival's reputation by falsely accusing him of contracting assassins to kill her. She hires bodyguards to protect her from the attacks, which she secretly arranged to bolster her accusations and discredit her rival. Both the assassins and bodyguards are unaware of her duplicity.
- An OmniCorp takeover bid targets Petrakis Shipping, a small frontier cargo-hauling corporation whose proud owner refuses to sell. A rise in pirate raids on Petrakis Shipping vessels and a curious reticence on the part of local StarForces Navy authorities to investigate prompt the owner to hire starships to protect his vessels or combat-trained personnel to crew a decoy freighter.

TCI

Primary Operations: Plastics, chemicals, fuels, glass

Headquarters: Armstrong, Luna

Net Worth: 268 trillion Credits

Employees: 9.7 million

Chief Executive: Arpana Singh, president

Created by an early 21st-century merger, Tiamat Chemical Inc. took its name from a Mesopotamian deity known as the creator of the universe and goddess of the oceans.

Commonly known as TCI, the interstellar conglomerate now stands atop the chemical industry field and ranks highly among the top corporations in the United Worlds federation. The company has a strong presence on the frontier, as well as a decided interest in the freight-hauling, exploration, and mining industries.

History - Tiamat Chemical Inc. was formed in 2026CE from a consortium of small chemical manufacturers who sought parity with their international competitors in reaping the riches of lunar settlement.

Second-tier corporations from Brazil, Hungary, India, Indonesia, Iraq, Mexico, Romania, Saudi Arabia, and Venezuela joined forces to exploit the chemical resources of Luna. The conglomerate found itself uniquely positioned when the advent of fusion power in 2048CE intensified demand for plentiful lunar helium₃. TCI became a key supplier of fusion fuels for power plants, starship drives, and other uses.

Research in orbital labs and variant environments kept TCI at the forefront of development of new alloys, polymers, and materials useful in construction, manufacturing, and scientific pursuits. TCI also followed close behind as humanity spread across the stars, ever alert to the possibilities opened by mineral and chemical resources found on other worlds.

Nearly 200 years after its inception, TCI has come to dominate the chemical industry in the United Worlds and it rates as one of the largest corporations in the federation. A recent pattern of TCI stock purchases indicates that a buyout or takeover could be in the works. The rumors have driven up stock prices and unsettled corporate officials. Analysts say a war for control of TCI will undoubtedly be bloody, figuratively and possibly literally.

Products & Operations - Tiamat Chemical Inc. is the U.W.'s top chemical concern. The company has five divisions, each focused on a particular market. The Chemical, Petrochemical, Polymer, Fiber, and Life Science Divisions have their own research, refining, and production arms.

On paper, TCI has a corporate structure resembling most other interstellar conglomerates. In practice, the company operates like a modern-day feudal state; divisions are nearly autonomous, ruled by their directors as though they were private fiefdoms.

Company president Arpana Singh exploits the rivalries rife in TCI to stay in power, playing factions off each other in a complex game of shifting allegiances, power blocs, and internal politics.

Primary TCI products include alloys, fertilizers, pesticides, plastics, elastics, hydrocarbons, paints, coatings, and industrial chemicals. TCI also sells raw materials necessary to manufacture hundreds of other products, from starship hulls to robots. Other secondary products include pharmaceuticals and textiles.

The current market strategy of TCI centers on the continued discovery and acquisition of raw materials on frontier worlds. Explorers know TCI well as a customer for data on new worlds, as well as a frequent source of contracts for exploration and planetary surveys.

Competitors of TCI include ChemCo, DuPont-Hoechst, and Taegu Chemical.

Principal Subsidiaries - The conglomerate has a number of subsidiaries, most of which directly relate to its focus on chemical manufacturing. Some are mining or shipping operations, while others turn out finished goods using plastics or other products of TCI refineries. Seeking to reduce its reliance on outside firms for necessary services, TCI has acquired such subsidiaries as Halcyon Cargo Ltd., Kapelkin Mining Co., and Velasco Amalgamated, a producer of mining equipment. Other chief subsidiaries include Atlas Fuels Inc., a vendor of fusion and antimatter fuels, and the Coleman Corporation, a producer of life support, environmental, and recreational goods.

Stock - A public corporation, TCI has 6.4 billion shares of common stock. Arpana Singh owns 8%, and the rest of the board of directors account for 36%. Eight individuals and groups loyal to the board hold 15% of the stock. The remaining 41% of TCI stock trades on the open market. In 2236CE, someone began quietly buying up shares of TCI stock. Corporate officials are wary of a possible takeover bid, fueled by rumors that one or more of the stockholders thought loyal to the board may be co-opted by the mysterious buyer.

Arpana Singh - Arpana Singh is president of TCI. Born in India, she assumed control of her wealthy family's extensive business interests following the death of her older brother in a shuttle crash. Singh used her previously unrecognized financial know-how to increase the family's holdings and fortune. She parleyed the family bloc of TCI shares into a seat on the board of directors in 2198CE, and her acute business acumen won Singh the presidency in 2214CE.

DATA DUMP

A devious master at power plays, Singh expertly manipulates the feuding factions rife within TCI to retain her grip on power. Chief executive officers come and go, but Singh remains the true master of TCI. Her devilishly clever traps have ensnared and destroyed many rivals. Numerous people view Singh as an ancient but still deadly spider, spinning endless webs of deceit and betrayal from her lunar estate.

Singh, 124, undergoes periodic rejuv treatments to inhibit aging. Her hair is dyed black, with only a lock of pure white hair flaunting her access to life-prolonging antigeria care. Singh has brown eyes and stands barely 155cm tall. She has a stooped posture and walks with the aid of a cane. She has become something of a recluse, rarely leaving her home outside Armstrong. Mindful of her brother's death, Singh refuses to fly and never leaves Luna for any purpose. Her personal wealth is over 6.2 billion Credits.

Who's Who in the United Worlds - reference ww271822.102232.330277 - .05Cr

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ADVENTURE SEEDS

- Nervous about the possibility of a takeover, a TCI junior executive hires a datathief to track down information on recent stock purchases. His netrunning efforts turn up a high-security brokerage database, but the thief manages to retrieve some client records. An assassin kills the executive as she meets with the thief, and the cyberjock must go on the run pursued by the forces of his mysterious enemy and police who blame him for the executive's murder.
- TCI loses contact with asteroid mining operations in a frontier system. A local company rep hires a starship to check on the miners, who may be on strike, under attack by pirates, infected by an exotic plague, captured by the Vorn, or wiped out by an alien lifeform. The TCI rep may know more about the situation than they are telling.

ARES CORPORATION

Primary Operations: Armaments, armor

Headquarters: Burroughs, Mars

Net Worth: 204 trillion Credits

Employees: 4.3 million

Chief Executive: Rear Admiral Arturo Ramirez, ret.

The Ares Corp. is a top defense contractor as well as a leading producer of commercial arms and armor. Established on Mars in 2092CE by a retired StarForce Marine Corps general, Ares rapidly gained a foothold in the defense contracting field with the help of its founder's many contacts. Ares is the leading producer of hardware used by StarForces and many planetary military forces. While defense contracts form the core of its business, the company also does well with sales to the public. Security at Ares facilities are very tight due to strict regulations on arms production and the often-classified work going on inside. Ares recruits heavily among veterans, and most corporate officers are former high-ranking Star-Forces officers. Even the excellent contacts these provide would be little help in securing new contracts without the company's reputation for superior products. Ares weapons and armor are considered top of the line by most industry analysts.

Key competitors include the defense division of OmniCorp, Coherence Inc., Colt-Remington Co., and Tsai Gravitics. Retired Rear Admiral Arturo Ramirez serves as Ares Corp. president and chief executive officer. Ramirez commanded a StarForce Navy task force on the frontier during the Interstellar War, retiring shortly after the end of the conflict to take over at Ares Corp.

DESAIX INTERSTELLAIRE

Primary Operations: Biotech, medical technology, pharmaceuticals

Headquarters: Paris, Earth

Net Worth: 236 trillion Credits

Employees: 3.2 million

Chief Executive: Marie Desaix

Desaix Interstellaire sells the most precious product of all - life. Or, to be specific, extended life. Desaix Interstellaire is the clear leader in the field of antigeria medicine, using patented rejuv treatments to curb aging and prolong life.

The corporation began in 2120CE on Earth. Jean Desaix founded the initially minuscule firm to market the antigeria treatments pioneered by his mother, Dr. Madeleine Desaix. Official company histories claim Dr. Desaix supported her son's corporation, but others argue that its practice of selling life-prolonging treatments to the ultra-rich would have horrified Dr. Desaix, who hoped her discoveries would be used to benefit all humanity.

Desaix Interstellaire has three key divisions, handling biotechnology, pharmaceuticals, and medical technology. The biotech wing oversees the antigeria programs constituting the bulk of the corporation's business. Desaix Interstellaire operates luxury resort spas on most core worlds and a few frontier worlds, where patrons can receive ultra-expensive life-prolonging treatments. Sales of conventional medical equipment, drugs, and medicines account for a sizable share of company revenues.

Public antipathy to bioengineering causes many people to regard Desaix Interstellaire with suspicion. In fact, some rumors claim Dr. Madeleine Desaix's work derived from the barbaric experiments of the Biotech Wars, a contention strongly denied by the company, and such accusations traceable to an individual are aggressively litigated against. The extreme cost of antigeria treatments also inspires resentment among those doomed to a natural lifespan by lack of funds.

Desaix Interstellaire has few competitors worth noting in the field of rejuv treatments, but chief rivals in other arenas include Hasekawa Cybernetics, Baxter-Merck & Co., and Yucatan Farmaceutica.

Marie Desaix, daughter of the company founder and granddaughter of Dr. Madeleine Desaix, is Desaix Interstellaire's president and CEO.

NOVA ELECTRONICS

Primary Operations: Computers, electronics

Headquarters: New Geneva, Asgard

Net Worth: 225 trillion Credits

Employees: 6.2 million

Chief Executive: Emre Kemal, CEO

Nova Electronics enjoys a strong reputation as a longtime producer of quality computers, but faces rising competition from a host of rivals eager to knock it off its dominant perch in the marketplace.

The corporation originated on Asgard in the Epsilon Eridani system in 2163CE as a designer of starship navigation computers. Introduction of an innovative software interface in 2170CE brought Nova Electronics windfall profits, which the corporation used to expand into all areas of the computer market.

Four manufacturing divisions comprise the bulk of Nova Electronics, producing computers, software, peripherals, and robotics. The research and headquarters divisions, still based on Asgard, complete the picture. Subsidiary firms supply many of the components used in company factories.

Nova Electronics recently announced plans to spin its robotics division off into an independent company in 2239CE. Analysts say the corporation hopes to retain its competitive edge by focusing on its core market of computers and software.

Chief rivals include Ashford-Cray Labs, Digitech Inc., NEC-Sun Microsystems, and Wexler Robotics.

Emre Kemal, recognized in business circles as a sharp operator skilled at keeping aging firms competitive, was recently recruited by the board of directors as CEO of Nova Electronics.

SEC DYNE

Primary Operations: Corporate security, consulting services, security equipment

Headquarters: Horizon City, Eden

Net Worth: 160 trillion Credits

Employees: 2.1 million

Chief Executive: Tuong Vu, president

Security Dynamics, or SecDyne, has provided exceptional security services to its corporate clients for more than two centuries. Founded in Kenya in 2025CE by a veteran of the BioTech Wars, SecDyne specialized in corporate security. The rise of powerful transnational corporations, later to become interplanetary and even interstellar powers, provided an ample market for its services. In 2130CE, SecDyne relocated its headquarters to Eden in the Alpha Centauri A star system.

SecDyne offers a variety of assistance to its corporate clients, from a sizable catalogue of security equipment to consulting services of all kinds. The company also provides security services to several corporations on long-term contracts. SecDyne has been involved in a number of corporate trade wars over the years.

Primary competitors include Aegis Enforcement and Gladius Security Co.

Tuong Vu, an aging recluse, has controlled SecDyne for the past 45 years. Some datanet gossip-mongers claim Vu actually died a few years ago and was secretly replaced by a clone or prototype artificial intelligence program by SecDyne's board of directors to avert a destructive battle for control of the company.

Fires of Heaven^{v1.0}

WEXLER ROBOTICS

Primary Operations: Robotics

Headquarters: Wexler Habitat, Earth orbit

Net Worth: 212 trillion Credits

Employees: 5.8 million

Chief Executive: Victoria Bunton, president and CEO

A leader in the robotics industry, Wexler Robotics manufactures a popular line of robots useful in the home or workplace.

Wexler Robotics originated in England in 2038CE as a designer and producer of primitive, heavy industrial robots. Advances in microcircuitry, computers, energy storage, and metallurgy, many fostered at company labs, enabled Wexler Robotics to become an early player in the emerging field of household and office robots.

Based in an Earth-orbit habitat, Wexler Robotics operates facilities in most core systems of the federation. Although it continues to produce industrial and scientific robots, Wexler Robotics is best known for its commercial robots sold for use in homes, offices, and starships.

A destructive economic and covert corporate trade war has erupted between Wexler Robotics and Hypercom Integrated. The strife ignited in 2236CE as the two companies battled over the remnants of bankrupt competitor Brummell AG in the Epsilon Eridani system but has spread to involve assets throughout the United Worlds. While mostly restricted to espionage and stock manipulation thus far, the recent retention of Aegis Enforcement by Hypercom Integrated suggests that at least one participant believes the conflict could escalate.

Other competitors of Wexler Robotics include Cognex-Mitsui Co., Nova Electronics, and the OmniCorp's Robotics Division.

Victoria Bunton is president and CEO of Wexler Robotics. Bunton is rumored to have contacts among Yakuza crime syndicates, although the truth of these reports is difficult to ascertain.

▼ **CORPORATE AFFAIRS** - The star-spanning corporations of the United Worlds are easily more powerful than most 20th-century Earth nations. Rife with intrigue, duplicity, and conflict, they strive ceaselessly to capture an ever-larger share of the ever-growing interstellar market.

Power-hungry executives compete for the riches and influence offered by top corporate posts. Some rely on talent and ambition to carry the day, but others turn to darker tactics to boost themselves up the corporate ladder; fraud, blackmail, and extortion are all part of the game for some ambitious executives. Most upper echelon executives are wealthy enough that they are no longer linked to the "real world", but have become an "us", and everyone outside their rarefied sphere is a nameless, faceless "them" that is treated with indifference at best, and as a commodity at worst. The universe is seen through the distorted lens their wealth creates, leading to a sense of morals and values that they are only rarely held accountable for.

The endless competition between corporations has a seedy underbelly of lesser individuals as well. Spies, saboteurs, turncoats, and datathieves all find plenty of employment as unethical firms seek a leg up on economic adversaries.

The phrase "hostile takeover" adopts a far more sinister tone in some parts of the federation, where corporate conflicts are settled by a silenced bullet as often as a penstroke. Planetary and federal governments keep the more violent aspects of corporate wars in check, though more often than not corporations simply do not want to alienate their customer base by engaging in open conflict. However, in some regions of the United Worlds, corporations are beyond the control of local governments. Remote space habitats or corporate outposts on frontier worlds are among the chief battlefields in clashes between corporations. The world of Hephaistos has become a center of corporate intrigue due to the pervasive influence of its corporate titans on government officials and law enforcement authorities.

Trade Wars - Conflict is inevitable in the cut-throat 23rd-century business world. Trade wars erupt from time to time between competing corporations, most often when oversupply of a particular product or service threatens profitability. Some trade wars are confined to a single system, while others brew into federation-wide conflicts.

Price cuts and intensified advertising are only the public facets of a trade war. Behind the scenes, many corporations turn to covert operations to thwart rivals. Espionage, sabotage, datatheft, hijackings, and sometimes even murder are employed to cut down competitors. This occurs both at the highest and lowest levels of the business world. A second-tier interstellar shipping firm might find it is being leaned on by both sides, just as a mom & pop shop could discover a local gang has been hired to cause trouble at any shop carrying a particular company's products.

Companies are careful to conceal direct involvement in undercover tactics from the public and government, seeking to avert a Commerce Ministry crackdown that harms everyone involved. Incidents that could expose the hidden war are quickly covered up by perpetrator and victim alike. Much of the unseen combat takes place in cyberspace as hired netrunners fight on virtual battlegrounds. The rest operates through proxies, anonymously hired saboteurs, hired guns and troublemakers. Often, information is leaked to groups that already have an axe to grind against a particular industry (like anti-pollution organizations), or sometimes organizations are anonymously created or fostered by a corporation for the sole purpose of being used as a tool against the competition.

A trade war typically ends when the oversupply of goods has been eased (often with the demise of one or both companies) and profitability rises once more, although in some cases the conflict spirals into a destructive feud lasting months or even years. The public sometimes suffers repercussions in particularly nasty trade wars. If all the companies involved are financially crippled, it means that support for the product in question is hard to find. There are no spare parts for vehicles that were once popular, a weapon's specialized ammunition is no longer manufactured, or a catalyst for a ship's life support system suddenly becomes a scarce commodity. Sometimes, an aftermarket supply develops and the product continues to be useful, but sometimes it simply becomes too expensive and the product disappears from the market entirely. That 3-D prototyper you thought was such a deal might not seem so sweet once you find out that no one makes supplies for it anymore...

"What noise? Oh, that's just Bailey. Ship's cat. He keeps the mice down. Hey, this bucket's nearly thirty years old, y'know. There's no telling what kind of critters we've picked up hauling cargo from here to the rim, and you can only space compartments to clear 'em out every so often, y'know?"

- Lutjen Bekker, cargo chief, 2236CE

▼ **INDEPENDENTS** - The sleek, ultramodern vessels of 23rd century corporate shipping lines share space with countless independent freighters, also called free traders. Often older, less advanced designs, these starships are owned by adventurous traders out to seek their own fortune among the stars. Analogous to the tramp steamers or gypsy truckers of times past, many independent freighters haul cargo on short-term contracts, sometimes taking on jobs deemed too risky by more staid corporate rivals or signing contracts promising fantastic rewards for dangerously fast delivery.

Other freighter captains seek to turn a profit through speculative trading. They buy goods at one port, hoping to sell them at a profit somewhere else. A riskier but potentially more lucrative way to make a living, speculative trading demands a sharp eye and daring spirit.

Some freighters are purely business operations with hired crews, but some are owned and operated by extended families who have traveled the star lanes for generations. No complete census of free traders has ever been taken, but some sociologists estimate that as many as fifty percent are so-called family ships.

▼ **Note** - In most space opera campaigns, the adventurers will eventually acquire a ship. This grants mobility and flexibility, but also liabilities. Unless the gamemaster is careful, the game can start to revolve around trying to make the loan payments instead of having adventures. *Maybe even worse, the adventurers are financial geniuses and start accumulating wealth to the degree that they can simply hire other people to do the adventuring for them!* The gamemaster should keep both of these undesirable possibilities in mind if adventurers are going to play as independent traders. In general, any simplistic economic model in a role-playing setting can be abused to accumulate staggering wealth. A simple "roll dice on your skill" system is not going to handle real-world economic complexities, and the gamemaster needs to take this into account.

Fires of Heaven^{v1.0}

"I took a room at the Sheraton Armstrong on Luna one night after bringing in a cargo. Just had to get out of that damned ship, even if it was only for a few hours. Anyway, I watched a holovid about the adventures of a tramp freighter captain on the frontier. He seduced a governor's daughter, fought off a pirate raid, and beat his wicked rival to port with a valuable cargo to make a fortune!"

"Funny, though, he never seemed to have to repair his ship, bail his crew out of jail after a bar brawl, bribe a greedy dockmaster for a good berth, or worry about finding another freight contract in time to make payroll."

- Francisco Aguilar, free trader, 2236CE

Life of a Tramp - The romantic lifestyle of the free trader appeals to many workaday sorts in the United Worlds. Independent freighter captains travel where they will, free of demanding bosses, stuffy offices, or boring work assignments. And there the romance ends.

While a trader does enjoy far more freedom than most people in the business world, they also bear far more responsibility. They must bring in enough credits each month to cover the high cost of operating a starship (including repaying loans taken out in months when there wasn't sufficient business to cover operating costs), not to mention the payroll of the crew depending on his success for their livelihood. Profits, if any, often go to upgrade the ship or pay for the next cargo.

There are a million chores aboard a starship, from routine maintenance to hustling up freight contracts, and the captain typically winds up being involved in all of them.

Still, while it may not be the carefree life of adventure envisioned by the uninitiated, most free traders have no regrets about seizing control of their own destiny, traveling from world to world to make or break their fortunes out among the stars.

Crew - Automation has reduced starship crews to a minimum, but certain tasks still must be performed by humans. On small freighters, several of these tasks may be handled by the same person, while larger vessels may have multiple people assigned to the same job but working in shifts.

At minimum, a freighter requires a flight crew, consisting of a captain, helmsman, astrogator and sensor op, a starship engineer, and a payload supervisor. Some vessels combine positions, such as helmsman/astrogator or engineer/payload supervisor, for a true skeleton crew. A freighter with a crew this lean, however, runs on the ragged edge of safety, efficiency and, certainly, enjoyable working conditions. Other positions found on many freighters include an executive officer, medical officer, cook, assistant starship engineers, and payload workers.

Aboard family ships, youngsters are trained to fill crew positions. Other independent freighters must hire their crews. Hiring centers are found on most starports, where captains can advertise openings and experienced spacers seeking work can post contact information.

Doing Business - Free traders have to earn a living just like everyone else. Loan repayments, port fees, fuel costs, spare parts - the seemingly endless expenses of operating a starship demand a regular influx of credits. Tramp freighters have two legitimate ways to earn money: delivery contracts, or hauling goods for others for a pre-determined price; and speculative trading.

Delivery Contracts: No corporate freight line can foresee every possibility or handle every shipping need. Independent freighters exist to fill in the gaps, hauling goods on short-term contracts to meet the needs of a complex, ever-changing interstellar economy.

Following no fixed routes, tramp freighters go wherever profit can be found. Tramp freighters are especially active on the frontier, where a dearth of routine shipping inhibits competition by corporate freight lines.

Prices for delivery contracts depend on the amount of cargo, time for the trip, number of jumps required, and operating expenses of the freighter. They are typically a matter of negotiation between the contractor and captains bidding for the job.

Along with conventional cargo, some tramp freighters carry digital cargo in the form of info stored in computerized dataholds. They convey non-time-sensitive communications between star systems on behalf of customers unwilling to pay the high rates charged by interstellar comm arrays.

Speculative Trading: Free traders who opt to go the speculative trading route operate on the same basic principle as any business: *buy low, sell high*. A trader generally seeks to buy goods at low prices on worlds where they are commonplace, then carry the items to a world where they are rare and, consequently, more valuable. This usually entails carrying finished goods from core systems to the frontier, and raw materials on the return trip.

Of course, if it were truly that simple almost anyone could earn a fortune as a free trader. A hundred potential complications can arise, from shifting market conditions to pirate raids. Canny free traders glean every nuance from official reports and soak up every bit of gossip to help predict the next market shift on a world. Accurately anticipating a need can yield the trader a windfall profit, while a mistake might saddle him with a worthless cargo.

A free trader buys and sells cargo at wholesale prices, although final prices depend heavily on supply, demand, and bargaining skill. In general, wholesale prices average forty percent of retail. This is useful only when buying in large quantities. Would that free traders could buy replacement parts for their ships at this discount!

EXAMPLE: Say a free trader buys 100 envirosuits to convey to the 61 Cygni B system, where an asteroid mining boom has created a demand for e-suits. Say that e-suits cost 4,000 Credits apiece retail. The trader locates a factory that has an oversupply of suits and buys them at thirty percent of this, or 1,200 Credits each; 120,000 Credits in all, out of the trader's pocket, in advance.

On arriving in the 61 Cygni B system, the trader finds an outfitter in the asteroid belt willing to purchase all 100 suits. After a long bargaining session, the outfitter agrees to pay forty percent of standard retail, or 1,600 Credits apiece; 160,000 Credits total. The trader makes a profit of 40,000 Credits on the cargo. Of course, 100 e-suits do not take up a large volume of space and the trader has to cover his overhead, so he probably has other cargo to sell as well to boost the overall profitability of the voyage. If the trader can only find someone to buy 30 of the e-suits, then he has to hang around (and spend money on ship upkeep) until he can sell the rest, or sell them at a discount and move on to the next deal.

▼ **FREE TRADER SOCIETY** - The nomadic existence of most independent freighters has given rise to a novel, spaceborne subculture.

Interstellar Trade Association - The Interstellar Trade Association, or ITA, represents the interests of free traders in the United Worlds. Financed by annual dues, the association lobbies the U.W. Assembly and government ministries on behalf of independent cargo-haulers.

ITA offices, found on most Alpha- and Beta-class starports, also offer direct assistance as needed. Officials of the association mediate disputes over port fees, customs inspections, contractual disputes, and other problems encountered by ITA members. The ITA has approximately 220,000 members. Abd al bari Mahmoud, a free trader native to Earth, is its current president.

Ship Families - A substantial share of all the independent freighters in the U.W. are owned and crewed by extended families. Known as ship families, they live a nomadic existence among the stars. A ship family typically consists of up to thirty people (usually *far* less), related by blood and marriage, all of whom live, work, and play aboard a crowded freighter passed down from generation to generation. Ship families may also spread their members across starports, having family members as cargo brokers in a variety of locations. The need for frequent repairs and upgrades to their aged vessels offsets the benefit of having no loan payments to make, so most of the ship families earn a comfortable but in no way extravagant living.

The risks inherent in such a life, coupled with controlled birth rates, help prevent families from overcrowding their ships, but circumstances sometimes arise requiring an adjustment. Families in such straits often arrange for a branch to form a new family with its own vessel, purchased with the aid of the original family. If finances preclude such an approach, the family may arrange marriages, adoptions, and fosterage pacts with friendly, short-handed ship families.

A culture of complicated courtship rituals, blood feuds, and other customs has arisen among the ship families of the United Worlds. They tend to be insular, relying on each other for aid rather than outside authorities. Ship families possess a strong sense of personal honor and a deep suspicion of outsiders, which at times leads to trouble. A complex web of intermarriage, foster children, adoptions, and family branchings knits the ship families of the federation together, although relations between individual families are not always smooth.

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▼ **ADVENTURE SEED** - Star-crossed lovers from feuding ship families, Jani Tuuri and Mariana da Silva Santos long to escape the enmity between their free-trading clans.

The blood feud between the Tuuri family, owner of the free trader *Kalevala*, and the Santos family, owners of the *Viajante*, dates back more than thirty years to a joint trading venture gone wrong amid accusations of theft, incompetence, and deceit.

The two youngsters happened to meet at the Brigit starport in the Epsilon Indi system one year ago and fell in love at first sight. They slipped away several times over the next few days for clandestine rendezvous, as tensions rose between the two families. After a barroom brawl in which one of Tuuri's cousins was stabbed, starport authorities ordered both freighters to depart.

Their paths haven't crossed again, but Tuuri and Santos have managed to send a few secret messages to each other with the help of some sympathetic relatives. The leaders of both families would be furious to learn of the hidden romance, but the youngsters have vowed to let nothing come between their love.

A human of Finnish descent, Tuuri, 18, has blond hair and hazel eyes. He stands 180cm tall and has an athletic build. A human of Brazilian ancestry, Santos, 17, has lustrous black hair and brown eyes. She stands 165cm tall and has a curvaceous build.

The Black Market - An illegal economic system, the black market trades chiefly in goods that are unobtainable through lawful channels: arms, drugs, and slave clones, for example. Along with blatantly illegal goods, black marketeers also deal in normally legitimate merchandise made contraband by evasion of tariffs or disregard for required permits.

Just about anything can be bought or sold on the black market, from illegally manufactured weapons to food or bootleg holovids. Certain illicit services, such as those of assassins or unlicensed bounty hunters, are also traded on these underground networks. Outrageous prices are the norm in black-market dealings. After all, if it could be gotten for a fair price it wouldn't be on the black market in the first place. Black marketeers tend to be circumspect in their dealings with customers. Potential patrons first have to find those involved in the market, typically by asking around in the seedier sectors of a starport or city.

Once a potential patron has been checked out, he may be quietly directed to a member of the underground network.

Most black marketeers operate a front business, of some kind, typically a store, warehouse, or other enterprise involving the purchase, sale, storage, or transportation of lawful goods in order to hide unlawful transactions within their normal trade patterns. They rarely have many contraband items on hand, but may have samples or holopics of their illicit goods. Most also have clandestine connections to people within legitimate corporations, the military or various governments, from which they procure many of their products.

After agreeing on a price, the parties typically arrange a later rendezvous to exchange the illicit products and credits - black marketeers employ datathieves to launder their illegal transactions, and expect those who deal with them to do likewise.

Black marketeers are generally well-connected to planetary crimelords and even some interstellar cartels, which tends to dissuade potential cheats or thieves. Many also employ bodyguards for more direct protection against double-crossing customers. The fearsome Antares Cartel controls the black market on many U.W. worlds.

Smugglers - Smugglers are the lifeblood of the black market, bringing in illicit goods on the sly for sale to the crime cartels who administer these clandestine networks. Like the independent freighters they mimic, smuggler vessels knit the underground economy of federation worlds together by transporting illegal cargoes between markets. Some smugglers hide contraband in concealed compartments or inside legitimate cargoes, while others seek to avoid U.W. inspectors altogether via stealth-capable starships and out-of-the-way landing sites. The more brazen or well-connected smugglers use conventional facilities and bribable inspectors to get their goods through.

Secret smuggler bases holding caches of fuel and supplies are known to operate on jovian moons, inside asteroid belts, or in remote locales of lightly populated worlds. Not all smugglers are hard-core lawbreakers, however. Many an independent freighter captain in dire need of credits has accepted a dubious cargo or suspicious hauling contract for a badly needed infusion of funds.

COMMODITY PRICES - All prices

DATA DUMP

are retail unless otherwise noted.

These are an average of prices throughout the United Worlds. Actual prices vary depending on supply and demand. Prices for used equipment, where applicable, are lower.

Bulk Commodities (wholesale)

Agricultural	Density	Price
Corn, bulk	low	87Cr/ton
Cotton, bulk	low	1,168Cr/ton
Exotic woods, bulk	low	48,030Cr/ton
Lumber, bulk	low	12,136Cr/ton
Rice, bulk	low	470Cr/ton
Soybeans, bulk	low	259Cr/ton
Wheat, bulk	low	105Cr/ton

Metals

Aluminum, bulk	medium	1,433Cr/ton
Copper, bulk	high	1,710Cr/ton
Gold, bulk	high	9,285Cr/kg
Iron, bulk	high	167Cr/ton
Platinum, bulk	high	12,500Cr/kg
Silver, bulk	high	189Cr/kg
Steel, scrap, bulk	high	78Cr/ton

Communications

Interplanetary Comm.	n/a	5Cr/minute
Interstellar Comm.**	n/a	125Cr/message

Vehicle Fuels

Hydrogen	low	1,000Cr/ton
Liquid Hydrogen	low	2,000Cr/ton
Antimatter*	high	20,000Cr/μgram
Fission Fuel*	high	4,000Cr/kg
Fusion Fuel*	medium	8,000Cr/kg
Ion Fuel	low	40,000Cr/ton

Jumpgate fees

Per ton per light year	n/a	≈.5Cr
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Space Passage

First Class***	n/a	1000Cr/day
Second Class***	n/a	500Cr/day
Third Class***	n/a	200Cr/day

Vehicles

Aircar	high	100,000Cr
Ground Car	high	40,000Cr
Hovercar	high	50,000Cr
Rover ATV		60,000Cr

* does not count storage or containment facilities

** bulk transmission rates are considerably lower

*** routes subject to high competition may be as low as half this

Information Now! Almanac - reference se384367.396578.274938 - .05Cr

Pirates cargo demand. Cargo surrender profitable not. Damage to ship profitable not, but profitable more than cargo surrender. Pirate's bridge laser cannon hit. Pursuit broken. Escape concludes.

- Cha'ra'na'ta, free trader, 2236CE

▼ **THE UNDERWORLD** - Street crime, gangs, and powerful crimelords are a problem to a greater or lesser extent on every inhabited world of the United Worlds, but some forms of crime and underworld organizations transcend planetary boundaries.

Assassins and Bounty Hunters - Underworld freelancers, assassins and unlicensed bounty hunters typically work on a contract basis. A cartel boss or other criminal leader hires them for specific tasks at fees that are negotiated in advance. An assassin is hired to kill a specific person, whether it be a government leader, troublesome prosecutor, key witness, or rival crimelord. The fee depends on the difficulty of the job and the amount of trouble that will ensue - a killing that will spark a system-wide manhunt demands considerable compensation. Professional assassins are highly capable experts at their craft who command hundreds of thousands of credits per job.

Legitimate, licensed bounty hunters pursue accused criminals who have jumped bail. The bail bondsman or holder of the collateral put up for the bail hires a licensed bounty hunter to retrieve the errant individual and avert forfeiture of the bond. These individuals are outnumbered by unlicensed bounty hunters who typically work for planetary crimelords or interstellar crime syndicates. These unsavory individuals track down smugglers who fail to deliver cargoes, debtors who fall behind in their payments to loan sharks, or anyone else unfortunate enough to be sought by a crime figure with the money to put a bounty on their head. The conditions of a particular bounty vary, but in most cases targets are sought dead or alive. In many cases, unlicensed bounty hunters are little more than cheap, low-skill assassins.

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DATA DUMP

Natasha Grigoryev - A fear-somely effective underworld bounty hunter with extensive cybernetic augmentations, Natasha Grigoryev throws herself into her work with a recklessness bordering on a death wish. Grigoryev grew up on Hephaistos and joined the StarForces Marine Corps as soon as she could legally enlist. Her combat skill earned Grigoryev a spot in the elite Special Forces, where she excelled over the course of several years of service.

A single mother, Grigoryev left the Corps when her young daughter contracted an incurable disease. Within a scant few months, her only child was gone. Back on Hephaistos, Grigoryev began drinking heavily until one day, her account nearly depleted of credits, she hit upon a way to turn her martial talents into ready cash. As an unlicensed bounty hunter, she began tracking down individuals sought by underworld crime figures, loan sharks, a few corporate contacts, and other illicit clients.

Her penchant for taking wild risks in pursuit of her prey won Grigoryev a name in the underworld, not to mention a steady string of jobs. Grigoryev came close to death in a shootout on Nai in 2230CE. A shady surgeon reconstructed her shattered face and body using older cybernetics, lacking the cosmetic extras that make modern implants nearly lifelike. As much machine now as flesh, Grigoryev hasn't bothered to upgrade her implants to regain a more human appearance.

Coolly efficient, she has lost nearly all touch with her humanity. Grigoryev has no friends, no lovers, and no life outside fulfilling her contracts. She recently accepted a job offered by an undisclosed client to search for a girl once known as Rayne Lancaster, thought to be hiding somewhere in the Epsilon Indi system. The thought that, had she lived, her late daughter would now be almost Lancaster's age has not yet occurred to Grigoryev.

A human of Russian descent, Grigoryev, 36, stands 175cm tall and has a slim, athletic build. She has an icy blue left eye and wears her blonde hair close-cropped with a ponytail down her back. Her cybernetics include both legs, her right arm, right eye, right ear, and a number of internal organs. The entire right side of her face has been reconstructed with microcircuitry tracing through shattered flesh. Grigoryev carries a veritable arsenal of weaponry, including a sawed-off shotgun that she fires one-handed with the strength of her cybernetic arm.

Datatheft - Information has power and value in the 23rd century, and computers are most often the keys to unlocking that information. Naturally, new forms of crime (and criminals) have evolved to feed off this phenomenon. Datathieves, also known as hackers, crackers, or netrunners depending on their specialty, break into computer networks for fun and profit. They uncover secrets, sabotage systems, raid financial accounts, alter records, plant falsified information, and do just about anything else involving a computer.

Some datathieves are just in it for the challenge, but the professionals hire themselves out to anyone needing their netrunning expertise. Clients run the gamut from job-seekers trying to pad electronic resumes to planetary crimelords seeking to launder their ill-gotten gains in a computer-based economy. Many datathieves find work in the shadowy world of corporate conflict. Covert trade wars between vast interstellar corporations bring plenty of opportunities for employment as rival firms seek to disrupt foes via computer attacks or protect against enemy intrusions.

Very few datathieves consider what they do a job - they'd run the nets even if they weren't being paid for it. Access is paramount to a datathief, and few can resist the temptation to crack a high-security system. Cybernetics, particularly brainware, are extremely popular in the datathief subculture. Rare indeed is the hacker without a datajack, VR implant, or other cyber aid.

Organized Crime - Not unlike their counterparts in legitimate business, underworld organizations have profited greatly from humanity's trek to the stars. Access to new markets, resources, and opportunities has enabled some crime cartels to expand their influence across countless star systems. A number of organized crime cynosures, such as the Mafia, have largely faded into history. Eclipsed by newer crime rings or rendered obsolete, they exist only in holovid period pieces and scholarly texts.

Others, such as the yakuza, emerged from the transition to an interstellar society essentially intact. But these venerable underworld organizations face competition from new crime syndicates risen from the opportunities opened by ongoing federation expansion.

Antares Cartel: One of the best-known examples of an emerging organized crime ring, the Antares Cartel has made its mark chiefly in smuggling. Drugs, weapons, and black-market goods of all descriptions are brought to worlds throughout the United Worlds by ships with ties to the Antares Cartel. Fences and underworld dealers sell the illicit cargo, forwarding a healthy cut of the proceeds to the cartel. Only the most foolish (and short-lived) try to cheat the crime ring.

The cartel also traffics heavily in cloned slave laborers, bodyguards, warriors, and other products of prohibited biolabs on several worlds and space habitats.

The Antares Cartel takes its name from Antares, a red giant star approximately 500 light-years distant from Sol. The significance of this star to the cartel is unknown. In fact, law enforcement authorities know very little about the shadowy upper levels of the crime ring. Ruthless in protecting its secrets, the cartel has killed several defectors, witnesses, and undercover operatives over the years. Some have simply vanished, while others fell to hired assassins despite extensive U.W. Security Force protection.

The actual cartel appears to consist of fewer than five hundred people, with thousands of affiliated smugglers and black marketeers working as hirelings, contractors, or franchisees.

The Yakuza: Dating back to Japan in the 18th century, the yakuza are now interstellar crime cartels with a unique culture rich in tradition. Yakuza gangsters follow a code of honor stressing loyalty and obedience. Some even view themselves as "noble gangsters" who keep other criminals from getting out of hand, although this is more often fancy than fact. Ancient traditions, such as cutting off part of a finger to atone for an offense, are still followed by most gangs. A few syndicates have modified the tradition to allow the offender to erase the shame through exemplary service, gaining permission to have a cloned or cybernetic finger implanted in place of the missing digit.

Modern yakuza syndicates are embroiled in a vast array of criminal enterprises, including murder for hire, drug smuggling, prostitution, gambling, slavery, datatheft, and financial crimes. The cartels are heavily involved in gun running, and many even operate their own arms factories where illegal weapons are turned out for black market sales. Infiltration and corruption of legitimate corporations are also favorite yakuza endeavors.

Yakuza syndicates are organized as either *gumi* or *rengo*. In a pyramidal *gumi* structure, the chief *oyabun* controls the gang. A second-in-command insulates the *oyabun* from day-to-day affairs. Six *sanro-kai* (advisors) and a council (*saiko-kanbu-kai*) are next in the hierarchy. The *kambu atsukai* acts as an executive, and below him are the *wakashu* (young men). Each *wakashu* commands a number of *kobun* or *kumi-in*, who are street soldiers. In a *rengo* structure, several yakuza gangs form a large syndicate led by a council of *oyabun*.

Persistent rumors and popular fiction link the yakuza to legendary ninja assassins, but law enforcement authorities have found no evidence to support the continued existence of ninja.

Centuries-old yakuza traits, including elaborate tattoos, slang dialects, and arrogant behavior, mark 23rd-century gangsters. While personal codes of honor vary from syndicate to syndicate, yakuza always show respect and instant obedience to their superiors in the gang.

Modern yakuza are also fond of cybernetic enhancements, particularly combat-oriented modifications. Many street soldiers seek out underworld surgeons for elective implantation of black-market cyberware in hopes of gaining a lethal edge over foes.

Some of the more prominent interstellar yakuza syndicates include the Hamada-rengo, Motoyoshi-kai, Satomura-kai, and Yamahiro-gumi. All save the Motoyoshi-kai, a Ryujin syndicate, are based on Earth.

The yakuza now recruit *kobun* from a variety of ethnic backgrounds, although the upper levels of most syndicates are still predominantly Japanese.

Fires of Heaven^{v1.0}

Piracy - While not quite rampant, piracy is a serious threat to starship travel in the United Worlds. Pirates tend to operate chiefly in frontier systems, where solitary ships can be more easily waylaid, but are not unknown even in core systems.

Pirate vessels are heavily customized versions of legitimate starships (most often freighter designs) incorporating illegal armaments, tougher armor, enhanced sensors, and other combat-oriented modifications. Some pirates earn credits and credibility as legitimate cargo haulers, turning to piracy only in times of great need. Accommodations may be lush or utilitarian, depending on the style and success of the crew. In any case, no two pirate vessels are alike.

A pirate band may possess a single ship or several; in addition, individual bands may join forces for a particularly juicy target. Hidden pirate havens on otherwise uninhabited moons or in remote regions of asteroid belts house caches of fuel and supplies for spaceborne buccaneers.

The exact organization and structure of a pirate crew varies. Some are egalitarian, with each pirate taking a share of the plunder based on position, and the crew electing its captain. Others are ruled by an iron hand, with harsh and often fatal discipline for those who step out of line. Regardless of how leaders are chosen, no pirate captain lasts for long unless he can produce enough loot to keep the crew happy. Risk without reward holds no charm for pirates, and an overly cautious or unlucky captain could find himself facing a mutiny.

Pirates target unarmed or lightly armed cargo vessels, and favor ambushes. Asteroid belts are prime hunting grounds, but pirates have also been known to hide from approaching ships behind moons or uninhabited worlds. Other pirates rely on subterfuge to lull freighter crews into complacency until they draw close enough to attack.

Once in attack position, pirates typically demand the surrender of the vessel. Pirate crews prefer to strip surrendered ships of valuable cargo, but will take their chances in battle if necessary. How likely a ship is to surrender without a fight depends on the region of space and the identity of the pirates. Someone who is known for taking cargoes and leaving the ships and crews alive is less likely to get a fight than a pirate known for taking any ship they can get and spacing the crews.

Battles usually consist of ship-to-ship combat, in which the freebooters try to disable rather than destroy the target, followed by a boarding action to seize control of the vessel. Since the pirate's only escape from the scene is in someone's starship, making sure they can flee the scene is always a paramount consideration. Once a pirate has taken a ship, they typically offload anything of value while keeping watch for StarForces Navy ships or other rescuers before fleeing with their captured bounty. Once the stolen goods are safely stowed, the pirates will either head for a distant planet (usually neither the origin nor the destination of the plundered ship) where they can attempt to sell their wares in their guise as legitimate merchants, or remove themselves to a hidden base where the stolen shipment can be broken up into smaller quantities for easier fencing.

Popular images of swashbuckling derring-do aside, pirate raids are brutal affairs rife with bloodshed and wanton violence. Murders, sexual assaults, beatings, and other crimes are all common, not to mention the fact that survivors, if any, are often abandoned to their fates in badly damaged hulks drifting through space. Far too often, the biggest prize is the captured ship. Experienced salvagers strip off components of value that cannot be traced, and take anything with rare elements to be melted down and resold. The crew and passengers are merely inconvenient witnesses. Without them, the captured ship and its wealth are just another ship that entered hyperspace and never came out. The U.W. has the death penalty for piracy, so it is ironically in a pirate's best interest to *not* leave witnesses.

The United Worlds government takes a two-pronged approach to the problem of piracy. StarForces Navy vessels patrol trade routes to deter pirate raids and respond quickly to attacks, but piracy-related investigations are handled by the United Worlds Security Force. The two organizations work together as needed; for example, a raid by marshals on a suspected pirate haven may well be backed up by naval vessels poised to disable any fleeing starships.

"We received a tip that a particular corporate executive purchased clone slaves as servants at his estate on Mars. After an investigation confirmed the tip, we raided the place. It turned out this guy had found a woman that he considered the epitome of femininity, so he acquired a dozen identical clones of her to be his household servants. Creepy."

- Aung Sein, United Worlds Security Force,
2233CE

Slavers - Clandestine traders in human flesh, slavers are a blight on the United Worlds. The interstellar slave trade traffics primarily in clones bred in underworld biolabs. Not only can clones be bioengineered for specific traits, such as strength and endurance, they can be programmed by *in vitro* brainwashing techniques for loyalty, docility, or other useful qualities. The fact that clones aren't supposed to exist in the first place means no one will miss those sold into slavery, whereas kidnapping or other means of acquiring slaves are likely to attract the attention of authorities.

Clone slaves are sometimes employed as forced labor, usually in remote space habitats, often unregistered and unknown to authorities. Interstellar marshals have also reported a few cases of clone slaves being used to work plantations in isolated regions of lightly populated frontier colonies.

Many crimelords buy clone bodyguards, valued for their inhumanly fast reactions and fanatic loyalty, while clone gladiators battle in underworld pit-fighting venues for depraved gamblers. Cloned duplicates of celebrities are sold to pornographers or high-priced prostitution rings.

The Biogenic Crimes Division of the U.W. Security Force investigates reports of biolabs and clone slaves. Many slaves have been freed in raids by so-called gene cops, although the clone terrorists of the Alpha Cell organization believe marshals are not doing enough to rescue their enslaved brethren.

Terrorism - Terrorism poses a significant problem in the 23rd century. Terrorist organizations may be few, with modest followings, but access to ever-more powerful armaments, bombs, and even bioweapons enhances their lethal effectiveness.

Terrorists use violence to advance political causes; the difference between a terrorist and a freedom fighter is largely a matter of perspective. The United Worlds government and public consider Alpha Cell, the Radical Anarchist Front, and others terrorists, in spite of the noble ideals these groups claim to uphold.

"Security system records have Colin Hollister entering the administration building at 1408 02-28-36. He is recognized by the security personnel, has the correct holo ID and passes a voice recognition scan. The person identified as Hollister vanishes from all security scans from 1412 to 1420, at which time he reappears and is processed back out by security personnel. The assassination of Deputy Minister Piotr Ivanov took place sometime in this eight-minute gap."

"Local police found Hollister's body at his home the next day. The medical examiner estimates he died at least 24 hours before the discovery of his body, six hours or more before the murder of the deputy minister."

- Aliye Bayar, United Worlds Security Force,
2236CE

Alpha Cell: The organization known to the public as Alpha Cell fights injustice against clones and bioengineered humans. Composed chiefly of clones, Alpha Cell targets both underground exploitation and United Worlds policies it deems prejudicial.

Cloaked in secrecy, Alpha Cell has a reputation for precise, nearly flawless strikes that rarely produce collateral deaths or injuries. Eschewing the random bombings employed by other terrorists, Alpha Cell specializes in assassination, kidnapping, and rescues of enslaved clones. It also has proven adept at infiltrating government and law enforcement computer systems.

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In reality, this organization has no formal name. The top leaders of the movement constitute the alpha cell, linked to subordinate cells through complex contact procedures designed to prevent the capture of one cell from jeopardizing the entire organization. Investigators discovered the alpha cell appellation and mistakenly applied it to the organization as a whole. The media followed suit, propelling the name Alpha Cell into the public consciousness.

Alpha Cell consists of fewer than one hundred operatives, scattered throughout the United Worlds. The U.W. Security Force has identified the shadowy leader of the organization only by his Alpha Cell codename, Watchmaker.

"The Angel had been detained trying to smuggle a detonator past security at the Eden starport. We suspected another Angel had already gotten the rest of the bomb on-station, and we were desperate to find it, so we had the Angel restrained and were questioning her. She just sat there glaring at us. Then she started choking."

"An autopsy showed she'd swallowed her tongue. The station medical examiner said that was supposed to be impossible..."

"The bomb went off 18 hours later: hull breach in the outer habitat ring, 140 dead."

- Nicholas Wells, United Worlds Security Force,
2237CE

Angels of the Apocalypse: A secret cult of fanatics dedicated to bloodshed in the name of attaining godhood for their prophet, the Angels of the Apocalypse are one of the gravest internal threats to the United Worlds. The Angels have caused a staggering loss of life since their first known appearance in 2226CE, and are arguably the most feared terrorist organization plaguing the federation.

Angels of the Apocalypse are protected in their beliefs, if not their actions, by the U.W. Charter's guarantees of religious freedom. Nonetheless, those who publicly associate themselves with the cult are under constant scrutiny by authorities. Law enforcement authorities and the courts defend the monitoring as an essential defense against the dire threat posed by the Angels to the safety and security of United Worlds citizens. Civil liberties advocates complain that marshals use suspected involvement with the Angels of the Apocalypse as an excuse to surveil whoever they wish, whether evidence of actual cult ties exists or not.

As a result, the bulk of the sect remains underground with only a few affiliated attorneys and spokespeople operating in public.

The Angels of the Apocalypse seek to bring about apotheosis: the direct ascension of their leader to godhood. The group's teachings hold that deification can only be achieved through the deaths of non-believers, which will bring about the end of the universe and transform the faithful into heavenly beings of light.

Details of the cult liturgy are hard to come by, but it is thought that the Angels plan to shed the blood of millions in pursuit of apotheosis.

Nearly 19,000 deaths have been attributed to the mad schemes of the Angels of the Apocalypse in the past decade. Atrocities committed by the Angels include the 2228CE gassing of transit tubes on Asgard, the release of a gene-tailored contagion on Tawhirimatea in 2233CE, and the computer-virus sabotage of life-support systems on the passenger liner *Evening Star* in 2236CE.

In 2230CE, United Worlds marshals foiled a plot by the group to detonate an antimatter bomb on EarthPort. In 2233CE, a highly modified cargo ship dove out of the plane of the ecliptic at .1c, and only luck placed a StarForces vessel where it could intercept in time to prevent what would have been a five hundred megaton strike on Mars. Another near-miss took place in 2235CE, when planetary police on Brigit prevented a band of Angels from breaching the protective dome over Concordia. Most recently, an Angel infiltrated the antimatter generation center on Hell in 2237CE and was only narrowly prevented from releasing stored antimatter fuel that would have obliterated the facility and created fuel shortages throughout the federation.

Serial killings are another tool of the cult, and Angels are suspected in strings of ghastly murders on numerous worlds. Attacks by the Angels are characterized by phenomenal recklessness. Lone Angels will sometimes enter public places and begin firing guns, slaying bystanders at random until they are brought down by peace officers. Angel-led assassination attempts are bloody affairs that routinely miss their targets but take many other lives.

Failures of their more complex schemes are more often than not a result of carelessness or happenstance than detection by authorities. Confident of eventual triumph, the Angels seem inured to setbacks or failures caused by inadequate preparation.

The identity of the cult's leader, known as the Prophet, remains a mystery. Indeed, authorities are not even certain of the Prophet's gender, age, or even homeworld.

The Angels are armed with far more than faith in pursuit of their apocalyptic creed. The cult has vast resources, including substantial financial reserves, extensive hidden bases, and numerous secret arms factories.

The Angels also have access to considerable technical expertise. Authorities surmise the cult has a cadre of genetic engineers, weapons designers, explosives experts, and other highly skilled personnel that provides logistic support for its terror strikes. How they get highly intelligent and skilled people to plan and execute the Angels' horrific acts is a continuing mystery.

The most fanatical Angels are tasked with carrying out the cult's deadly attacks, nearly always at cost of their own lives. Those few captured by authorities invariably commit suicide at the earliest opportunity. While the exact number of Angels remains unknown, authorities believe followers number in the thousands. The cult organization follows a strange logic largely unreadable by outsiders.



Radical Anarchist Front: The Radical Anarchist Front seeks to bring about the fall of civilization, government, and organized religion to force a return to a pastoral, family-based society. The organization often resorts to violence and terror to accomplish its goals. Bombings, assassinations, kidnappings, and other crimes are frequent tactics for RAF cells.

Attacks are chosen to weaken institutions and shake the public's faith in organized society. Targets typically include agencies or individuals associated with government, law enforcement, military forces, organized religion, or anything else the RAF deems a stifling influence on the freedom of humanity.

Investigators believe the RAF has ties to the public Anarchy Party, a legal political organization active on numerous worlds. The party disseminates anarchist teachings, sponsors candidates for public office, lobbies governments, and raises funds for the cause. Definitive proof of a link between the two organizations has yet to be found.

Other Terrorist Organizations - In addition to interstellar terrorist bands, a number of planetary organizations pursue more limited goals through terror tactics.

Ethical debate on the propriety of terraforming, urbanization, and introduction of Earth species on alien worlds has spawned a violent fringe element devoted to halting these practices. Eco-terrorists usually direct their attacks against government or corporate installations involved in altering or exploiting native environments. One of the earliest of such movements, Mars First!, remains active in the 23rd century, as do similar efforts on other worlds.

The United Worlds policy of gradually guiding colonies toward autonomy frustrates some impatient for independence. Others argue that the strings attached to "independence", including mandatory U.W. membership, are too restrictive. Terrorist organizations seeking to drive out federal authority for either reason occasionally arise on some planets.

Despite the progress made toward a more harmonious society, some people are unable to let go of ethnic, religious, or national enmities dating back centuries. Far more rare than in times past, such hatreds still drive some to seek vengeance for perceived age-old wrongs through terror attacks.

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DATA DUMP

Jurgen - A ghostly echo of the Biotech Wars, Jurgen has moved silently through the expanding United Worlds for nearly 200 years and now leads Alpha Cell as the Watchmaker.

Jurgen was born in Germany in 2001CE, and transformed by an underworld biolab into a cold-hearted biogenic assassin. Following the Biotech Wars, Jurgen escaped the hunters who sought out and destroyed his fellow bioassassins, leaving him possibly the last of his kind.

Over the years, Jurgen emerged from hiding to periodically commit perfect killings for astronomical prices. Many cases of his handiwork are not even recognized as having been foul play, and Jurgen has remained careful never to let even a seed of suspicion that even one bioassassin survives take root. His altered genetic makeup and periodic antigeria treatments have prolonged Jurgen's lifespan and youthfulness.

He also sought other survivors of his kind, but found only clones and genetically engineered individuals created for lives of slavery. Gladiators in bloody pit-fighting events staged by gambling cartels, laborers in black-market factories, or bodyguards for crimelords, they faced bleak lives of toil and despair. Even those who escaped or were freed by United Worlds Security Force marshals faced prejudice and suspicion born of the revulsion toward biogenics engendered by the Biotech Wars.

Jurgen set out to build a resistance movement dedicated to freeing gene-engineered humans and clones from the oppression of underworld masters and unfair United Worlds laws. The organization later to become known to the public as Alpha Cell was born.

Jurgen kills without conscience, hesitation or doubt. This doesn't mean he takes lives wantonly or carelessly, however. Jurgen realizes that unnecessary deaths create trouble - his control results from practical considerations rather than moral qualms.

Invariably alert, calculating and cautious, Jurgen never stops planning and preparing. He absorbs every fact and nuance, storing apparently useless bits of knowledge away for the day when they can be turned to his advantage. His mind is like a computer, constantly analyzing and evaluating everything around him.

Jurgen's long lifetime of experience has made him extremely cool in even the most stressful situations. In fact, he rarely exhibits any form of emotion unless called for by his disguise of the moment.

DATA DUMP

Jurgen repairs and restores antique mechanical watches for relaxation, giving rise to his codename, Watchmaker.

Designed to be a perfect killing machine, Jurgen has vastly refined his natural talents with two centuries of experience. He possesses a near-encyclopedic knowledge of killing techniques and terrorist strategies, coupled with a brilliant mind and unparalleled real-world expertise.

Even Jurgen no longer recalls his original appearance. His regular changes of identity mean Jurgen rarely looks the same more than a few days at a time. Not only does he change his facial features, clothing, and hair, Jurgen alters his personality, walk, demeanor, bearing, and every other aspect of his outward appearance to match his chosen identity. He favors Nordic features, but can pose as a human of almost any background.

Jurgen stands 178cm tall, with a lean, muscular build that belies his genetically enhanced strength, although he can alter his outward characteristics to a certain degree.

Urban Legends: Modern Bogeymen - reference ua328407.028941.834713 - .05Cr

Planetary Crime - Petty crimelords are found on nearly every inhabited world of the United Worlds. While their power rarely extends beyond a single planet, they have a pervasive influence on the crime scene of their homeworlds. Planetary crimelords run the local rackets, control elements of the black market, and extort tribute from other illicit activities within their territory. Depending on the corruptibility of the government and peacekeepers, crimelords may have planetary officials in their back pockets. Many crimelords rely on clone bodyguards programmed for fanatic loyalty for security.

Each inhabited world typically has several crime bosses contending for control of its underworld. In rare cases, a single crimelord or a coalition of underworld figures dominates the crime scene, eliminating or absorbing potential rivals before they can become a problem. Violent gangs composed of disaffected young people are a problem on several U.W. core worlds, and every planet has a problem with ordinary street crime to some degree.

Piett Vogt - A ruthless planetary crimelord on Asgard in the Epsilon Eridani system, Pielt Vogt fights failing health and betrayal from within to retain his status as an underworld power. Born on Asgard, Vogt joined a Ny Oslo street gang as a youth and eventually worked his way into a small organized crime ring in the city. His crafty nature sped Vogt's climb to the top, and in time he became the chief lieutenant to crimelord Ansgar Ullsten.

DATA DUMP

As years passed, Vogt hungered for more power. He betrayed Ullsten to a rival crimelord, forging a secret pact to set his mentor up for an ambush and then merge the two crime rings. Ullsten perished, but Vogt double-crossed his ally by leading Ullsten's forces in a war of revenge. By the end of his bloody crusade, Vogt had absorbed the surviving remnants of his rivals and cemented his grip on the Asgard underworld. For the past 30 years, Vogt has ruled the crime scene on Asgard with an iron hand, controlling most of the black market and smuggling activities on the planet. Other underworld operations, such as illicit gambling or prostitution rings, pay tribute to Vogt. Those who refuse to pay are destroyed.

But Vogt's faltering health has emboldened Marija Slezevicious, a one-time enforcer who has risen to a prominent position in the crime ring, to plot to eliminate Vogt and take his place at the top. Vogt suffers from Holman's disease, a rare degenerative illness that progressively decalcifies the skeleton. The incurable but barely treatable condition makes walking or standing painful for Vogt and he spends much of his time in wheelchairs.

A human of Dutch ancestry, Vogt stands 188cm tall and has a heavy build. He has snowy white hair and calculating brown eyes. Vogt, 68, undergoes regular antigeria treatments.

Unauthorized File Access! - reference uw198101.615641.531283 - .00Cr

All the crimes of the early 21st century are still alive in the 23rd, adjusted for technological and social changes. Cons and swindles, pickpocketing, identity theft, petty extortion and protection rackets, street gangs, drugs, illicit sex trade, human, clone or animal pit fights, unlicensed gambling, it is all there. How much and what form it takes depends on the world, the city and the level of wealth.

"An explosive charge demolished the door, and the marshal came diving out of the smoke into the room where the smugglers were holding us prisoner. Falling in slow motion in .4g, the recoil of his two pistols slid him sideways across the floor. The smugglers didn't even have time to look surprised before they died."

- Lucia Vacaroiu, free trader, 2232CE

▼ **UW LAW ENFORCEMENT** - The laws of the United Worlds apply primarily to regions under federal authority, such as open space, asteroid belts, starports, and colonies still under federation authority. Some laws, such as those governing weapons or biotechnology, also apply to the independent worlds.

U.W. Security Force - The law enforcement arm of the federal government, the U.W. Security Force investigates violations of federal law and keeps the peace in areas under federal authority. Its agents are all federal marshals and are often referred to as interstellar marshals.

In practical terms, it combines the functions of a police force and an investigative agency. Headquartered on Earth, the security force handles problems as diverse as piracy, clone labs, and smuggling rings. The adventurous exploits of marshals are popular subjects for holovids, games, novels, and other forms of entertainment. As a result, the public holds a romantic image of the organization, particularly marshals patrolling rugged frontier systems, often working alone in the face of all kinds of hazards.



Fires of Heaven^{v1.0}

DATA DUMP

Gillian Halliwell - A strong leader known for her integrity, and dignity in the face of personal tragedy, Gillian Halliwell is director of the United Worlds Security Force.



Born on Eden in 2188CE, she graduated with honors from an Earth law school and went to work as a federal prosecutor on her homeworld. After years of steady, solid work, she won appointment as a judge in a United Worlds lower court. On the retirement of the former director of the U.W. Security Force in 2234CE, President Marcus Okoye tapped Halliwell for the post. While some attributed the appointment to her family's political contacts, in truth Okoye had been impressed by her record of diligent, honest work, and balanced judicial opinions.

Shortly after her appointment, Halliwell's young son and husband were killed in a hypersonic aircraft explosion on a family vacation to Nai in the Tau Ceti system. Only an unexpected call had kept Halliwell from joining them aboard the aircraft. A Security Force investigation later verified Radical Anarchist Front claims of responsibility for the assassination attempt, in which 32 perished. The perpetrators have never been found. Halliwell grieved privately, then took office as the new U.W. Security Force director. Her professional performance in the post, unmarred by either trepidation or reactionary backlash, has won Halliwell the respect of the organization and public at large.

A human of English descent, Halliwell, 49, has short blonde hair and appraising blue eyes. She stands 170cm tall and has a blocky build. Security Force bodyguards protect her at all times.

Who's Who in the United Worlds - reference ww274922.107012.331707 - .05Cr



Jurisdiction and Duties - Essentially, all colony worlds under Colonial Affairs Ministry control and everything beyond low orbit of independent worlds falls into the bailiwick of interstellar marshals.

The agency also has full jurisdiction over trespasses against federal law, wherever they may occur, although marshals are required to conduct joint operations with planetary law enforcement agencies on independent worlds. Only a federal judge can waive this requirement, and only for the most compelling of reasons, for example, when the planetary police agency itself is a target of the probe.

Organization - The U.W. Security Force consists of several divisions, each of which handles a particular task. The overall organization has a hierarchical structure, which applies regardless of the division to which a marshal may be assigned. Marshals are the bulk of Security Force personnel. They patrol federal territories, conduct investigations, and carry out other basic duties. Senior marshals oversee field offices. A division chief heads each branch of the organization, aided by one or more assistants depending on the size and scope of its duties.

Next are the two deputy directors and finally the director of the U.W. Security Force. The director, who serves a ten-year term, is nominated by the president and confirmed by the United Worlds Assembly.

Each inhabited star system has a field office, usually found at the biggest starport in the system. Individual marshals are under the authority of the in-system field office regardless of their assigned division, although depending on their duties a marshal might not set foot in the starport for months at a time.

The Security Force has a small fleet of interstellar starships (mostly second-line frigates and corvettes with upgraded electronics), but most often relies on commercial lines for non-urgent transportation. In cases involving potential combat situations, StarForces Navy vessels are assigned to convey or assist marshals via a long-standing liaison arrangement.

Divisions of Note - More than a dozen divisions comprise the United Worlds Security Force. Some handle particular duties, such as administration or training, while others are charged with investigating specific types of crimes. Marshals assigned to one division could stay Earth-bound their entire careers, while those in another might never spend more than a few weeks on any one world.

Biogenic Crimes Division: The Biogenic Crimes Division investigates all cases involving illegal cloning, genetic engineering, bioweapons, and other violations of United Worlds laws on biotech. Known on the street as "gene cops", marshals from this division raid underworld biolabs, jail rogue genetic engineers, free enslaved clones, and thwart use of bioweapons by criminal and terrorist factions.

They have no interest in arresting clones or bio-engineered humans, who aren't responsible for their illegal origins, although underworld slavemasters often feed rumors to the contrary to their captives to discourage escape attempts or pleas to the authorities for rescue.

Forensic Science Division: The experts and criminologists of the Forensic Science Division have cracked tens of thousands of cases, all without leaving their laboratories. Ballistics, fingerprints, DNA, fibers, forgeries, magnetic resonance imprints, and microscopic residues are just a handful of the types of evidence analyzed by this division. Equipped with the latest technology and staffed by top scientists, its labs glean incredibly detailed information from the barest clues left behind by criminals.

The Serial Crimes Bureau compiles uncannily accurate psychological profiles of serial killers and other repeat offenders, helping investigators zero in on potential suspects, and the Computer Crimes Bureau defeats codes and security programs to recover data from confiscated computer systems.

Along with providing scientific support to marshals in the field, the Forensic Science Division makes its expertise available to planetary law enforcement agencies as needed.

"Backup? Out here, there is no backup."
- Ahmed el-Sayed, U.W. Security Force marshal,
2236CE

Patrol Division: Marshals assigned to the Patrol Division enforce the law in regions under federal jurisdiction. They may conduct investigations, but more often spend their time actively stopping crimes and making arrests.

In spite of the fact that most marshals work in pairs, they are sorely outnumbered in nearly all cases. Adept at martial arts, gunplay, and other combat skills, marshals on patrol are ready for any contingency - especially when the nearest backup may be worlds away. Agents of this division, which holds a not altogether undeserved romantic image of marshals roaming the stars to bring justice to rough-and-tumble frontier worlds, are the most familiar face of the Security Force to the public.

Lihwa Yang - A tough-as-nails marshal with the U.W. Security Force, Lihwa Yang keeps the peace on the untamed frontier worlds of the Omicron Eridani system.

DATA DUMP



Born on Tawhirimatea, Yang grew up in the crowded arcologies of the desolate world. She vowed to become an interstellar marshal after her older sister burned out her mind on exotic drugs peddled by the planet's criminal triads. Yang made good on her pledge, winning a U.W. Security Force badge after earning a degree in criminal justice. Alongside her partner, fellow marshal Jax Garrett, Yang patrols remote regions of Gawaine, enforcing federation law among the scattered farming communities and towns. She has gained a reputation for both her fighting prowess and incorruptibility. Unbeknownst to Yang, however, Garrett has been on the local crimelord's take for years. Yang's selfless campaign has sparked a crisis of conscience for her corrupt partner. Tired of her interference, crime bosses have ordered Garrett to set Yang up to be killed. He has so far made excuses, but soon Garrett will be forced to choose between his clandestine paymasters and his partner.

A human of Chinese descent, Yang, 30, has long black hair and no-nonsense brown eyes. She stands 167cm tall. Yang has a toned, athletic build and possesses considerable skill at gunplay and kung fu.

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Psionic Crimes Division: The so-called psi cops are tasked with probing reports of crimes involving psionics, such as brain-tampering, mind control, and other federal-law infractions.

A few marshals assigned to this division are themselves psions, but this is not a requirement. The Psi Crimes Division also consults extensively with carefully screened civilian psions and experts on psionics. Due to the unusual nature of the crimes and criminals investigated by this division, mental discipline is one of the strongest traits of these marshalls.

Federal Courts - Citizens accused of violating United Worlds law are tried in federal courts, which are found on all inhabited worlds large enough to support them. Prisoners from pioneer colonies or outposts lacking federal courts are extradited to the nearest court. Federal courts also try cases involving disputes between independent worlds, provisions of the U.W. Charter, and other matters under federal jurisdiction.

The highest court is the United Worlds Supreme Court, which deals solely with matters involving the federation Charter.

Federal Penal System - The United Worlds operates penitentiaries on most independent worlds and some colonies. Those convicted of federal criminal violations are incarcerated in these prisons, designed to provide varying levels of security.

The highest-security federal prison is located on Tinirau, a moon orbiting the gas giant Avatea in the Lalande 21185 system. The Tinirau prison houses crimelords, terrorists, serial killers, and others deemed an extreme danger to others or a serious escape risk. Even if an inmate somehow eludes the highly sophisticated security systems of the underground facility, surface conditions on frozen Tinirau are deadly to unprotected humans. A pair of StarForces Navy frigates orbits the moon on permanent duty to deter rescue attempts. Tinirau patrol duty is *not* considered a desirable assignment to have in your StarForces personnel record, as it is usually a punishment assignment handed out in lieu of an official reprimand of some kind. It is also one of the most boring assignments in the StarForces.

▼ **PLANETARY LAW** - Independent federation worlds govern their own internal affairs, subject to certain restrictions, and maintain their own legal systems. Civil and criminal laws are adopted by the planetary government, enforced by planetary peace officers, and adjudicated by planetary courts. Planetary authority is defined by U.W. law as extending to "low orbit", but the definition of this is very vague. In practical terms, all sub-orbital craft and any offenses taking place upon them are a matter of planetary jurisdiction. If a craft makes a complete unpowered circuit around a world, it has made an "orbit" and then falls under outer space jurisdiction. There are "hot pursuit" provisions in the law going both directions, so you cannot escape pursuit from one authority by moving into the jurisdiction of another.

For the sake of game play, you should probably *not* use all the high-tech forensic tools that *should* be available in the Fires of Heaven universe. You could say that this is because of prior court rulings in some famous cases, or maybe there is a lingering effect of the Biotech Wars that causes problems with trying to use trace DNA evidence, or a just pervasive enough problem with database hacking that just device-based surveillance is not sufficient to get a conviction. So you need *real* witnesses and *real* detective work to get arrests and convictions.

Planetary Peace Officers - Every independent world has its own police force. The authority of planetary peace officers extends to low orbit. They have no jurisdiction in federal territory or on other independent worlds, although law enforcement agencies typically cooperate easily. The exact title, structure, tactics, and competency of planetary police agencies varies from world to world.

Planetary Courts - Violations of planetary criminal laws, as well as most civil disputes, are tried in planetary courts. Each independent world has its own court system, usually a hierarchy of lesser courts, superior courts, and various courts of appeal up to a supreme court that is the highest authority on planetary law -- exceeded in authority only by the United Worlds Supreme Court.

Planetary Penal Systems - Citizens convicted of violating planetary laws are consigned to the world's penal system. Depending on population and crime rates, prisons may be scarce or plentiful. Highly populated worlds typically have a hierarchy of prisons, from low security to ultra-secure facilities, where prisoners are housed based on their crime, threat to others, and escape risk.

Legal procedures - It is just the nature of things that adventurers will find themselves under legal suspicion at one time or another. For the players and gamemaster, here is some in-play information about how it works.

Surveillance: On core worlds, most public areas are under some form of surveillance. This includes major intersections, the entrances to government buildings and most major businesses or corporate structures, anyplace where a lot of people would be expected to gather (subways, etc.), and important infrastructure (power substations, underground utility tunnels, etc.). This is expected and generally taken for granted by core world residents, but those raised on frontier or secondary worlds may find it unnerving.

Many businesses, especially restaurants, make a point of *not* having internal surveillance, sometimes even eschewing cameras on the front door. When people leave the street for a social purpose, there is not a right to privacy, but an expectation of one, and businesses that cater to this get more credits than those which do not.

Core worlds may also use obvious surveillance devices as a deterrent in high-crime areas, and local governments have gotten very good at ensuring overlapping coverage to prevent unseen vandalism of the devices (or using hidden cameras or high-flying drones to catch the perpetrators). Speaking of which, most urban core world regions will have a small fleet of automated surveillance drones.

Very little of this surveillance is monitored by humans. Computers will monitor and record the information, and do mundane but computationally intensive tasks like checking faces against lists of wanted criminals, sending out tickets for people violating traffic laws, and such. When a detected event requires human intervention, the event is passed to a human operator, who then forwards the information to the appropriate responder. For instance, a gunshot, auto accident, unauthorized subway trespass or camera going unexpectedly offline would cause a human monitor to be notified, and the event would be played back so they could make the appropriate decision.

Datamining: Another form of government surveillance is datamining. Anything you do that is electronically traceable is traced, at least on core worlds. As with other surveillance, it is automatic and unmonitored, but is also recorded and can be used in a legal sense. So, if your car is speeding, the system knows whether or not it is the owner behind the wheel. If you call in an eyewitness report of a crime, the system knows if your phone is at the location you claim to be at. If you are off-world and your credit card is used on-world, or if you get treated for an injury in an auto accident and there was no auto accident at that time and place, the system knows and notifies someone.

Commercially, most services you use have a user agreement that allows the service provider to utilize that data. Your credit card subjects you to advertisements based on your buying preferences. Your phone beeps with coupon alerts when you pass a store that you have bought from before. Gambling establishments know your entire financial history before you get past their foyer. When a policeman pulls you over at for a routine traffic violation, they know your entire criminal history and and weapon permits you have by the time they get out of their car.

Rights: These vary from world to world in terms of how they are enforced and the standards required by the courts, but all U.W. citizens are technically guaranteed the following:

- The right to be secure in their persons. In *theory*, this means that you cannot be detained simply because of your ethnicity or species or planet of origin or outward signs of political belief. An officer of the law needs to have a reason to suspect criminal activity or intent before detaining a person, searching them or their vehicle. In *practice*, however, police have remote scanners that can detect concealed weapons, and can mine data to come up with some sort of reason that would hold up in court to justify their actions in the event they actually do find contraband on you or in your vehicle.
- Crimes can only be committed by sentient beings. The equivalent of "forfeiture laws" do not exist in the U.W. A vehicle used to transport illicit goods is not an accessory to the crime. It can, however, be impounded for further investigation or collection of evidence for a reasonable amount of time.
- All individuals have the right to know their rights and to have legal representation. If you are arrested, you have the right to remain silent until you have conferred with an attorney, but you do not have to remain silent and the police would much prefer that you were talkative...

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Arrest: If you do not resist arrest, police have no legal grounds to use force. However, regardless of your status, they may elect to restrain your hands, to remove any and all weapons or electronic devices from your person, to apply law enforcement-grade electronic blocks on your cyberware and take a DNA sample to authenticate your identity. If you do resist arrest or flee, police are authorized to use force appropriate to the situation.

A person who is arrested is put into a holding cell of some kind. The "booking" process merely confirms DNA and takes basic biometric data to compare to criminal databases. Afterwards, there is basic questioning and/or access to legal counsel. If it turns out you are obviously the "wrong guy", you get released. Any money spent on lawyers is not refunded, any extra costs you incur for travelling to the impound to recover your vehicle is your expense and if your hotel bills you for an extra night because you weren't there to check out, that's your problem.

If there remains sufficient suspicion about your culpability, you then get a bail hearing, where you may be released after posting a bond sufficiently large to encourage your attendance at your trial, which might be anywhere from a week to a few months later. Conditions of bail *usually* prohibit you from leaving the planet and your travel papers will be flagged so that computers will record if you travel or book travel off-world. Bail jumpers, violent offenders or wanted felons do not get bail, and stay put until trial. At this point, it is also possible to do out of court settlements. If you got in a fight and trashed a bar, you can avoid prosecution if the bar owner graciously drops charges in exchange for you paying for the remodelling job (done by his brother).

Trial: The system is pretty good about finding the innocent and the guilty. Money, often *lots* of it, can be used to exploit technicalities in the law, or more likely, be used to bribe or intimidate the police, witnesses, experts and judges. It takes a lot of work to put together a case against a corporate head or major underworld figure, and it is for all practical purposes, impossible in some jurisdictions. But for average people and average cases, the system does work. For adventurers who *have* broken the law, this is not necessarily a good thing. Mitigating circumstances are taken into account. However, fines, revocation of permits, increased scrutiny or probation and possible restrictions on travel are all reasonable outcomes, things which can put a crimp on an freewheeling adventurer's lifestyle. In general, not getting caught is the best policy...



EXPLORATION



"I've dreamed of exploring the far frontiers ever since I was a kid. When my aunt died and left her ranch on Eden to me, I sold it and used the credits to buy a used starship. The *Hidalgo* is not the luxurious interstellar yacht I always imagined I'd have, but it's held together pretty well over the years."

- Nyree Te Huia, explorer,
2235CE

▼ **EXPLORATION** - The urge to see what lies over the horizon, the desire to push forward into the unknown, beholding vistas never before viewed by human eyes, has always driven humanity. Starfarers of the 23rd century cast their gaze beyond the boundaries of the known universe to all the incredible discoveries that still await humanity.

Brown dwarves, pulsars, quasars, nebulae, and spatial anomalies are of tremendous scientific interest, but the most exciting and lucrative expeditions are those bound for star systems with life-bearing potential. The prospect of finding a garden world, or at least a habitable one, brimming with untapped natural resources inspires explorers to forever quest after distant suns.

But not all expeditions set out for the uncharted reaches beyond the frontier. United Worlds space contains scores of planets, many of which are still unexplored or only partially surveyed. Exploration tasks range from scanning entire star systems to performing detailed surveys on a particular continent or region of a world.

Fires of Heaven^{v1.0}

▼ **EXPLORING A SYSTEM** - Cataloging the star, planets, moons, asteroid belts, and other elements of unexplored star systems constitutes the first step in finding new homes for humanity. Since the Rozhkov Drive cannot be used within the gravity well of a system, charting systems can be a tedious process.

Explorers setting out to chart a new system typically carry plenty of deep-space probes to extend the reach of their vessel. As the ship begins its journey inward from the Rozhkov Radius, probes are dispatched to scan planets orbiting the star. Capable of high-g acceleration impossible for a manned craft, the probes relay basic information on the system back to the ship by radio or comm laser. These probes are reusable and fairly expensive so explorers try not to send them places they can't get them back from (unless someone else is paying the bills).

The data allows explorers to set course for the most promising worlds, leaving detailed examination of less interesting planets for another trip - a course taking explorers past every world could take years to complete. Along with ascertaining the presence of planets worth further investigation, a system-charting expedition also compiles astrogation data to simplify return trips.

Charting a Planet - Once the basic system data has been gathered, explorers typically pick one or two promising planets for closer examination. Orbital surveys and (if warranted) ground surveys provide a tremendous amount of detailed data on a newly discovered world.

Orbital Surveys - Orbital sensor sweeps are useful for collecting some data, particularly for cartography, but ground probes are indispensable for gathering detailed information on a world.

Probes can be controlled by a self-contained computer or remotely by human operators aboard a starship. They typically perform a variety of tests on the atmosphere, soil, water, and chemistry of a planet. Some probes take samples of plants or small animal life, such as analogues of flying insects. Others are outfitted with holocameras and microphones for observation by shipboard controllers.

Probes designed for one-time use are not mobile, but most are equipped with turbines or thrusters for flight, or treads for ground movement, to enhance their usefulness.

FIRST CONTACT - Strict United

Worlds policies cover the possibility of first encounters with intelligent alien races by explorers, free traders, or other outbound citizens.

DATA DUMP

Spacers are instructed to avoid direct contact, if possible, and report the discovery to federation authorities as quickly as possible so diplomats, exoscientists, and military personnel trained in first contact procedures can be dispatched.

If contact cannot be avoided, spacers are to avoid at all costs hostilities or other actions that could complicate future relations with the aliens. Ordinary citizens have no authority to negotiate treaties, trade accords, or any other agreements with newly contacted races on behalf of the federation or private parties. In theory, this policy removes the incentive for free traders to negotiate exclusive trade pacts with an alien civilization before reporting to authorities, for example. Of course, it also encourages less ethical crews to negotiate agreements anyway and keep the whole affair secret.

Every ship bound for unknown space carries a software information kit on establishing first contact with an alien race, from tips on establishing peaceful intent to advice on avoiding possible social gaffes. In the end, however, every first contact is unique and must be played by ear.

Cyclopedia Federacion(2235CE) - reference dc465261.396341.590881 - .05Cr

"A non-hostile world? No such thing. Oh, the air may be sweet and the climate agreeable, but the second you stop paying attention, you're dead. There are a million ways to die on a virgin world. But if you don't want to believe me, that's fine. Sooner or later I'll have one less competitor to worry about."
- Nigel Blair, explorer, 2230CE

Ground Surveys - Orbital sensor sweeps and remotely operated probes provide only so much information. Nothing compares to actually setting foot on a new world. The rewards, in terms of direct knowledge about a planet, often outweigh the manifold risks inherent in exploring an alien environment brimming with unknown dangers.

Of course, landings are impossible, or at least inadvisable, on some planets. Worlds in close orbit around stars are typically irradiated, burning wastelands, while other planets possess corrosive atmospheres dangerous to both personnel and equipment. Finally, some worlds are just not worth the expense or danger of sending down landing parties.

Analyzing the data gleaned from orbital surveys is the first step in sending an expedition to a world's surface. Explorers use the information to determine the purpose, duration, and landing sites of the mission. The data can also help explorers select and equip the team.

▼ **Note!** - The gamemaster should set varying difficulties to avoid complications of different types. Failing to make the roll means that a particular expert fails to notice something they should have, which will result in some consequence or negative modifier later on...

The composition of the team depends in large part on its task. A mineralogical survey calls for a team heavy in exogeologists, for example. But certain personnel are necessary no matter the job at hand. Security experts are required to deal with hostile alien life or other dangers. Medics must be on hand to treat injuries or illness. Support personnel may also be needed, especially on a long-term expedition, to maintain a base camp, drive vehicles, repair damaged equipment, or handle other routine but critical chores.

The right equipment and team members can spell the difference between life or death for a landing party. Life-support gear, vehicles, weapons for self-defense, robots, and provisions are just some of the equipment carried by most landing parties.

Vaccinations are another vital component in preparing for a landing party. Each member of the expedition must be inoculated against harmful alien viruses, bacteria, or other contagions detected by the robot probes of the target planet. Wide-spectrum antibiotics and immune-system boosters are prescribed in hopes of providing protection against undetected micro-organisms.

▼ **Note** - Immune system boosters and other measures are of limited effectiveness against a completely unknown alien biosphere. These measures are generally only good for a +1 to Health to fight off or avoid catching any particular unknown alien pathogen.

An unpleasant but mandatory side effect of any venture onto an unknown life-bearing world is quarantine for the crew and sterilization of the ship. Only in a life-threatening emergency can a ship returning from such a world exchange air, water or biological material with another life-bearing world. Even if the emergency is genuine, a ship owner may be liable for hundreds of thousands of Credits to cover immediate and long-term monitoring of the "contaminated" environment.

For the relatively long transit times involved in exploration, quarantine usually means that the crew is restricted to the ship or a quarantine facility until a doctor takes blood samples and checks them for alien organisms. Then the ship is sterilized. The life support system is flooded with an antiseptic gas, and then the entire life support system is vented into space. After a sufficient interval, the life support system can be resupplied and reinitialized.

The U.W. encourages compliance with a carrot-and-stick approach. First, the process is mandatory, with extremely punitive fines for non-compliance. Second, the process is subsidized to the extent that the ship owner is only out-of-pocket for their crew salaries and off-ship lodging for about a week, a small enough price to pay considering the price they'll get for a survey of a new, habitable world.

Initial visits to a new world are typically short-term affairs, mostly to confirm the basic survey data. If the first trips are successful, longer expeditions may be planned to prospect for valuable ores, collect specimens of native lifeforms, scout potential sites for pioneer colonies, or undertake other tasks.

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▼ **ECONOMICS OF EXPLORATION** - The spirit of discovery notwithstanding, exploration within the United Worlds and at its fringes can also be big business. Colonists, governments, corporations, and others are always on the lookout for possibilities opened by exploration of a new star system or planet.

Explorers fill this economic niche, braving the unknown to bring back valuable information on space outside the United Worlds, not to mention undiscovered treasures on worlds within the federation. Depending on the economic potential of their finds, adeptness at finding willing buyers, and skill at negotiation, explorers can generally bring in enough money to stay in business. A good system and planetary survey in an uncharted system will usually turn a profit, as will a good surface survey of an otherwise unexplored world. Usually. It only takes one major medical expense, a few lost survey drones to turn a modest profit into a loss, or a blown fusion engine to eat up an entire year's profits. There are a few exploration outfits that have a comfortable cushion because of some lucky finds they have made, but many freelancers are barely staying ahead of their expenses.

Of course, every explorer dreams of hitting the jackpot. A garden world ripe for colonization, or a lost alien city stuffed with amazing but easily understood technology could yield enough credits to make a person rich beyond imagination.

Exploration Companies - Some explorers are employees of corporations, scientific institutes, or other entities (including the military), but most are independent contractors. Incorporated business ventures, exploration companies may consist of a single ship or a star-spanning enterprise with a dozen or more vessels. Silent partners or other investors fund some explorers, while others eke out a living going from contract to contract.

Most exploration companies are based in frontier systems for practical reasons, but the larger concerns have core-world branch offices or agents for easy client access.

Crew - Regardless of the organization of the company, every exploration craft needs a crew. A wide range of highly specialized jobs must be filled to safely collect usable data on other stars, systems, and planets, but the best crew member is a "generalized specialist", someone who is truly good at one thing, but capable enough to carry their weight in several other fields (particularly self-defense).

The starship has to have a flight crew, of course, including a captain, astrogator, and helmsman. Explorers hire the best astrogators they can find - a ship bound for unknown, uncharted space needs every advantage. Other flight crew positions, such as sensor ops or communications jobs, can usually be filled by the exploration staff to conserve on crew space. Starship engineers play a vital role as well, maintaining and repairing the ship's systems a long way from shipyards or parts-supply houses.

Science skills, particularly those related to planetology, are naturally critical for explorers. Most expeditions have a core science staff covering at least the basics of planetology, astrophysics, and exobiology. Experts in various specialties are hired on a per-mission basis as needed. This reduces overhead costs, in addition to ensuring that vital crew slots are not wasted on experts ill-suited to the upcoming job - an exploration ship contracted for a mineralogical survey on a lifeless moon has no need of a full-time exozoologist, for example.

Security personnel are another critical element of exploration crews, not to keep order aboard ship, but to protect landing parties and fend off the dangers of unknown space. Hostile alien lifeforms, desperate pirates operating on the fringes of United Worlds space, and Vorn raiders are all on-the-job hazards for explorers. Security experts, often ex-military personnel, ensure the rest of the crew can safely complete its mission.

Physicians and other medical personnel are crucial for explorers who may be light-years and weeks away from the nearest hospital. In addition to treating ordinary illnesses and injuries, physicians may be called on to check new worlds for alien contagions, devise anti-toxins to newly discovered poisonous lifeforms, or check the spread of an alien disease among the crew. On many exploration ships the chief medical officer has the authority to order the ship destroyed to prevent a plague from reaching populated worlds.

Crew sizes are almost always limited by starship accommodations, and every explorer wishes he could add just a few more people to the expedition roster. As a result, explorers favor personnel with a variety of skills; an exobiologist with detailed knowledge of alien microorganisms might be *useful*, but one who can also serve as chief medical officer is *invaluable*.

In some exploration companies everyone in the permanent crew holds joint ownership of the business. In others, most (and sometimes all) of the crew are just employees.

Starships - A starship is a necessity for explorers, unless they are to be restricted to ground surveys on a particular world or plan to hire transport ships as needed. But the specialized equipment required for proper exploration usually makes acquiring a customized ship more desirable.

Many explorers purchase aerodynamic starships capable of planetary landings. Otherwise, boat bays and shuttles are needed to send down landing parties for ground surveys. Exploration craft tend to carry extensive sensor suites, not to mention a few weapons for defense as they challenge the unknown dangers of uncharted space.

Other Equipment - Explorers require a fair amount of equipment to do their job safely and thoroughly. All-terrain rovers, which can usually be sealed for use on airless worlds, are a popular way to get around on an unexplored planet. Aircars are good for speed and aerial mapping, but useless in vacuum or extreme weather. Robots are used for all kinds of tasks, from planetary probes that transmit data from hostile or unknown worlds to sensor bots accompanying landing parties.

Life support gear may be required, depending on the expected conditions. Enviro-suits, cold- or hot-weather gear, airmasks, and so forth are all routine exploration supplies. Customized vehicles, armored e-suits, high-gravity exoskeletons, and other costly equipment may be needed for hostile environments.

Medical kits and science kits are also advisable for landing parties. Arms and armor may be needed on worlds with hostile lifeforms or other dangers. Unusual terrain may require special equipment, such as rock-climbing gear.

Explorers have to be ready for almost anything, since acquiring an overlooked piece of equipment can be pretty difficult light-years from human-inhabited space.

Grace Chen - A daring explorer on the outer edge of known space, Grace Chen finds herself torn between love and adventure.

DATA DUMP



Born to a wealthy family, Chen grew up aboard a private space habitat orbiting Tawhirimatea. She attended college on Earth, where she met and fell in love with Amala Saleh, then a medical student. But Chen longed to escape the staid confines of the core worlds for the unseen wonders of the frontier and beyond. Chen signed on with an exploration ship after graduation and reluctantly broke off her relationship with Saleh.

Over the years, Chen added exploration skills to her university training in exobiology. That and her enthusiasm for surveying newly discovered planets earned Chen a promotion to science officer aboard the private exploration vessel *Viking*. Javier Ortega y Diaz, the ship's captain, became her mentor. Under his tutelage, Chen added business and leadership skills to her repertoire.

In 2235CE, *Viking* took a long-term contract to conduct mineralogical surveys on Osiris in the Delta Pavonis system. While there, Chen found that Saleh had joined the pioneer colony as resident physician. They renewed their relationship of years earlier in a whirlwind romance that found them married before either quite knew what was happening.

While Chen took a crack at settling down on Osiris, *Viking* set off on a freelance expedition to 82 Eridani, a star 20 light-years from Sol known to have potentially habitable worlds. Exploring a garden world orbiting the star, the landing party was captured by a pack of monkey-like creatures inhabiting an enormous, sticky web. Diaz led a rescue mission that freed the captives at the cost of his own life.

After *Viking* returned to port, the backers of the exploration company offered the captaincy to Chen. Her decision to accept the post over Saleh's objections has caused a rift in their marriage, and the two have separated. *Viking* has set a return course to 82 Eridani with Chen at the helm, determined to unlock the mysteries of the planet.

Chen, 38, a human of Chinese-American descent, carries an athletic build on her short 160-cm frame. She has intelligent brown eyes and keeps her black hair closely cropped for ease of care in freefall.

Female Captain's Monthly: Profiles in Independence - reference yc670521.275341.441281 - .05Cr

Fires of Heaven^{v1.0}

We're on our way to Shen Nung, people! I just signed a contract from OmniCorp to round up 100 wild spidercats from one of the uninhabited continents. I think they want to sell them as pets. Ellie, contact the feds and see what kind of permits we need. Ajmal, Sebastiana, you'd better start refitting the storage bay for live cargo. Pirgo, put some Nutoan humor to work on the dockmaster - see if you can get us a break on fusion fuel. I need to go dig up some used safari gear somewhere.

- Jumoke Obataiye Obasanjo, explorer, 2237CE

Sponsored Expeditions - When corporations, government agencies, or other entities are interested in having a particular planet surveyed or a specific set of data collected, they typically offer a contract for the work, taking bids from interested exploration companies or hiring explorers with whom they have worked in the past.

Some contracts include bonuses for exceptional finds, although only the best exploration companies are typically able to demand such clauses. A sponsored expedition guarantees a minimum return on the trip, but the explorers could wind up delivering priceless data at a bargain price depending on what the journey turns up.

Sponsored expeditions run the gamut from routine asteroid mineral surveys to exploration of an uncharted planet or star system. More esoteric contracts are also available. For example, zoos, circuses, and wildlife parks are always interested in rare, showy, or newly discovered lifeforms. Explorers are sometimes chartered to go on safari in search of new additions to their collections.

Exploration Contracts - The immense number of variables involved in an exploration contract render creation of a formula or standard price pointless. The explorers must determine the expected cost of the expedition, including fuel, provisions, starship wear, crew payrolls, and purchase of necessary equipment, then add a reasonable profit. *For even a smallish exploration ship, a year's expenses can easily top a million credits!* The sponsor and explorer bargain until they strike a deal that both can live with.

The terms of the contract are sometimes even more important than the final price. Advance payments may be required to outfit the expedition, or bonus payments may be offered for exceptional finds, for example.

Freelance Expeditions - Explorers can also go the freelance route, seeking out valuable information on their own in hopes of selling it later to an interested party. Data on a hitherto-unknown mineral deposit, organic chemical, or other economic boon can usually find a buyer among the manifold corporations, governments, and other entities of the federation. Most valuable of all, of course, are newly discovered, habitable, resource-rich worlds.

A freelance expedition trades the security of a set contract payment for the freedom to negotiate a fair price for a really exceptional discovery. However, a freelance expedition yielding little of compelling interest may not bring in enough to cover the expense of the trip.

While the U.W. government and a few corporations, such as Amex, will buy almost any exploration data as long as it doesn't duplicate information already in their files, the prices offered are fairly minimal and are little more than a last resort to wring at least a few credits from the journey.

Selling the Data - Explorers returning from freelance expeditions must first find potential buyers for their data. Governments are chiefly interested in habitable worlds for future colonization, while corporations prize exploitable resources. Unsavory or desperate explorers might even find buyers in the underworld, although crime figures are mostly interested in rarities such as exotic drugs or protected alien antiquities. All Progenitor ruins and artifacts are automatically U.W. property, but the finder's fee offered by the U.W. pales in comparison to the black market value of such finds.

Further research on the survey data may be required to enable the explorers to accurately judge its worth. The value of a newly discovered mineral deposit, for example, depends heavily on the supply and demand of the ore back in the federation.

Once a potential buyer has been identified, negotiations begin. The explorers may offer an overview of the data, sometimes in exchange for a token fee, so the prospective client can form his own opinion of its value. Bargaining can take some time, but it is in the best interests of the explorers to conclude talks quickly before another crew stumbles on their discovery.

Most buyers demand exclusivity, so an explorer can typically sell a particular set of data only once. During negotiations, though, the seller may hint that they have received offers from other parties, or may even open the negotiations to direct bidding between companies for the most valuable goods.

Depending on their individual needs, some buyers may be interested in all the data brought back by an expedition while others will only desire specific classes of information. A pharmaceutical manufacturer most likely will not be very interested in a mineralogy report even though it would pay top dollar for samples of a plant with a paralyzing toxin, possibly useful as an anaesthetic, from the same planet.

▼ **COLONIZATION** - Explorers may be the first to set foot on previously unknown planets, but colonists turn them into new homes for humanity. Each sunrise brings new challenges to these hardy world-tamers, in the form of dangerous native life, unfamiliar weather patterns, alien ecosystems, and other enigmas.

Colonists labor beneath alien skies to grow crops, raise livestock, and wrest ores from the ground just to provide the basics of life. They also face the task of establishing industries, communities, and governments - in fact, whole new societies.

Deprived of easy access to technology taken for granted by other United Worlds citizens, colonists fall back on old standbys. Horses, not hovercars, provide transportation. Radios replace holocasters, while more shotguns hang over fireplaces than do high-tech laser rifles.

Hardships are plentiful for colonists, but so are rewards. The untouched resources of an entire world are at their fingertips. Early colonists can claim the best farmland and richest ore deposits. They name the mountain peaks, rivers, continents, and cities of their new home. Pioneer colonists lay the groundwork for the government, economy, and society of a future independent state of the United Worlds. There are many good reasons why most of the wealthiest and most influential families on individual U.W. worlds trace their roots back to early colonists.

Prospective financial and social advantages aside, people often become colonists for intangible reasons. Some thirst for the challenge of taming a virgin world. Others desire to put their own stamp on a new society. And no few colonists seek a simpler lifestyle free of the encumbrances of interstellar civilization.

Hardy and self-reliant, colonists must be resourceful to survive. They must be willing to work hard, but it takes more than muscle to settle a new world. Establishing a pioneer colony requires experts in just about every field of knowledge, from agronomists to devise soil treatments enabling farming to educators to organize a school system.

Above all, colonists must blend an independent spirit with a sense of shared purpose, enabling them to cooperate in the face of endless adversity to bring their dream of a new homeworld into reality.

After a time, some find the colonial life too harsh and decide to return to their homeworlds. This can be an expensive proposition, as (depending on the terms of their contract with the colony's sponsors) they may have to pay back an initial signing bonus from their sponsor, reimburse it for expenses, and then buy their own tickets home.

Charters, Licenses, and Sponsors - The U.W. Colonial Affairs Ministry has complete authority over colonization efforts by federation citizens. United Worlds law prohibits settlement of any previously uninhabited world without a charter from the ministry.

Once explorers have identified a planet ripe for colonization, prospective settlers must obtain a charter from the Ministry of Colonial Affairs and, often, find a sponsor to cover the costs of taming a new world.

No legal colonization effort can proceed without a charter. Along with giving colonists legal authorization to settle the world, a charter sets forth the terms and conditions under which the pioneer colony will operate. In essence, a charter outlines the rights and responsibilities of every party to the colonization effort. Some of these conditions, such as those concerning formation of a government, are standard, while others are customized for the particular planet in question. A large portion of each charter deals with exploitation of resources and protection of the natural environment, ensuring that settlers do not despoil their new home.

Fires of Heaven^{v1.0}

The ministry has the discretion to grant multiple charters for the same world, typically for different continents or land masses. Each colony functions as a somewhat autonomous state, cooperating with other colonies on matters or decisions affecting the world as a whole. Such cooperation is delineated in the charters granted to individual colonies, and ministry administrators deal quickly with friction between planet-sharing colonies. Every charter also details how new waves of settlers will be integrated into the colony.

Settling a world is an expensive proposition. The cost of buying or hiring a colony ship to convey the first settlers to the world is only the beginning. Computers, armaments, power plants, construction equipment, livestock embryos, seeds, and a multitude of other gear must be supplied. In most cases, even food must be imported until the first crops are harvested.

The colonization effort often doesn't end with the arrival of the first ship. New waves of colonists can be shuttled to the planet in the months and years to come. Decades of resupply may be required until the colony builds an industrial base sufficient to make it economically self-sufficient.

Most colonization efforts involve one or more sponsors, who agree to underwrite the cost of establishing the colony. Financial institutions, corporations, governments, and private societies (from religious and ethnic groups to political factions and organizations promoting societal ideals) are all potential sponsors. The exact terms of each sponsorship pact vary, but generally the new colony repays the sponsor through a schedule of regular payments, a share of trade proceeds for a period of years, or rights to exploit resources on the world.

Along with colonization charters, the Colonial Affairs Ministry issues licenses giving corporations or other enterprises the right to exploit resources on a world, typically a barren moon or hostile planet deemed incapable of sustaining a colony. Licenses are issued to commercial interests rather than colonists. Licenses and charters are never granted for the same planet, although multiple licenses could be issued for a single world.

License holders have great discretion and authority over activities on a world. For example, a company could insist that only employees or authorized personnel be allowed on the planet. Policies are set by company officials, not the inhabitants. But licenses impose greater limitations on the exploitation of the planet, specifying what resources can be removed, what portions of the world are open to development and so forth. Most licenses also involve a regular fee or portion of the proceeds to be paid to the federation government. Licenses have set expiration dates, typically 50 or 100 years.

The federal presence on licensed outposts is generally limited to a ministry bureaucrat acting in an advisory role and a handful of U.W. Security Force marshals to enforce federation laws.

Squatters - Unable or unwilling to obtain a colony charter from the Ministry of Colonial Affairs, some would-be pioneer colonists establish illegal settlements on frontier worlds. A few build hidden communities far from legal colonies on already-settled worlds, but the inevitability of eventual discovery by the charter-holders makes this an unpalatable course of action for those seeking a long-term home.

Most instead seek a new, uncharted world beyond the boundaries of United Worlds space. Relying on smugglers for trade, these squatter colonies hope to become strong enough to meet the federation on their own terms as the human government slowly expands its authority outward.

Squatter colonies are typically founded by people seeking to escape the strict laws governing United Worlds colony worlds. Some are interested in perpetuating a particular religious sect, theory of government, or other concept at odds with federation law. For example, a fringe religion in which women are considered second-class citizens may chafe at the equality clauses of the United Worlds Charter, or a band of escaped clone slaves may desire to establish a society in which cloning is the only legal form of reproduction.

Smuggler caches and pirate bases are also technically squatter colonies. Some are also found beyond the edge of United Worlds space, but most underworld starfarers prefer to trade security for easier access by building bases in isolated regions of populated star systems.

Planefall - A colony ship most often spends several weeks in orbit around the world to be settled while sensor sweeps and planetary probes confirm data gathered by earlier explorers. Leaders of the colonization effort take this time to finalize plans, pick landing sites, and make other preparations to set down on the planet. Small expeditions are often dispatched to further examine the planet and inspect potential settlement sites.

Colonists favor islands, peninsulas, or other restricted locales for initial settlements. Ecosystems are usually less complex and defenses easier to arrange on a limited landmass, hopefully giving pioneers some time to learn more about their new home before spreading to environments of greater complexity and danger.

Life on a Colony World - The economics of a pioneer settlement are fairly simple. Big-ticket (and usually irreplaceable) items, such as shuttles or power plants, are often community property owned by the colony as a whole. A communal spirit prevails, with everyone pitching in to make the colonization effort a success. Any commerce between individual colonists that occurs typically takes the form of barter for goods or services. Actual supplies of U.W. credits are fairly scarce, though visitors who have them will be welcomed, as they are universally useful for purchases of goods that cannot be bartered for. Colony sponsors finance imports of food, fertilizers, technology, and other necessities.

Farming and mining underpin the economy of most young colonies, producing raw materials for export. Business ventures begin to arrive, establishing stores and industries as the colony expands. Eventually, the colony achieves economic self-sufficiency, repaying debts to its sponsors and balancing imports against exports to provide for its needs.

Dr. Amala Saleh - A top-rated surgeon, Dr. Amala Saleh has left the bustling core worlds behind for life as a frontier doctor on Osiris.

DATA DUMP



Born on Asgard, Saleh won a scholarship to medical school on Earth by dint of her hard work and academic excellence. Saleh had a relationship with fellow student Grace Chen while in college, but it ended when Chen followed her dream of signing on with a starship exploring the far frontier.

Saleh swallowed her regret and continued to distinguish herself. After graduating at the top of her class, Saleh won a prized internship at the famed Angel of Mercy High Orbital Medical Station. Widely considered the finest medical institution in the United Worlds, Eden's Angel Station offered Saleh unparalleled experience in solving medical mysteries from throughout the federation. In time, she completed her residency and accepted a staff position there.

As time passed, Saleh found herself thinking of her patients less as people than as medical problems or surgical challenges. A desire to get back to the heart of practicing medicine, coupled with a longing to set down roots, led her to sign on as the chief physician for an expedition colonizing Osiris in Delta Pavonis system.

On Osiris, a chance encounter with Chen, now science officer aboard the *Viking*, rekindled their romance and the couple married. Chen agreed to try life on Osiris, but when *Viking* returned from its latest expedition having lost its captain, investors offered the post to Chen. After many tearful arguments, she took the job and left on a dangerous new expedition.

Saleh and Chen have separated while they consider their future together - both caring deeply for one another, but seemingly unable to let go of dreams taking them in different directions.

Saleh, 40, has calm brown eyes and long black hair. Her dark complexion revealing her Arabic heritage, she has a full build and stands 170cm tall.

Female Captain's Monthly: Profiles in Independence - reference yc670521.275341.441281 -.05Cr

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Exploration - Exploration of a virgin world does not end when colonists touch down. Explorers among the settlers fan out to broaden knowledge of their new home. Some seek ore deposits or other raw resources, while others catalogue native lifeforms to identify useful species - not to mention potential threats. Additional orbital surveys can be performed under contract from the colony, often leading to the granting of mining licenses that tip the colony's balance of trade.

A planet can hold a lot of secrets. Colonial explorers strive to unlock at least the crucial ones before they can endanger the colony. As the colony grows, explorers are still needed to prospect for exploitable resources, pick sites for new settlements, and continue solving the mysteries of an alien world.

Government - An administrator from the Ministry of Colonial Affairs accompanies settlers on the journey to their new home and serves as the head of the newly established colony, with total authority over all decisions and actions involving the colony.

Administrators are carefully chosen for their diplomatic skills and ability to cooperate with colonists, reducing heavy-handed interference in day-to-day affairs or other potential sources of friction to a minimum.

Most administrators prefer to function in an advisory role to leaders elected from among the colonists, while reserving final authority over their decisions. Disputes can be appealed to the ministry, or even to the U.W. Assembly. The ministry has at times replaced colony administrators at the request of colonists. The ministry prefers to assign a single administrator to guide a colony to independence over a decades-long period. Obviously, most administrators fill only one such post in their careers, and many retire to live out the remainder of their lives on their newly independent world. Some retired administrators have been so popular that they have been elected the leaders of the former colonies.

As the colony expands, more personnel are dispatched to assist the administrator, experts who spend a few years at a particular colony handling a specific task, such as assisting colonists in drafting a constitution or establishing trade policies. Long-term positions in the administrator's office are usually filled by colonists, further integrating it into the daily life of the colony and preparing colony members to administer an independent government.

Colonial Law - All colonies fall under federal jurisdiction and adhere to federal laws. Laws governing colony worlds grant the administrator a great deal of discretion, particularly on arms permits and regulations on carrying weapons, so that rules can be tailored to fit the needs of each world by people on the scene, not bureaucrats and legislators light-years away.

Marshals of the United Worlds Security Force enforce the law on colony worlds, supplemented by planetary police agencies as a world moves closer to independence.

"We threw an electrified fence up around the settlement, just as a precaution. First night, the alarms go off; something shorted the fence out. Every night for six nights, the same thing happened. Finally, we figured out that the electricity attracted some slime worms that fed on the voltage. They were causing the short circuits. Weird."

- Tilda Heiselman, security expert, 2235CE

Security and Defenses - The dangers of a colony world are many and often unforeseen, making security experts (often ex-military personnel) a vital element of every colonial expedition.

The unique nature and threats of each world require a customized response. Electrified fences are of little use against predators that fly or tunnel to seize prey. Native animals harmless most of the year may go into frenzy during a particular season. Carnivorous plants may be waiting to entrap the unwary. Or colonists could accidentally upset a delicate natural balance keeping dangerous native lifeforms in check, putting the entire settlement at risk.

Security personnel are also concerned with outside threats. The isolation and paucity of law enforcement authorities may attract smugglers, pirates, or other underworld figures. Alone on the rim of federation space, the world could fall prey to an incursion by the Vorn or even an as-yet unknown race of hostile aliens.

The Path to Independence - All colonists look forward to the day when their new home becomes an independent state of the United Worlds. The world government takes authority for all internal affairs, and citizens gain voting representation in the federation Assembly.

Practical advantages aside, independence also validates the success of the former colony in the eyes of other worlds, vindicating the hardships and sacrifices endured by pioneer settlers. Many autonomous worlds commemorate acceptance into the federation with annual festivities of some kind.

The Ministry of Colonial Affairs guides colonies toward independence, helping settlers establish the basics of governments, codes of laws, justice systems, and other fundamentals. Over a period of years, ministry officials fade into the background as local institutions take greater responsibility for colony affairs.

The colony also strives for economic self-sufficiency. Sponsors, if any, must be repaid. Trade ties with other worlds are critical, allowing the colony to balance the cost of necessary imports against profits from exports. A colony cannot claim it is an independent state if it cannot support itself (and be able to pay the taxes required of U.W. member worlds).

A mature colony ripe for independence is virtually indistinguishable from a newly independent world for most intents and purposes.

Eventually, the colony applies to the United Worlds Assembly for admission as an independent state. Based on a detailed report prepared by the Ministry of Colonial Affairs, the assembly votes to accept or deny the request.

The process from colonial planetfall to full U.W. membership takes from twenty to thirty years in most cases, depending chiefly on the time needed to achieve economic self-sufficiency. Even the lushest of worlds seldom takes less than twenty years, but worlds of marginal habitability or with poor mineral resources may take fifty years or more.

▼ **LOST COLONIES** - Over the past century, a handful of colony ships bound for distant suns have simply vanished. Most are believed to have been lost in misjumps, particularly those that disappeared in the early days of U.W. expansion when jump drives were far less reliable and astrogation did not have the advantage of quantum computers and D'eira astrogators.

Some scientists have raised the possibility that some of these vessels may have survived but emerged far from known space. Lost in uncharted space the settlers could have searched out a habitable world and founded a lonely outpost of humanity deep in the cosmos. Deep space radio telescopes monitor normal ship frequencies in addition to their normal research. Since no signals from such a displaced ship have ever been received in the past century, it means that if a colony ship did survive a mis-jump, it ended up over a hundred light years away.

The most famous of the missing colony ships, the slower-than-light *UWS Conestoga*, has been the subject of almost as many holovid productions as the successful *UWS Argo*, with equal numbers fabricating whole-cloth a triumphant landfall on an uncharted paradise as posit the utter destruction of the ship or the slow, agonizing death of its crew.

Other possibilities raised for disappeared colony ships include:

Coup d'etat: An extreme faction among the colonists hijacks the ship, going instead into uncharted space or a pre-scouted uninhabited world and setting up a squatter colony, presumably with themselves in charge. This claim was made in *Witt-Lloyds vs. Beecham Enterprises*, regarding the disappearance and subsequent insurance claims made by the owners of the *Kalamar*. The plaintiff was unable to provide sufficient evidence that the defendant knew a religious minority among the colonists planned to disrupt the proposed multi-faith government of the new colony. Judgement was that defendant had exercised good faith in its background checks of the crew and passengers, and was not culpable for their actions.

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Fraud: The isolated but still-notorious case of the FBN Exploration Ltd. is the main reason for many of the current safeguards and regulations regarding exploration and colonization. FBN manufactured a completely fictitious survey of an unexplored star system, then sold the data, chartered a colony ship and sold passage to prospective colonists.

After the colony ship *Hart's Hope* failed to return, U.W. officials found that FBN had also vanished, its personnel and assets nowhere to be found. A full (if belated) analysis of the FBN "exploration" data showed that the astrogation data supplied would have placed any incoming starship in the heart of that system's primary. Despite the case being a century old, arrest warrants for five hundred and seventeen cases of first degree murder are still on the books, and it is still considered an "open case".

Piracy: Colonization efforts are usually widely publicized affairs, and a colony ship is a big, slow pot of gold just waiting to be picked up and carted off. A few well-equipped pirates could steal an entire ship and its cargo, and simply dispose of the passengers to prevent there being any witnesses to the deed. Such an audacious and heinous act of piracy has never been documented, but the post-FBN policy of sending a pair of U.W. warships ahead to provide escort and confirmation makes it unlikely that it can happen at the present time.

What *has* happened in the past is that a new colony finds that a well-armed pirate and a cargo ship land at the colony shortly after it is set up, and steal at gunpoint all the easily portable wealth, like fusion reactors, construction equipment, cargo shuttles and the like. In the post-Vorn years, colonies and colonial backers insist on sufficient ground defenses to break the teeth of anything but the most powerful raiders, and may even pay for a surplus StarForces hull, refitted for economical orbital interdiction duty.



STARSHIPS

"We set down on Osiris out in Delta Pavonis with a load of agro equipment. No orbital starport, just a dinky landing strip near the colony. Well, the drive broke down and we couldn't lift off! They had no spares, of course. We spent three months there waiting for another freighter to bring a replacement part. Hottest, dustiest place I've ever been. I'm still finding sand in my clothes, bedsheets, everywhere."

- Dewapaladewa Simbolon, helmsman,
2236CE

▼ **INTERSTELLAR TRAVEL** - With a setting spanning over a dozen inhabited stellar systems, transport across the light-years is as important to a **Fires of Heaven** adventurer as an airplane would be to an inhabitant of the 20th century. Even if you don't own one, you need one to get where you're going. The two most common ways for a 23rd-century adventurer to travel to the stars (aside from joining the StarForces and being shipped to wherever superiors think you should go) are by booking passage on a commercial ship or by using your own personal starship.

And just like most rpgs with a 20th or 21st century setting will have airplanes, it is not a regular occurrence for adventurers to be in dogfights. Even with the more heroic nature of adventures in **Fires of Heaven**, regular starship combats *will get you killed*.

Read that last line again. *Starship combats get adventurers killed.*

So, this chapter is really a separate game unto itself, a way to design, build and blow up starships in the **Fires of Heaven** universe, *but not necessarily ships that the adventurers are on*. If pirates attack the frontier colony where an adventure is taking place, let the players run the defending system's ships. How the combat turns out will certainly have ramifications for the adventure, even if adventurers are not on the ships doing the fighting. Grab whatever detail you need from this chapter as you need it for role-playing purposes, but remember that this chapter is really just a ninety page rulebook for a starship combat board game, a rulebook that just happens to have some role-playing elements in it.

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▼ **ACQUIRING A STARSHIP** - Starships are extremely expensive in terms of an adventurer's likely assets. An average pod freighter, purchased new, runs 6 million credits. Even a rattletrap cargo-hauler filled with obsolete systems costs several million credits.

Clearly, only the wealthiest individuals or corporations can afford to buy starships outright. Some individuals may inherit starships from parents, mentors or family friends, or even receive them as gifts, but most are not so lucky. Adventurers may also pool assets to get the money needed (see [page 5.24](#)). Fortunately, other options exist.

Government Subsidies - The United Worlds or independent worlds sometimes subsidize starship purchases to encourage a particular type of business operation, repay debts, or fulfill other governmental goals. For example, a core world seeking to become a hub of interstellar commerce might offer subsidies to purchasers of new freighters who agree to make the world their home port. Subsidies, however, are often viewed as unfair interference in the free market. Another type of government subsidy is a long-term government hauling contract. A new colony might buy partial ownership in a ship, which gives them a certain share in where the ship goes and the cargoes hauled. Obviously, they would be looking for commodities needed by the not yet self-sufficient colony. Some fraction of the trips made by the ship must be for the colony, and the colony has approval (and veto) power on all other trips. Having a planetary "cargo manager" as an extra on the crew could make things both difficult and interesting for the adventurers.

Investors - Venture capitalists, relatives, underworld crimelords or corporations might be willing to put up the cash for a starship in exchange for a share of the expected profits. Obviously, this route mostly applies to starships purchased as business ventures.

Loans - The most common alternative, a loan covering the price of the vessel, involves regular payments (including interest) to a financial institution of some sort. The borrower must have a clean credit history, not to mention some way of convincing the lender that they can be successful in business. Defaulting on payments can result in confiscation of the vessel and other assets.

A 30-year-loan for a top-of-the-line small pod freighter (500 tons) could require *monthly* payments of 50,000 to 75,000 Credits. A moderately sized, well-worn tramp freighter with an old-fashioned spin hull and minimal equipment, purchased used, might have *monthly* payments of 25,000 to 35,000 Credits, plus maintenance costs of a few thousand more per month, plus the salaries of the crew for perhaps another few thousand per crew member per month. It adds up quick. A monthly upkeep in permits, maintenance, salaries and fuel can easily top 100,000 Credits per month.

Individuals unable to acquire funding from a legitimate source may turn to underworld loan sharks, although the ruinous interest charged on such transactions and the consequences of default make them a dubious alternative. Monthly payments to a loan shark would typically run higher than those of qualified financial institutions.

Payment - A starship could be the payment for an exceptionally costly or dangerous job. Given the high prices of most starships, the task would have to be so perilous that no one would accept it without such an enormous reward. The ship could be part of the initial equipment provided by the mission sponsor, with the condition that the party may elect to keep the vessel (or what is left of it) upon successful completion of the job as their payment.

Salvage - The vastness of space guarantees that some lost or crashed starships cannot be found for recovery - assuming there was even anyone around to look for them. Individuals looking for a cheap way to get a ship might go the salvage route, seeking a derelict or wrecked vessel to claim.

Obviously, most starships acquired through salvage are going to require repairs, possibly substantial ones. Depending on just how long the ship has been lost, even the functioning equipment may be sorely outdated. Even so, the cost of restoring a salvaged ship may still be considerably less than buying one outright. Many ships good for nothing else are used as floating outposts, soft landed on an asteroid, or simply orbiting somewhere as a pressure-tight supply dump or platform to mount equipment on. Think of the space equivalent of an old school bus parked in the back yard as a storage building.

Theft - Someone in desperate need of a starship could steal one, either violently or through fraud. Of course, stealing a starship involves a lot more than just taking physical possession of the ship if the thieves wish to hang onto their prize. Transponders must be altered, fraudulent registration papers obtained, and so forth, and no matter how many precautions are taken, there is always the risk of being caught by law enforcement authorities or the outraged former owners of the starship someday.

A stolen ship is most likely to become a pirate vessel, a supply ship for a squatter colony or sent out to the frontier and broken down into parts for people who don't ask too many questions.

Chartering - If a traveler is going to a destination off the usual trade routes, they can hire a starship for the duration of his task. To charter a starship, crew salaries, maintenance, fuel, and profit must all be taken into account. Assume that the persons chartering the trip need to pay a padded amount on all upkeep (ship's size level in Credits per month). Add to this about 4,000 Credits per month *per* crew-person (what the owner charges, not necessarily what the crew is paid) to arrive at the starting point for negotiations on chartering a ship.

EXAMPLE: An early ship in the sample listing is a size 5 survey ship. If it had a crew of ten (which includes five research personnel), then negotiations to charter it *start* at (money level of 5, which is 5,600 Credits), plus (ten crew times 4,000 Credits), equals 45,600 Credits *per month*. If there is competition, the price may go down. If it is especially dangerous, the cost *will* go up, and then there are negotiations about expensive equipment like survey drones, etc.

Consumables like fuel are *in addition* to the chartering rates, and are usually billed at cost, with an advanced deposit based on reasonable estimates of fuel consumption for the trip.

Licensing and Registration - Starships must be registered with a branch of the U.W. Ministry of Commerce. The names of the owner(s) and captain must be provided, as well as proof of legal ownership. Annual registration fees are based on the cost of the ship and are assessed at 0.05% of its value (1 Credit per 2,000 Credits of value, or 500 Credits per 1,000,000 Credits of value). Value is assessed by a fairly standard formula based on average value of given components, and assessed value may be at odds with purchase price on occasion.

The chief operator of each starship (as well as many of its officers, such as astrogators and engineers) must be licensed by the federation as well. Acquisition of a starship license requires the applicant to pass a test on legal and technical information related to operating a starship. The test normally takes two days and can be taken at any Alpha- or Beta-class starport. The exam costs 500 Credits, and yearly renewals (no test required) are 250 Credits.

▼ **Note!** - This test normally is a Hard(11) task for the skill in question. The test is given twice a year, so anyone who fails has to wait another six months before they can try again at that starport. Most starports coordinate testing schedules, so if you are willing to travel, there is probably a licensing test each month somewhere.

Some captains choose to fly unlicensed, but not only does this risk fines if they are caught or lawsuits if anything goes wrong that can be attributed to unlicensed officers, it also restricts the types of clients who will hire them. It is almost impossible to do regular business between major starports unless all your papers are in order. A competent crew member can lose their licensing on a temporary or even permanent basis for misconduct. For instance, doing astrogation calculations while intoxicated, the negligent death of a passenger and so on. Losing your means of livelihood for several months can be a serious blow and some simply take the risk and fly between worlds where they don't check these things as much.

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Civilian ships - Civilian hulls are a matter of public record. Anyone can find such a ship's hull plans and capabilities in the appropriate database. Included in this is government oversight; ship registration, logging them into databases when they dock, safety inspections, and so forth.

Civilian hulls are almost universally built for long-term profitable use. Engines are not overly powerful or fuel-hogging, and armor is the minimum required for safe operation. Exploration vessels may be an exception, but even most of these are simply refitted military hulls. The main difference between a military hull and a civilian one is the quality of the bridge avionics. The larger bridge of a military vessel can handle more sensor and weapon locks in a given amount of time than the more limited systems common to civilian vessels.

Some civilian ships are actually military hulls put to civilian use. These ships are not as easy to find public details on. They often have bigger weapons and better systems than on civilian hulls, but have the disadvantage that United Worlds law allows these vessels to be pressed into active service if certain emergency conditions are met. If the crew has military training, they may be allowed to man their own vessel, but otherwise a military crew takes over and the original owners and crew are shuffled to other wartime duties until the emergency is over.

The gamemaster can play this card if a particular civilian ship and crew are needed for a specialized or priority mission. This law also allows bumping of civilian cargo for priority military cargoes. Any losses to a ship in either case are supposed to be reimbursed at fair market value, although the credit transfer may seem neither timely nor fair to a person whose ship was damaged or destroyed, or whose cargo missed its delivery date.

▼ **STARPORTS** - Starports are centers of interstellar trade and travel in the United Worlds. As many starships are incapable of planetary landings, most starports are found in orbit around inhabited worlds. Some are little more than debarkation stations, while others are enormous space habitats surrounded by shipyards, factories, refueling stations, and StarForces Navy bases. A starport constantly bustles with activity. Freighters dock to load or off-load cargo, passengers hurry to planet-bound shuttles, customs officers check for illegal imports, starship crews blow off steam in pubs and other establishments, and shopkeepers strive to interest passers-by in their wares. Inherently cosmopolitan, starports are a place to see almost every kind of spacefarer from aliens to pirates to interstellar marshals and other United Worlds personnel.

Starports around independent worlds are sometimes divided by jurisdiction, with the federal government controlling one portion and the planetary government another. Security forces from both jurisdictions are almost always on good terms and routinely work together to keep the peace.

Booking Starship Passage - Many passenger lines exist to serve the needs of interplanetary or interstellar travelers. Those seeking a real bargain, or perhaps trying to avoid official scrutiny, can sometimes strike deals with the countless tramp freighters plying the spacelanes. For information on cargo shipping, see Corporations and Free Traders section (page 6.31).



Frequency of Departures - Passenger liners operate on fixed routes, generally on a schedule based on the distance to be traveled. While interstellar jumps take place instantaneously, two or more jumps are often required on longer journeys to reduce the chance of a misjump. This means longer trips (as the ship must recharge its energy banks between jumps) and greater expense. Those routes are, therefore, traveled less frequently. There is no scheduled service to uninhabited worlds.

Frequency of Scheduled Departures

Departure Port	in-system	Distance		
		<10 ly	10-15 ly	>15 ly
Alpha	hourly	daily	weekly	monthly
Beta	daily	weekly	monthly	?
Gamma	weekly	monthly	?	?
Delta	monthly	?	?	?

? = no scheduled service; charters can be arranged, and other flights leave at unpredictable intervals

EXAMPLE: Low-level exec Karen Hays wishes to book second-class passage on a Polaris-class passenger liner from the Alpha-class starport of Ryujin in the 61 Cygni A system to Nai, orbiting Tau Ceti, for a business trip. The two stars are 15.5 ly apart, so Hays must wait for the next monthly flight.

The Rozhkov Radius of 61 Cygni A (a spectral class K5 star) is 3 AU, and Ryujin orbits at 0.42 AU, for a distance of 2.58 AU that Hays' ship must travel to get to a safe point to engage its Rozhkov Drive. A Polaris-class liner has a cruising acceleration of 0.4 g, and using the "One-Way" travel time chart a time of five days can be estimated for the outward bound trip. The "Speed Accumulated Per Hour" chart can be used to calculate that the ship will be traveling at around 1,700 km/second (.006c) when it reaches 61 Cygni A's Rozhkov Radius.

The Rozhkov Radius of Tau Ceti (spectral class G8) is 5 AU, a difference of 4.27 AU that the ship must travel to get from the point it emerged after its jump to the orbit of Nai. The ship will emerge from jump at zero velocity relative to Tau Ceti, and so will have to begin accelerating once again. But this time, since the ship doesn't want to pass Nai moving at an astronomical speed, the "Destination" travel time chart is used to determine how long it takes to travel this distance with both an acceleration and a deceleration leg. That would be a little more than nine days, plus maybe one day for maneuvering and docking in Nai orbit.

Totaling the travel times, the trip will take about 15 days. Second-class accommodations to Tau Ceti will cost Hays 500 Credits per day, or about 7,500 Credits one way or 15,000 Credits round-trip. If this was a well-travelled route, the price could lower.

Port Fees - Starports charge all ships using their facilities a standard port fee, sometimes called a docking fee. This fee, billed in addition to any refueling, repair, or resupply costs, helps cover upkeep, employee salaries, and other operating expenses. Fees listed are on a per 1,000 ton basis, rounding up. If a person or business has their own offices or space on the starport, they can use their own facilities at no charge. A token 50 Credit fee is usually charged as an arrival or departure tax, which covers the equipment and salaries of space traffic controllers. This fee usually does not apply to small vessels like space taxis or work pods.

Port fees vary depending on the sophistication of the facilities. Ships docked to the starport pay the base fee. Starships due for an extended stay often take up a nearby orbit for half the standard fee. Most starports operate regular shuttle services to outlying vessels. Ships registered at a particular port (for which the port gets part of the yearly assessed value), usually pay half the listed rates.

Starport Class	Daily Fee per 1000 tons
Alpha	200Cr
Beta	150Cr
Gamma	100Cr
Delta	50Cr

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Travel Times - Space is *big*, but with the highly efficient engines available, the time it takes to get somewhere is usually not all that long. The times and distances on the following chart are listed in two formats.

"One-way" means minimal travel time without slowing down to dock at the end of the trip. This is usually about right for ships accelerating out to a Rozkhov Radius. You can add a small amount for ships powered by ion drives, since these usually accelerate up to a reasonable speed, and then use the reactors that would have powered the ion drive to charge the Rozkhov Drive accumulators, timing it so the jump is shortly after the ship reaches minimum safe jump distance.

"Destination" means accelerating to the midpoint of the trip, then decelerating the rest of the way. "RR" is Rozkhov Radius, the minimum distance away from that body's gravity well necessary for a safe interstellar jump.

One-Way Travel Times (non-stop acceleration)	Ship's Acceleration									
	0.1 g	0.2 g	0.5 g	1 g	2 g	3 g	4 g	5 g	6 g	12 g
Distance										
.0025AU (Earth to Luna)	7.6 hrs	5.4 hrs	3.4 hrs	2.4 hrs	1.7 hrs	1.4 hrs	1.2 hrs	1.1 hrs	1 hr	0.7 hrs
.1AU	48.1 hrs	34 hrs	21.5 hrs	15.2 hrs	10.8 hrs	8.8 hrs	7.6 hrs	6.8 hrs	6.2 hrs	4.4 hrs
.2AU	2.8 days	48.1 hrs	30.4 hrs	21.5 hrs	15.2 hrs	12.4 hrs	10.8 hrs	9.6 hrs	8.8 hrs	6.2 hrs
.3AU	3.5 days	2.5 days	37.3 hrs	26.4 hrs	18.6 hrs	15.2 hrs	13.2 hrs	11.8 hrs	10.8 hrs	7.6 hrs
.4AU	4 days	2.8 days	43 hrs	30.4 hrs	21.5 hrs	17.6 hrs	15.2 hrs	13.6 hrs	12.4 hrs	8.8 hrs
.5AU	4.5 days	3.2 days	48.1 hrs	34 hrs	24.1 hrs	19.6 hrs	17 hrs	15.2 hrs	13.9 hrs	9.8 hrs
.6AU	4.9 days	3.5 days	2.2 days	37.3 hrs	26.4 hrs	21.5 hrs	18.6 hrs	16.7 hrs	15.2 hrs	10.8 hrs
.7AU	5.3 days	3.8 days	2.4 days	40.3 hrs	28.5 hrs	23.2 hrs	20.1 hrs	18 hrs	16.4 hrs	11.6 hrs
.8AU	5.7 days	4 days	2.5 days	43 hrs	30.4 hrs	24.9 hrs	21.5 hrs	19.3 hrs	17.6 hrs	12.4 hrs
.9AU	6 days	4.3 days	2.7 days	45.6 hrs	32.3 hrs	26.4 hrs	22.8 hrs	20.4 hrs	18.6 hrs	13.2 hrs
1AU (Earth orbit; RR of class-M star)	6.3 days	4.5 days	2.8 days	48.1 hrs	34 hrs	27.8 hrs	24.1 hrs	21.5 hrs	19.6 hrs	13.9 hrs
2AU	9 days	6.3 days	4 days	2.8 days	48.1 hrs	39.3 hrs	34 hrs	30.4 hrs	27.8 hrs	19.6 hrs
3AU (RR of class-K star)	11 days	7.8 days	4.9 days	3.5 days	2.5 days	48.1 hrs	41.7 hrs	37.3 hrs	34 hrs	24.1 hrs
4AU	12.7 days	9 days	5.7 days	4 days	2.8 days	2.3 days	48.1 hrs	43 hrs	39.3 hrs	27.8 hrs
5AU (RR of class-G star)	14.2 days	10 days	6.3 days	4.5 days	3.2 days	2.6 days	2.2 days	48.1 hrs	43.9 hrs	31.1 hrs
6 AU	15.5 days	11 days	7 days	4.9 days	3.5 days	2.8 days	2.5 days	2.2 days	48.1 hrs	34 hrs
7 AU	16.8 days	11.9 days	7.5 days	5.3 days	3.8 days	3.1 days	63.7	2.4 days	2.2 days	36.8 hrs
8 AU (RR of class-F star)	18 days	12.7 days	8 days	5.7 days	4 days	3.3 days	2.8 days	2.5 days	2.3 days	39.3 hrs
9 AU	19 days	13.5 days	8.5 days	6 days	4.3 days	3.5 days	3 days	2.7 days	2.5 days	41.7 hrs
10AU	20 days	14.2 days	9 days	6.3 days	4.5 days	3.7 days	3.2 days	2.8 days	2.6 days	43.9 hrs
11AU (RR of class-A star)	21 days	14.9 days	9.4 days	6.7 days	4.7 days	3.8 days	3.3 days	3 days	2.7 days	46.1 hrs
Speed accumulated/hour	3.6km/sec	7.2km/sec	18km/sec	36km/sec	72km/sec	108km/sec	144km/sec	180km/sec	215km/sec	430km/sec

Destination Travel Times (including deceleration to zero velocity)	Ship's Acceleration									
	0.1 g	0.2 g	0.5 g	1 g	2 g	3 g	4 g	5 g	6 g	12 g
Distance										
.0025 AU (Earth to Luna)	10.8 hrs	7.6 hrs	4.8 hrs	3.4 hrs	2.4 hrs	1.96 hrs	1.7 hrs	1.5 hrs	1.39 hrs	0.98 hrs
.1AU	2.8 days	48.1 hrs	30.4 hrs	21.5 hrs	15.2 hrs	12.4 hrs	10.8 hrs	9.6 hrs	8.8 hrs	6.2 hrs
.2AU	4 days	2.8 days	43 hrs	30.4 hrs	21.5 hrs	17.6 hrs	15.2 hrs	13.6 hrs	12.4 hrs	8.8 hrs
.3AU	4.9 days	3.5 days	2.2 days	37.3 hrs	26.4 hrs	21.5 hrs	18.6 hrs	16.7 hrs	15.2 hrs	10.8 hrs
.4AU	5.7 days	4 days	2.5 days	43 hrs	30.4 hrs	24.9 hrs	21.5 hrs	19.3 hrs	17.6 hrs	12.4 hrs
.5AU	6.3 days	4.5 days	2.8 days	48.1 hrs	34 hrs	27.8 hrs	24.1 hrs	21.5 hrs	19.6 hrs	13.9 hrs
.6AU	7 days	4.9 days	3.1 days	2.2 days	37.3 hrs	30.4 hrs	26.4 hrs	23.6 hrs	21.5 hrs	15.2 hrs
.7AU	7.5 days	5.3 days	3.4 days	2.4 days	40.3 hrs	32.9 hrs	28.5 hrs	25.5 hrs	23.2 hrs	16.4 hrs
.8AU	8 days	5.7 days	3.6 days	2.5 days	43 hrs	35.1 hrs	30.4 hrs	27.2 hrs	24.9 hrs	17.6 hrs
.9AU	8.5 days	6 days	3.8 days	2.7 days	45.6 hrs	37.3 hrs	32.3 hrs	28.9 hrs	26.4 hrs	18.6 hrs
1AU (Earth orbit; RR of class-M star)	9 days	6.3 days	4 days	2.8 days	48.1 hrs	39.3 hrs	34 hrs	30.4 hrs	27.8 hrs	19.6 hrs
2AU	12.7 days	9 days	5.7 days	4 days	2.8 days	2.3 days	48.1 hrs	43 hrs	39.3 hrs	27.8 hrs
3AU (RR of class-K star)	15.5 days	11 days	7 days	4.9 days	3.5 days	2.8 days	2.5 days	2.2 days	48.1 hrs	34 hrs
4AU	18 days	12.7 days	8 days	5.7 days	4 days	3.3 days	2.8 days	2.5 days	2.3 days	39.3 hrs
5AU (RR of class-G star)	20 days	14.2 days	9 days	6.3 days	4.5 days	3.7 days	3.2 days	2.8 days	2.6 days	43.9 hrs
6AU	22 days	15.5 days	9.8 days	7 days	4.9 days	4 days	3.5 days	3.1 days	2.8 days	48.1 hrs
7AU	23.7 days	16.8 days	10.6 days	7.5 days	5.3 days	4.3 days	3.8 days	3.4 days	3.1 days	2.2 days
8AU (RR of class-F star)	25.4 days	18 days	11.3 days	8 days	5.7 days	4.6 days	4 days	3.6 days	3.3 days	2.3 days
9AU	26.9 days	19 days	12 days	8.5 days	6 days	4.9 days	4.3 days	3.8 days	3.5 days	2.5 days
10AU	28.4 days	20 days	12.7 days	9 days	6.3 days	5.2 days	4.5 days	4 days	3.7 days	2.6 days
11AU (RR of class-A star)	29.7 days	21 days	13.3 days	9.4 days	6.7 days	5.4 days	4.7 days	4.2 days	3.8 days	2.7 days

EABA

The "speed accumulated" can be used to calculate how fast a starship will be going at any particular point in its journey if it doesn't decelerate, whether that's the moment it reaches its destination or when some other ship crosses its path.

EXAMPLE: On a short-haul 1g intercept from Earth to intruders in lunar orbit, the intercepting ship will build up to a speed of 86.4km/sec upon arrival (2.4 hours times 36km/sec), which is fine if it plans to simply launch missiles in a hit-and-run fly-by, but which will only allow it a single starship turn to inspect the interlopers if it doesn't slow down.

All travel times assume that engines are running more or less the whole time; a ship can coast for part of the trip, using less fuel and taking longer to arrive. A ship can also fly at less than its rated maximum thrust to conserve fuel; times are increased accordingly. For intercept purposes, remember that one hour is ten starship combat turns (a standard **EABA** time level of 17 per turn).

The Rozhkov Radius of a gas giant ranges from 0.0025 to 0.005 AU, while that of a terrestrial world is 0.00002 AU (3,000 km) or less.

REALITY CHECK - Using the travel time chart to calculate the time it takes to get a safe distance from a star before engaging the Rozhkov drive is easy; subtract the distance of the starting point (usually a planet) from the Rozhkov Radius of the star to determine the distance to be traversed. But the distance between two planets in a single system is constantly changing, and the numbers listed in the Interstellar Atlas chapter and on the travel time chart don't reflect these changes.

For instance, while a trip to the Rozhkov Radius of Sol (5 AU) from the orbit of Earth (1AU) is a simple 4AU trip (12.7 days at .1g constant acceleration, for example), a trip from Earth to Jupiter (5.2AU) could realistically involve a distance of anywhere from 4.2AU if Earth and Jupiter are both on the same side of the sun, to 6.2 AU if they are on opposite sides of their orbits (from 13 days at .1 g, to almost 16 days, not counting detouring around the sun).

So that the gamemaster won't have to deal with fluctuating planetary positions every time the adventurers want to make an in-system jaunt this detail has been glossed over. Simply make the assumption that any pair of planets are always at closest approach, and subtract one orbit from the other to determine the distance to be travelled.

"Well, one of our laser cannon shots must have hit their engineering section. The pirate ship just drifted along its last heading, so we got out of there before they made repairs. Lucky? Are you crazy? It took eight weeks to fix all the damage to my freighter. Cost me quite a bit, plus the credits I lost by not being out delivering. Lucky, hmph."

- Peyman Shariat, free trader, 2235CE

SHIP REPAIRS - Starports can repair ship systems, and retrofit systems if they have the parts in stock, and they can even manufacture new systems (although not on the same scale as a dedicated shipyard). The base time it takes to repair 1 Hit of damage on a ship is based on its size, and assumes that the repair facility is up to the task, has the parts available and the repair crew to do the work. As long as the starport is at least 2 sizes larger than the ship it is working on, this is assumed to be the case. The table below lists the Hits of a ship and a size that usually matches this number of Hits.

If a starport has to repair multiple ships at the same time, it can be effectively split into multiple smaller repair facilities, with every points of size of the starport effectively doubling its number; thus, a size 15 starport could be counted as two size 14 starports, or four size 13 starports, etc.

Starport	Starport Size(mass)	Repair crew
Alpha	Size ≥14 (≥8 megatons)	≥125
Beta	Size 12 (≈1 megaton)	≈32
Gamma	Size 10 (≈150 kilotons)	≈8
Delta	Size ≤8 (≈20 kilotons)	≈2

Ship Hits(mass)	To repair 1 Hit(level)	Repair crew	Total cost
10(1 ton)	15 minutes(3)	1	10Cr
12(2 ton)	30 minutes(5)	2	30Cr
14(4 ton)	1 hour(7)	3	90Cr
16(8 ton)	2 hours(9)	4	250Cr
18(16 ton)	4 hours(11)	5	600Cr
20(32 ton)	8 hours(13)	6	1500Cr
22(64 ton)	16 hours(15)	7	3500Cr
24(125 ton)	32 hours(17)	8	7500Cr
26(250 ton)	2.5 days(19)	9	17KCr
28(500 ton)	5 days(21)	10	36KCr
30(1000 ton)	11 days(23)	11	90KCr
32(2000 ton)	23 days(25)	12	200KCr
34(4000 ton)	40 days(27)	13	375KCr
36(8000 ton)	3 months(29)	14	900KCr
38(16kton)	6 months(31)	15	1.8MCr
40(32 kton)	1 year(33)	16	3.6MCr

These time levels are all on the starship time scale (page 8.10), but this is really just the standard **EABA** time scale minus 17). Repair costs are usually about 30Cr per man-hour of work for large jobs.

Repair time can be modified in several ways. If the starport does not have sufficient repair crew (or cannot spare them), repairs will take proportionately longer (but will not cost any more). You need at least a quarter the required number of people (round up), simply to coordinate activities and operate heavy equipment, even with the assistance of robots.

A shipyard (as opposed to a starport) will have four times the repair crew of an equivalent starport, and will almost always have "standard parts", even for designs that aren't as "standard" as they used to be.

On the other hand, if you have more people than needed, repairs can be speeded up. Again, it doesn't cost any more, because the man-hours remain about the same. It just requires that the extra personnel be allocated to your job. This extra priority for your job may involve a surcharge or greasing of palms...

EXAMPLE: If a beta-class starport is repairing four ships simultaneously (and putting equal effort towards each), then each ship is effectively being repaired by a crew of 8. Ships of greater than 125 tons are getting repaired faster than normal, while those larger are getting repaired slower than normal.

In addition to this, the nature of the repair, the facility and the type of ship will greatly affect the time (and cost) of repairs.

Modifier	Repair time
Full repair facility	+0 time levels
Adequate repair facility	+2 time levels
Inadequate repair facility	+4 time levels
Barely adequate repair facility	+6 time levels
Jury-rigged repair	-4 time levels
Standardized design	-4 time levels
Many repair parts available	-2 time levels
Some repair parts available	+0 time levels
Reconstructed parts	+6 time levels
Sabotage repair	-2 time levels
Cosmetic repair	+6 time levels
Component repair	-4 time levels
Older technology	-2 time levels
Newer technology	+2 time levels

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Full repair facility: The default for repairs. It assumes that all tools, material handling, personnel and test equipment are available.

Adequate facility: This could be a less capable facility, or one that simply isn't used to dealing with the type of ship it is being called on to repair.

Inadequate repair facility: A facility that has enough people, but with some of them poorly trained, or lacking some key pieces of equipment. A ship with a dedicated damage control section would count as this.

Barely adequate: Making do with what you've got. A ship's normal engineering tools and test equipment for in-flight maintenance would count as barely adequate. You can do stuff, it just takes several times longer than normal.

Jury-rigged repair: You aren't really fixing the damage, you're bypassing it. The ship cannot regain all its Hits, and any component that was "repaired" is at +4 difficulty to use. If the ship loses any Hits, the roll for repairs has to be made again to see if the repair holds up, otherwise a repaired component goes off-line and the vehicle takes at least 1 extra Hit. Jury-rigging a damaged system to functional status requires time as for repairing at least 1 Hit of damage.

Standardized design: Any common civilian hull will use off-the-shelf components whenever possible to save design and construction cost. If you have a design that the gamemaster considers common enough to use this modifier, it means that virtually every place that can do repairs will have ready-made parts in stock, or prefab raw materials that can be quickly custom-formed into the pieces you need. This speeds repairs enormously. Only military starbases or repair facilities can use this modifier for military vessels, and they would use "all repair parts available" for civilian vessels (if they had to repair such).

Many repair parts available: This is a lesser version of the above. Most military starships are not standardized, but will share some components with civilian designs. If a repair facility has some of the parts ready-made or easily custom-formed, you can use this modifier. Civilian facilities would use this for repair of military ships (all civilian repair facilities are required to have a stock of certain materials needed for emergency repair of military vessels).

Some repair parts available: The default. Facilities are likely to have some of the bits you need, but will have to make the rest.

Reconstructed parts: Reconstructed parts means you have a lot of broken bits, and have to piece together something that works out of a bunch of things that don't (hello, duct tape!). If this last modifier is used, no more than half the vehicle's Hits can be repaired, and no more than half of any damaged gizmos or systems can be repaired, rounding up.

Sabotage repair: If a ship is damaged because of localized sabotage, odds are that the scope of the damage is limited and will be easier to fix.

Cosmetic repair: It takes a while to undo the scrapes, burns, punctures, wrinkles and bends so that the ship looks as good as new. If you have all the repair parts available (a standardized design), this modifier is +0 time levels instead (when you replace the parts, it looks good as new).

Component repair: On large ships, it is possible that things can be damaged in combat without the ship actually losing any Hits. In this case, the ship is counted as having taken 1 Hit for time and cost purposes, and then this modifier is applied ("Just put in a new astrogation computer and you'll be good as new!").

Older technology: Most ships flying around are Post-Atomic Era, using fusion technology, spin hulls and such. Late Atomic (on the frontier) and Early Post-Atomic ships (among the core worlds) are obsolescent, but still around in some quantity. Shipyards and starports have plenty of raw materials and parts that they would rather use at a discount than have to sell at scrap. In addition, these older systems are less complex and easier to repair.

New technology: The first Post-Atomic Era ships are in service (the majority of ships in service are Early Post-Atomic Era. These require new materials, new parts and new tooling. If you are not at a facility with up-to-date equipment, the newer ships take longer to repair, and will continue to until all facilities have gained experience with the new antimatter and artificial gravity-equipped ships.

EXAMPLE: The *Sesterce* is a 500-ton fission-powered 'tramp steamer' that had a run-in with some pirates, and ended up taking 3 Hits in the process of escaping. She limps into the gamma-class starport at Shen Nung for repairs.

First, the *Sesterce* has 28 Hits, with a default repair time of 5 days (starship time level of 21) for the first Hit, and a required repair crew of 10. Shen Nung only has a repair crew of 8, so adventurers with appropriate skills chip in to help speed things along (and thus won't be out having adventures with the rest of the crew). Fortunately, the *Sesterce* is a standard design, and uses older technology, for -6 to the time, but Shen Nung is only an "adequate repair facility" for this ship, for a +2. The modifier total is -4, which is canceled out by the +4 for repairing 3 Hits (+2 for each Hit after the first).

So, we end up with being able to repair the 3 Hits in 5 days of work, which will cost the ship owner about 36,000 Credits, less any discount they get for having the players do some of the work.

EXAMPLE: What if the *Sesterce* only took 1 Hit of damage, but this knocked out the fission drive, forcing the crew to make in-space repairs before they can go *anywhere*.

We start with the same repair time (starship time level of 21). The gamemaster says the two skilled crew can be assisted by a utility bot to make up a minimum repair crew, which is +4 time levels (+2 for each halving). The *Sesterce*'s tools are a "barely adequate" facility for +6 time levels, the repair involves rebuilding damaged components from left-overs for +6 more time levels, but it is a jury-rigged repair for -4 time levels and older technology for -2 more. The total modifier on time is +10, for a repair time of 31. It will take six *months* for the poor crew of the *Sesterce* to clamber about in and out of the ship to get the fission drive operating again! Now, this seems like a lot of time, but in reality, it is two guys with handheld tools and spacesuits trying to tear apart and fix a radioactive rocket engine the size of a small house, and when you put it like that, they should be glad they can fix it at all!

If the *Sesterce* had destroyed her attacker, the crew might be able to shuttle out and scrounge for parts, which could cut the repair time significantly.

This is an example of using starship combat to further an adventure. Imagine the *Sesterce* in an uncharted system, having to use a cargo shuttle to nudge the ship in-system into orbit around a new planet, and then shuttle non-repair crew down to the surface to stretch life support supplies and maybe find some useful resources.

EABA Starship Universal Scale

Level	Ship mass ⁽⁻¹⁹⁾	Ship Hits	Damage Limit	Ship size	Distance ⁽⁻⁴⁰⁾	Acceleration	Turns(time) ⁽⁻¹⁷⁾	Money
-2	.6 tons		8	1m	175km	.1g	.5 turns(3 min.)	500Cr
-1	.8 tons	9		1.4m	250km	.15g	.7 turns(4 min.)	700Cr
0	1 ton	10	7	2m	350km	.2g	1 turn(6 min.)	1KCr
1	1.3 tons			3m	500km	.3g	1.4 turns(8 min.)	1.4KCr
2	1.6 tons	11	6	4m	700km	.4g	2 turns(11 min.)	2KCr
3	2 tons	12		6m	1,000km	.6g	3 turns(15 min.)	2.8KCr
4	2.5 tons		5	8m	1,400km	.8g	4 turns(24 min.)	4KCr
5	3.2 tons	13		11m	2,000km	1.1g	6 turns(36 min.)	5.6KCr
6	4 tons	14	4	16m	3,000km	1.6g	8 turns(48 min.)	8KCr
7	5 tons			23m	4,000km	2.3g	11 turns(1.1 hours)	11KCr
8	6.4 tons	15	3	32m	6,000km	3.2g	16 turns(1.6 hours)	16KCr
9	8.1 tons	16		45m	8,000km	4.5g	23 turns(2.3 hours)	23KCr
10	10.2 tons		2	64m	11,000km	6.4g	30 turns(3 hours)	32KCr
11	12.5 tons	17		90m	16,000km	9.0g	42 turns(4.2 hours)	42KCr
12	16 tons	18	1	125m	23,000km	12.5g	60 turns(6 hours)	64KCr
13	20 tons			175m	32,000km	18g	84 turns(8.4 hours)	90KCr
14	25 tons	19	0	250m	40,000km	25g	120 turns(12 hours)	125KCr
15	32 tons	20		350m	64,000km	36g	17 hours	175KCr
16	41 tons		-1	500m	90,000km	50g	1 day	250KCr
17	50 tons	21		700m	125,000km	-	1.4 days	350KCr
18	65 tons	22	-2	1,000m	175,000km	-	2 days	500KCr
19	82 tons			1,400m	250,000km	-	2.8 days	700KCr
20	100 tons	23	-3	2,000m	350,000km	-	4 days	1MCr
21	125 tons	24		2,800m	500,000km	-	5.6 days	1.4MCr
22	159 tons		-4	4,000m	700,000km	-	8 days	2MCr
23	200 tons	25		5,600m	1,000,000km	-	11 days	2.8MCr
24	250 tons	26	-5	8,000m	1,400,000km	-	16 days	4MCr
25	320 tons			11,000m	2,000,000km	-	22 days	5.6MCr
26	410 tons	27	-6	16,000m	2,800,000km	-	1 month	8MCr
27	500 tons	28		23,000m	4,000,000km	-	1.5 months	11MCr
28	650 tons		-7	32,000m	5,600,000km	-	2 months	16MCr
29	820 tons	29		45,000m	8,000,000km	-	3 months	23MCr
30	1,000 tons	30	-8	64,000m	11,000,000km	-	4 months	32MCr
31	1,250 tons			90,000m	16,000,000km	-	6 months	42MCr
32	1,600 tons	31	-9	125,000m	23,000,000km	-	8.5 months	64MCr
33	2,000 tons	32		181,000m	32,000,000km	-	1 year	90MCr
34	2,500 tons		-10	250,000m	45,000,000km	-	17 months	125MCr
35	3,200 tons	33		362,000m	64,000,000km	-	2 years	175MCr
36	4,000 tons	34	-11	500,000m	90,000,000km	-	34 months	250MCr
37	5,000 tons			725,000m	125,000,000km(.85AU)	-	4 years	350MCr
38	6,400 tons	35	-12	1,000,000m	181,000,000km(1.2AU)	-	68 months	500MCr
39	8,000 tons	36		1,450,000m	250,000,000km(1.7AU)	-	8 years	700MCr
40	10,000 tons		-13	2,000,000m	362,000,000km(2.4AU)	-	11 years	1000MCr
41	12,500 tons	37		2,800,000m	500,000,000km(3.4AU)	-	16 years	1400MCr
42	16,000 tons	38	-14	4,000,000m	700,000,000km(4.7AU)	-	23 years	2000MCr
43	20,000 tons			5,600,000m	1,000,000,000km(6.8AU)	-	32 years	2800MCr
44	25,000 tons	39	-15	8,000,000m	1,400,000,000km(9.4AU)	-	45 years	4000MCr
45	32,000 tons	40		11,000,000m	2,000,000,000km(14AU)	-	64 years	5600MCr
46	40,000 tons		-16	16,000,000m	2,800,000,000km(19AU)	-	91 years	8000MCr
47	50,000 tons	41		23,000,000m	4,000,000,000km(27AU)	-	127 years	11000MCr
48	64,000 tons	42	-17	32,000,000m	5,600,000,000km(38AU)	-	182 years	16000MCr
49	80,000 tons			45,000,000m	8,000,000,000km(54AU)	-	255 years	23000MCr
50	100,000 tons	43	-18	64,000,000m	11,200,000,000km(.001ly)	-	364 years	32000MCr

▼ **THE STARSHIP UNIVERSAL SCALE** - This table is simply the standard chart, modified for the vastly larger distances, costs and scales involved with starships.

Ship mass: These are the numbers from the Lifting Capacity column, shifted by 19 rows. Note that ship size and ship mass are not directly related, since a heavily armored ship of a given mass will be far smaller than a lightly armored one.

Ship Hits: This just lists the number of Hits a ship has for that row of mass, taken from the vehicle design notes in **EABA**.

Damage Limit: This just lists the Damage Limit for a ship whose size in hexagons is on that row, taken from the vehicle design notes in **EABA**.

Ship size: If the total volume of the ship were a sphere, this is how big a diameter it would have. The level of its size will be the modifier for targeting the ship in starship combat. Bigger ships are easier to hit.

Distance: These are the numbers from the Distance column, shifted by 40 rows. The level of distance is the base number needed to hit in starship combat. One hexagon on a map for starship combat is usually either 1,000 kilometers or 8,000 kilometers, depending on the ships and weapons involved.

Acceleration: These are the numbers from the Distance column, shifted by 40 rows and divided by 10 to get an acceleration in gravities, which is used instead of distance moved to get penalties to hit. Ships crewed by any species in the U.W. cannot exceed 9g's.

Time: These are the numbers from the Time column, shifted by 17 rows. One turn of starship combat is six minutes.

Money: This starts at 1000Cr for Money(0), and is doubled each 2 levels. Allows for easier cost calculations in some cases.

How to use the table - Like the **EABA Universal Chart**, a lot of basic relationships can be easily figured using this table. With a little tweaking, you can also get a lot of complex information as well.

Lightspeed: Light travels *about* Distance(36) in Time(0) (actually, it would be Distance(36.4)). So, if you want to know how long it will take a message to travel 4.7AU, you would see that Distance(42) is 6 more time levels than Distance(36), so it will take Time(6) to get there, or about 32 minutes.

Combat: The distance, enemy ship size and total acceleration combine to get the number you need to hit. So, if you are trying to hit a Size(5) ship accelerating at 3g (Acceleration(8)) at a range of 90,000km (Distance(16)), your base number to hit in starship Time(0) is $16 + 5 - 8 = 13$.

Travel times: If using *constant* acceleration, the distance you have covered in a given amount of time is $\text{Time} + (\text{Time} - 3) + \text{Acceleration}$. It isn't exact, but it's close enough to put you in the right distance level. So, if you spend Time(9) at Acceleration(3), you will have covered $9 + (9-3) + 3 = \text{Distance}(18)$, or about 175,000 kilometers (the exact amount would be close to 206,000km).

To figure a "destination" distance for a given time, just subtract 2 from the previously calculated distance. So, if you spend Time(9) at Acceleration(3), but you turn around mid-flight so you end at a velocity of zero, you would cover Distance(16) instead of Distance(18).

Your speed at the end of acceleration is $\text{Time} + \text{Acceleration} - 1$ in Distance per starship turn. So, a ship that does Acceleration(5) for Time(6) will be going a speed of $5 + 6 - 1 = \text{Distance}(10)$ per turn, or 11,000km per turn or 30.6km per second.

Hexagons: A ship's volume can be converted to hexagons of (theoretical) floor plan by taking the $(\text{Size level} \times 3) + 3$ and taking the result on the Size column. So, a Size(7) ship would check the $((7 \times 3) + 3) = \text{Size}(24)$ row, which is 8,000 meters (8km). So, this ship has about 8,000 hexagons of usable volume. Or, you could find the row that matches the number of hexagons (Size(24)), subtract 3 and divide by 3 (round nearest) to get its actual Size, in this case Size(7).

Money: Ships will have a cost per hexagon of space. Take the appropriate row for each and add to the row for the cost of one hexagon of ship. So, if the ship which had 8,000 hexagons of space (Size(24)) had a cost of Money(4) per hexagon, the total cost for the hexagons of space is Money(28), or about 16,000,000 Credits.

▼ **STARSHIP COMBAT** - Between corporate intrigue, hostile Jodoni demesnes, interstellar pirates, and ongoing Vorn incursions into human space, arming starships and being prepared for the possibility of combat is an unpleasant but inevitable occurrence for anyone traveling outside secured transit corridors.

▼ **REALITY CHECK** - To be honest, combat between starships is likely to be like that between naval ships. Someone gets sunk, with heavy loss of life, someone else limps away to fight another day. **Fires of Heaven** puts a little more "swash" into things, to make combats a little more interesting and survivable. Even so, the term "survivable" is relative. You may have survived the fight, but being stranded light years away from the nearest repair depot with your Rozkhov Drive a smoking hulk and life support systems bleeding into space is not a viable long-term proposition.

Fires of Heaven uses slightly modified **EABA** rules for starship design and combat, with adjustments to monetary cost (to make ships *cheaper*) and scale (to make things easier). Ships designed here can be used in other **EABA**-compatible gameworlds, but weapon damage and component costs may need to be adjusted.

Basics - Ship-to-ship combat is quite different than personal-scale fights, but still uses many familiar **EABA** concepts. There are turns, but each Turn is about six minutes long (time level of 17), and the distance scale is one hexagon per 1000 kilometers (distance level of 43). The **EABA Starship Scale** (previous page) has already factored in the adjustments to time and distance, and gives some other numbers useful for designing starships.

This has a number of ramifications that you need to pay attention to. First, it means the distance scales are altered from small-scale **EABA** combat. The range scale has a 40 point shift (1,000km is the same as 1m). Round ranges down.

EXAMPLE: A range of 1,000 kilometers has the difficulty of a range of 1 meter (a difficulty of 3). A range of 8,000 kilometers would be a difficulty of 9.

Space is big. Even with 1,000km hexagons, an Earth map is 13 hexagons across (the Moon is only 2 hexagons), and it is nearly 400 hexagons from the Earth to the Moon. So, initial stages of a starship encounter may use 8,000km or larger hexagons.

Size: The hexagons taken up by a ship can translate into its Size and vice versa, and is used to determine the modifier to hit based on ship size, using the guidelines on [page 8.11](#).

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EXAMPLE: A ship that is 10,000 hexagons of space would start on Size(25) (for 11,000 hexagons), then subtract 3 (to 22) and divide by 3 to get a final Size level of 7. This ship is 7 points easier to hit, so at Distance(9) this ship is only a difficulty of 2 to hit.

Movement: Penalties are based not on speed, but on the sum of the acceleration used by both ships. Round results down to the slower table entry.

EXAMPLE: A 4g ship aiming at a 2g defender has a 6g penalty, which is a +9 to difficulty to hit.

Accuracy: Weapon accuracy is affected by both time and distance. All weapons are assumed to be using their Accuracy because of the extended time scale, so Accuracy is simply reduced by the shift in distance levels (40). However, most starship weapons are assumed to fire once every few seconds, and would get a 1 row (2 point) difficulty shift for each time they could double their rate of fire over the course of a 6 minute turn. For a little more than one shot per second, this would be nine doublings, for a 10 point shift in their favor. The net result is that weapon Accuracy is reduced by 30. This is countered by the exceptionally high Accuracy advanced weapons can have. In the end, starship weapons will have Accuracy (on the starship scale) as follows:

Tech	Accuracy
Late Atomic Era	-8
Early Post-Atomic Era	-4
Post-Atomic Era	0
Late Post-Atomic Era (Vorn only)	4
Early Advanced Era	10
Advanced Era	17

Modifier	Amount
Civilian weapons	-1
Vorn ships (low rate of fire)	-4

If a ship's weapon has a *negative* Accuracy, you still have to use it. Weapons in **Fires of Heaven** do not get any "Larger than Life" bonus. It takes exceptional adventurers to apply this Trait to a weapon. All listed starship stats will have already taken these modifiers into account.

▼ **Note** - Yes, these tech differences in Accuracy are extremely significant. But consider it like the difference in Accuracy between a modern tank and a WWII tank, which is only the difference between the Early and Middle parts of the Atomic Era. Obsolete hardware is at a serious disadvantage.

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If ships close so that they are fighting in the same hexagon (and at least one of them wants to get really close), there are no range penalties, and all weapons are assumed to have an Accuracy of zero. That is, even the most primitive of starship weapons is accurate enough to completely counter range penalties for distances of less than 100km.

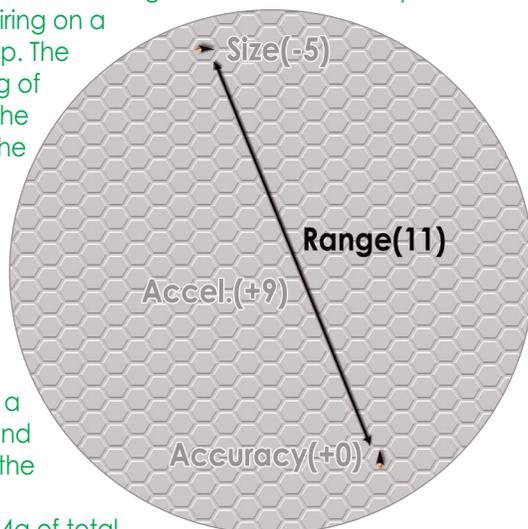
▼ **Note!** - While these accuracies may look terrible on the starship scale, they are astoundingly good on the normal scale. Most of the time, the aiming and tracking equipment on a starship weapon takes up as much space as the weapon itself, a factor that makes starships less effective than normal weapons at close range. At ranges where they will both hit anyway, a moderately powerful but exceptionally accurate weapon will lose to a very powerful weapon of moderate accuracy.

A weapon with an Accuracy of 0 on the starship scale can reliably hit a coin flipped into the air at a range of a kilometer. This is the level of accuracy needed to hit a moving ship at ranges measured in thousands of kilometers. Fortunately, starship weapons aren't optimized for shooting at infantry, but it is still a very, very bad idea to give a grounded starship a chance to aim at you.

EXAMPLE: A StarForces frigate with an Accuracy 0 ion cannon is firing on a fleeing pirate ship. The pirate is doing 2g of dodging, while the frigate is doing the same to avoid being hit. The range is 20,000 kilometers and the pirate ship is size 5.

The range is a difficulty of 11, and the modifiers to the difficulty are -0 (Accuracy), +9 (4g of total acceleration), and -5 (pirate ship size), equals a 15 or better to hit. For a skilled gunner, this shouldn't be too much of a problem.

On the starship scale, succeeding at a to hit roll means you get one hit with that weapon. Each two points you make the roll by is one additional hit.



EXAMPLE: If the previous gunner had rolled a 17 or 18, they would get two hits. If they somehow rolled a 19 or 20, they would get three hits.

Getting multiple hits can be very important. Ships with a damage limit of zero or less take no damage from most weapons, but their damage limit on any given turn is increased by 1 for each previous hit. Multiple hits in a turn may allow for a cumulative effect that results in real damage getting through.

Laying out a combat - For an engagement between two ships, a map is not usually needed. What will matter is the time it will take for one ship to reach a place of safety. This could be a jump point, a friendly outpost, the time it will take for an in-system StarForces ship to arrive, or the time it will take for a ship with superior acceleration to simply get outside the accurate range of enemy weapons.

For multiple-ship engagements that are a "running battle", the situation is much the same. You only need a map when a situation evolves where multiple ships will be involved and moving in separate directions. Note that at this point you have pretty much stopped role-playing and have started playing a board game. Role-playing is about clever tactics and risky gambits that let you avoid the fight to begin with, or somehow end it before it really starts.

A map needs to be large enough to handle the practical sensor range of the ships involved, typically with hexagons 8,000 kilometers across. If it is clear that the situation will continue into combat range, then you can start at the maximum practical combat range, which is really about Distance(19), or 250,000 kilometers. Targeting systems might reach further on the best ships, but weapons cannot maintain enough focus to do damage past this range.

Starship combat can move to a scale of 1,000 kilometers per hexagon on the map if the situation requires it. Most combats that require a map are usually at this scale, as the really long range stuff can usually be handled more abstractly.

▼ **Note** - Ships, weapons and armor in **Fires of Heaven** are supposed to generate a certain level of risk and ship lethality. If it does not work for the way you want it to "feel" like, adjusting one or more weapon system or sensor parameters by up to $\pm 2d$ will probably adjust combat ranges and lethality to suit your tastes and expectations.

Sequencing - Ships will move based on rolls for the level of their acceleration, acquire targets based on the skill of the sensor operator, and fire based on rolls for the skill of their gunners. Whoever has the option of going first can wait to see what someone else does. So, a gunner who goes first can wait until their ship moves before firing or see if the sensor operator can get a better fix or find a new target.

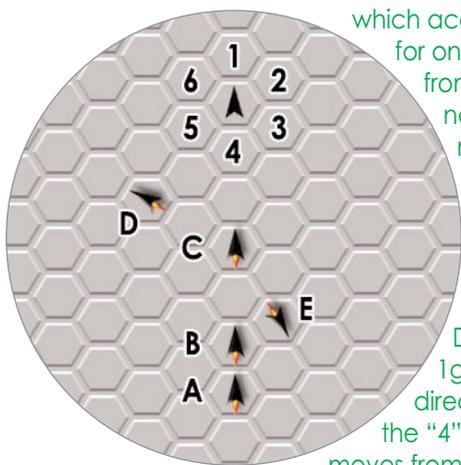
EXAMPLE: A ship with 3g of acceleration (level 8) would roll 2d+2 for movement sequencing, while a ship with 1.5g of acceleration (level 6) would only roll 2d+0.

Actions - Within a turn, crew involved in starship combat are probably doing one of three things: maneuvering the ship, acquiring targets or operating weapons.

Maneuvering: The pilot operates the ship's maneuvering systems, alone or under the direction of the captain, aided by autopilots and tactical input from sensor operators. The range means that enemy ships are seldom seen as more than blips on a navigational display. The pilot engages in random maneuvering sequences based on enemy fire patterns and number of enemies, rotates the ship to bring certain weapons to bear or shield particular systems from enemy fire, and of course is trying to close, hold or increase the distance to the enemy, depending on the situation.

A ship that accelerates at 1g for 1 starship turn (6 minutes) will be counted as moving 1 hexagon (of 1,000 kilometers), and retain this velocity from turn to turn. Movement on a map from a standing start is halved on the first turn. If a starship stops accelerating, it will continue to move because of accumulated speed. This speed must be bled off to change direction.

EXAMPLE: A stationary ship which accelerates at 2g for one turn moves from A to B. If it does nothing on the next turn, it moves from B to C. If it thrusts in the "6" direction for a turn, it will move from B to D, and if it thrusts 1g in the "3" direction and 1g in the "4" direction, it moves from B to E.



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A ship that is using its acceleration to simply move as far as possible is +0 to be hit (and to its own fire), as it is a stable, predictable target. A ship that is using its acceleration to avoid being hit only accumulates half as much speed in a given direction. So, it would take a 2g ship to accumulate 1 hexagon of movement in a turn and still be able to dodge enemy fire.

EXAMPLE: The ship in the previous example would need a 4g acceleration to do the moves listed and maintain a 4g acceleration profile to avoid being hit.

If a ship accumulates fractional amounts of movement, just keep track of how many turns it will take to accumulate a full hexagon of movement and apply it as needed.

For an abstract or "running battle", you can use the **Starship Universal Chart** to keep track of range changes based on the capabilities of each ship.

▼ **Note** - One of the painful realities of an acceleration-based modifier on the chance to hit is that civilian ships take it both ways; they cannot run fast enough to avoid pursuit, and they cannot accelerate enough to be significantly harder to hit. Slow haul freighters typically manage .1g or .2g, which means at best they are +0 to be hit, and at worst they are -2 difficulty to be hit! Since such ships are poorly armed as well, a pirate simply has to close to a range that allows pinpoint targeting of key systems. Up-to-date targeting systems, even civilian ones, can shoot out a porthole at a hundred kilometers on a drifting ship.

It's like pitting a patrol boat against a bulk ore freighter. The only reason it's a fight is that the patrol boat might run out of ammunition before doing anything significant to the freighter. The patrol boat would do better to simply board the freighter with a team of commandos and take control that way. Which is the way a lot of pirates in the **Fires of Heaven** universe operate.

In addition to basic hijinks, a pilot may attempt to use their skill and experience to "fake out" foes and their targeting computers. The pilot can make a "best three" skill roll. All enemy sensor operators roll against this. Whoever has the high roll adjusts the chance to hit by the difference. If the pilot wins, all fire from that enemy is harder. If the enemy sensor operator wins, all fire from that ship is easier (they anticipated what you were going to do).

Acquiring targets: The sensor operator is a vitally important member of the crew in combat. Automatic systems can pick up a lot of things, an expert systems classify readings based on past experience, but a skilled sensor operator has an intuition that a computer cannot match, and can find the proverbial needle in a haystack. Each sensor operator can acquire one target per turn using Sensor Ops skill, compared to the range and target size, modified by the quality of the sensors, the size of the sensor array, the nature of the target and the type of sensor lock needed.

Medium-size sensor	Comparison
Late Atomic Era	-0
Early Post-Atomic Era	-1
Post-Atomic Era	-2
Late Post-Atomic Era (Vorn only)	-3
Early Advanced Era	-4
Advanced Era	-5
Detection lock	-10
Communication lock	-4
Targeting lock	+0
Target powered down*	+10
Target not maneuvering	+5
Target maneuvering	+0
Using weapon-mounted sensor	+10

The "powered down" modifier starts at +0 and gets +1 per time level the ship is powered down.

EXAMPLE: The *Sesterce* has medium-sized Late Atomic Era sensor, which would be +0 to spot things. If the *Sesterce* was trying to spot a derelict size 9 hulk at 4,000,000km (range level of 28), they would need to make a difficulty 19 roll (range of 28, plus 0 for sensors, minus 9 for target size, minus 10 for a detection lock and plus 10 for target powered down). Even with an excellent sensor operator, this is an unlikely roll. To have a 50-50 chance of finding this target on autoscan (3d+0 roll) in a single turn, the *Sesterce* would have to close to a range of 350,000km or less (range level of 20). On the other hand, if the *Sesterce* is trying to get a targeting lock on a maneuvering ship this size, a 3d+0 roll will also have a 50-50 chance at this range.

▼ **Note** - Any combat vessel worth its durasteel can get combat tracking info long before it gets to a range where it can use its weapons. Remember though, that some hull configurations, especially military ones, are designed to be harder to spot. More on that later.

A "detection lock" is a blip on the screen. You know it is there, if it is moving, and if so, in what direction, with what acceleration, by what means and the nature of its power source. You can communicate with broad-beam devices at this range, but it requires more power and larger antennas than narrow-beam devices.

A "communication lock" means that you can accurately aim a narrow-beam communication at the target. Not only is this more efficient than broad-beam communication, it is less likely that it can be eavesdropped on. A communication lock is also sufficient to read transponder information and get an ID on any ship in the civilian registry. You may be able to get fuzzy optical, EM or radiation signature images at any communication lock range.

A "targeting lock" means you have enough information to accurately aim weapons and launch missiles. Anything in this range can be magnified to pretty good detail in any spectrum the sensors use.

Once a target is acquired, it stays acquired and the sensor operator does not have to make further rolls to keep it tracked. If the modifiers to spot the target change to make it more difficult, the tracking lock is lost and the sensor operator will have to spend a tracking action to re-acquire it.

A sensor operator may attempt to acquire multiple targets in a turn, but each extra attempt counts as a major action. Each extra attempt is at -1d to skill. This is on all rolls for ships with a civilian bridge, and is just cumulative for ships with a military bridge. Attempts are only at -1 to skill if all targets are in the same hexagon). Multiple sensor operators can share use of the same sensor, but spreading sensor time this way has the same penalty as one person acquiring multiple targets.

EXAMPLE: Attempting to acquire three targets in one turn means that each attempt would be at a -2d penalty from a civilian bridge and at -0d, -1d and -2d from a military bridge. If it were three missiles, and all were in the same hexagon, each attempt would only be at a -2 penalty from a civilian bridge.

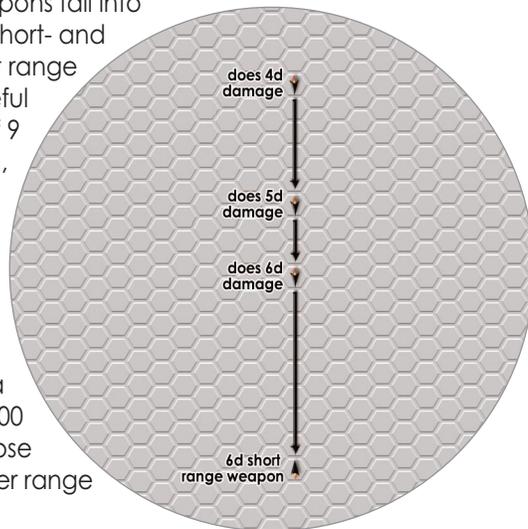
Active missiles at a range of one hexagon or less and other point defense targets are spotted automatically; if it's that close, the sensors will pick it up. All starship weapons and launchers have their own rudimentary sensors, and these can be used by the weapon operators in the event that the main sensors are knocked out, or if extra sensor data is needed, like for shooting down incoming missiles at very close range.

Ship sensors can be set on "autoscan" for any parameters desired (communication, targeting, etc.). This is a 3d+0 "Sensor Ops" skill roll, passably good, but nowhere near as good as a skilled operator.

Last but not least, if you have a comm lock with a ship, you can pass any targeting data you have to that ship, allowing them to use weapons even if they do not have a target lock.

Operating weapons: The greatly extended ranges of combat make many weapons impractical, and those that can be used often spend more mass on aiming and collimation technologies than they do on the weapon itself. As a result, starship weapons are less powerful than their short-range counterparts.

Starship weapons fall into two categories: short- and long-range. Short range weapons are useful out to a range of 9 (8,000 kilometers), but lose 1d of damage per range level after this. Long range weapons are good for full damage out to a range of 15 (64,000 kilometers) and lose 1d of damage per range band past this.



▼ **Note!** - For EABA vehicle or weapon design purposes, **Fires of Heaven** short range weapons are designed with a -4d damage penalty, and long range are at a -6d penalty.

Short range weapons such as point-defense lasers normally only operate out to a range level of -10 (10 kilometers), and are only useful only against incoming missiles and boarding parties. They would seldom be used against opposing ships unless someone was foolish enough to close while they were still operational.

Point defense weapons are only usable at normal (non-starship) ranges, and are normally used to shoot down incoming missiles. A ship that moves into the same hex as another *and* can out-accelerate its target can close to a range where point defense weapons can be brought to bear on the opposing ship.

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Unlike most combats, those in outer space provide virtually no cover smaller than a planet to hide behind nor any conditions that obscure visibility.

Remember that just because a starship combat turn is longer does not mean weapons are fired infrequently. Starship weapons are fired as often as they charge, whenever a target presents itself. This could be once or dozens of times in a turn, and a "firing action" is the moment of choosing an aiming point and a point within the turn when firing efforts are concentrated.

Adventurers at a gunner station act on their personal sequencing for their skill, so even though firing does take place over the course of a turn, the order in which ships fire is important. *If an enemy's weapon is disabled before their gunner gets a chance to take their action, too bad for them.* So, there is plenty of time for chatter, giving commands, being creative, trying to fix things, and so on. An action might be running a sensor array, taking a number of shots at an enemy ship, retargeting and change of control of any number of missiles currently controlled by the ship, moving to a different part of the ship, or other activities that would take several seconds to minutes in the normal time scale. A firing action typically involves aiming and firing several times, while using an autofire weapon may actually represent hundreds of shots. This doesn't mean the player rolls the dice hundreds of times; the player's action is to make one attack that sums up the adventurer's several minutes of activity.

That said, the "to hit" process operates as described earlier. A gunner shooting at multiple targets takes a major action penalty on each, or a -1 to their skill if they are all in the same hexagon, just as for sensor operation. If a gunner is also getting a sensor lock on the same turn, this counts as a second major action, and both sensor use and weapons fire are at a -1d penalty. If the gunner has to move between stations or do much of anything other than concentrate on shooting, this would also count as a second major action penalty.

Actions on board a ship take place at the normal rate, so a starship combat that takes place while a group of adventurers is trying to fight off hijackers runs at a 1:360 ratio; one starship round to 360 regular rounds. Fighting off the hijackers will be over by the time the first starship round is resolved.

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▼ **DAMAGING STARSHIPS** - Starship weapons are *not* insanely powerful in terms of damage; despite the fact that the main weaponry of a small ship can take up an entire turret, it might be the damage equivalent of an assault rifle. The biggest reason for this is range. A 6d+2 laser rifle is something you can carry. The starship weapon, on the other hand, will probably never engage a target closer than several thousand meters, and typical range might be several thousand kilometers. The extra circuitry, focusing, and collimating equipment that keeps the beam from diffusing doesn't make the beam do any more damage, it just lets it do that damage at a *much* greater range. The same applies to the targeting equipment, which would make a ship's weapons superbly precise at man-to-man range, but only ordinarily accurate at ship ranges.

Most starships are designed for long service in extremely hostile environments. Redundancy is the norm among all spacefaring cultures. Computers, life support, weapons, even hull design are all fault-tolerant and designed so that any single incident doesn't cause a catastrophic failure.

To top it off, many starships will be large enough to have a damage limit of zero or less (**EABA**, page 7.18). This means that the fairly small holes made by lasers or particle beams often do little more than cause atmosphere leakage. To counter this, ships may be firing hundreds or even thousands of shots during a turn, and often, they will hit multiple times. The cumulative effect can be considerable.

Each time in a turn that a hit penetrates armor but does no damage, increase the damage limit of the ship by 1 for future "non-damaging" hits. This effect only applies to hits below the ship's damage threshold, and damage limit is never raised to more than 1 by such hits. Once a hit does actual damage to the ship (1 Hit), the damage limit is reset to its original amount and the process repeats.

EXAMPLE: A ship with a damage limit of -5 normally takes zero damage from any penetrating hit, no matter how nasty it is. Crew can be affected (damage limit does not apply to them). During a turn of starship combat, this vessel has its armor penetrated by six hits. After the fifth hit, the ship's damage limit is raised to 1. The sixth hit does 1 Hit, as the cumulative effect overloads the redundant systems and compensating mechanisms built into the ship. The ship's damage limit is reduced back to -5, and the process repeats.

In addition, note that any hit location that qualifies as "passenger", "cargo" or "gizmo" does not care if the vehicle takes zero Hits from the attack. Something in that area is likely to be affected. A 10 centimeter ion cannon hole through console 3B on the bridge of a dreadnaught is unlikely to do much to hamper the overall function of the ship, but the same cannot be said for the overall function of the crewman who was sitting at console 3B when it happened...

If it is not a system where crew or passengers are likely to be, like say, aerodynamic surfaces, the gamemaster can make judgement calls for later. The ship may not have lost Hits to the damage, but do you want to try re-entry with a huge hole gouged out of your heat shield?

System Damage - Except where noted, if any hit location of a system is damaged, the *entire* system is damaged or degraded in performance. And, if a ship crosses a damage threshold from loss of hits, it means that in addition to a particular system having a chance of failure, the system interconnectivity and power distribution is affected enough that *all* ship systems are downgraded in effectiveness.

In general, the overall system types that can take damage are as for the **EABA** vehicle rules: Engine, Fuel, Passenger area, Cargo, Body, Gizmo. Within that, there may be many specific components:

Engine(1):

Any maneuvering engine

Fuel(2):

Any maneuvering engine fuel

Passenger area(3):

Bridge

Accommodations

Labs

Other

Cargo(4):

Cargo hold

Damage control

Hangar

Stores

Gizmo(5):

Rozkhov Drive

Reactor

Sensors

Weapons

Stealth

Streamlining

Magnetic screens

Body(6):

Armor

ADVANCED RULE - DETAILED HIT LOCATIONS - The

normal hit location rules provide for six vehicle areas, each with an equal probability of being hit. Detailed hit locations allow up to thirty-six possible hit areas, arranged in a six by six grid. A sample ship's hit locations might look like this:

		First roll					
		1	2	3	4	5	6
Second roll	1	C	C	C	P ₂	C	L
	2	F ₁	F ₁	R	R	G	S ₁
	3	E ₁	E ₁	P ₁	R	Q	Q
	4	E ₁	E ₁	P ₁	R	Q	Q
	5	F ₂	F ₂	R	R	Q	W ₂
	6	C	C	C	W ₁	T	B

Each item in this grid is referenced by two separate 1d rolls, and the number of times an item shows up on the grid is based on the mass of the system compared to the total mass of the ship. Each 1/36th of the ship (about 3%) gets one space on the grid. Items or subsystems with a mass of less than 1/36th of the ship (about 3%) would be combined with other such systems for hit location purposes.

Suggested abbreviations:

- R Rozkhov Drive
- P₁ Power plant #1 (or #2, etc.)
- E₁ Engine #1 (or #2, etc.)
- W₁ Weapon #1 (or #2, etc.)
- F₁ Fuel for Engine #1 (or #2, etc.)
- C Cargo bay
- H Hangar
- Q Quarters & life support
- G Bridge
- S₁ Sensor array #1 (or #2, etc.)
- A Wings, streamlining or re-entry protection
- B Magnetic shielding
- T Stores and spares
- L Laboratory, sick bay or research space

If you use advanced hit locations, there is no "body" or "armor" hit location. A specific system or part of the ship will be hit.

EXAMPLE: A 500 ton ship divided into 36 bits would have about 13.9 tons per grid location. So, an 80 ton Rozkhov Drive would take up 6 locations.

On the grid to the right, you can see that a roll of "4" on the first location die and "2" on the second location die is a hit to the Rozkhov Drive.

		First roll					
		1	2	3	4	5	6
Second roll	1	C	C	C	P ₂	C	L
	2	F ₁	F ₁	R	R	G	S ₁
	3	E ₁	E ₁	P ₁	R	Q	Q
	4	E ₁	E ₁	P ₁	R	Q	Q
	5	F ₂	F ₂	R	R	Q	W ₂
	6	C	C	C	W ₁	T	B

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EXAMPLE: If this ship was hit by a laser cannon that did 4d+1 through ship's armor, but did zero Hits because of damage limit effects, you *still* roll for hit location. If the roll were "2", "1", then you check the second column and first row to see this is a "cargo" hit. The ship takes no damage, but one item in the cargo hold is hit for 4d+1.

If the roll were "5", "2", then the bridge is hit. This counts as a "passenger area" hit. The ship takes

		First roll					
		1	2	3	4	5	6
Second roll	1	C	C	C	P ₂	C	L
	2	F ₁	F ₁	R	R	G	S ₁
	3	E ₁	E ₁	P ₁	R	Q	Q
	4	E ₁	E ₁	P ₁	R	Q	Q
	5	F ₂	F ₂	R	R	Q	W ₂
	6	C	C	C	W ₁	T	B

no damage, but you get the standard TV effect of a shower of sparks from a console and some poor ensign getting blasted for 4d+1 hits.

If a ship system takes up multiple hit locations, a hit to any one of them affects the whole system, so a hit to any Rozkhov Drive location has a chance of disabling the whole drive. If one hit location has multiple components, all are affected by a hit to that location. However, if a system taking multiple hit locations is a "distributed system", a hit to that location will only affect part of the system. The most common "distributed systems" on a ship will be living quarters and cargo space. A hit to one location may damage or depressurize one section, but not the whole system.

As long as all key systems are represented, do not worry too much about the rounding. A player designing a ship can't have any system vital to the ship un-represented. You can combine letter codes if needed to cram everything in, like having "GS" on a small ship represent sensors and bridge.

While not necessary, a ship can be graphically designed using the left side of the table as the rear, the right as the front, the top as the left and the bottom as the right. It's very abstract, but it gives the gamemaster another option in adjudicating certain situations. For instance, you could say that hits from a given arc add or subtract 1 from a row or column roll. A player who says they are trying to protect the left side of their ship might have opponents add 1 to their "row" roll for hit location, or might apply their right side armor to any hit effects. Since ships are constantly maneuvering over the course of a turn, any facing (and its armor) can be preferentially aimed at. Sides adjacent to the one facing you are +2 difficulty to hit, and a side opposite is +4 difficulty to hit.

EABA

Another option is the "outside in" hit locations, where the outer perimeter of the hit location table represents the outer surface of the ship, and the inner locations represent things protected by other components. Obviously, things like sensors, engines and hangars have some of their locations on the outer layer. The sample ship is designed with both the front/back and in/out location options.

You would arbitrate the in/out variant by rolling location normally. However, effects will apply to a location of the defender's choice on either line that is used to reach the actual hit location (from the edge of the table closest to that location). Each time the ship crosses a damage threshold, you lose the ability to substitute targets for one concentric row moving towards the center of the ship.

EXAMPLE: We'll say the sample ship has taken 4 Hits, and takes 1 more Hit into its "left front arc" (right side and top of the table), to location "5", "2", which is a bridge

"inside" of the ship, so the defender can choose between either of the closest items on

the "outside" of the ship. This is the fifth column, first row (cargo, a roll of "5", "1"), or sixth row, second column (sensors, a roll of "6", "2"). Wisely, they pick a cargo hold to take the damage. The ship has now taken 5 Hits, which puts it at the -1d damage threshold. If the ship takes another hit with a "5", "2" location roll, the bridge is hit. The -1d damage threshold means you can no longer use the outermost row as your substitute locations. A "right front hit" (right side and bottom of table) roll of "2", "4" could substitute locations. It could *not* use the first column, fourth row location (outer layer is off limits), but it could use the second column, fifth row location (a roll of "2", "5"), taking a hit to fuel instead of engines.

		First roll					
		1	2	3	4	5	6
Second roll	1	C	C	C	P ₂		L
	2	F ₁	F ₁	R	R		S ₁
	3	E ₁	E ₁	P ₁	R	Q	Q
	4	E ₁	E ₁	P ₁	R	Q	Q
	5	F ₂		R	R	Q	W ₂
	6	C	C	C	W ₁	T	B

▼ **ADVANCED RULE - NON-PENETRATING HITS** - Very large ships have a sort of "virtual armor". They may not be technically as armored as their rating, it is just very difficult to damage them with any quantity of small weapons. If you wish to, for civilian hulls, use the rule about cumulative hits overcoming a ship's damage limit, but allow hits of more dice than the damage limit to contribute to this.

EXAMPLE: A civilian hull with an Armor of 9d+0 and a damage limit of -6 could eventually take Hits from attacks of 6d+1 or more.

Specific system effects - EABA provides raw details on how systems are affected, but for the extra bits on a starship, more information is needed. Details on how to handle damage to each type of location are below.

Engine: If the hits cross a damage threshold, the engine is "stunned" and conks out. It has a base Will roll of 3d+0 (2d+0 if touchy, 4d+0 if durable), and must make an Easy(5) Will task to restart each turn. This roll is affected by the penalty for whatever damage threshold the ship is at. A ship with no working engine cannot use its acceleration to help dodge attacks, nor can it change course. It still has attitude jets and may change facing in order to bring weapons to bear or shield certain arcs from damage. A ship with multiple engines only rolls for ones which are damaged, both for conking out and restarting. If only some of a ship's engines fail, the rest can be used for partial maneuverability.

In general, ion drives and fission drives are durable (4d+0), fusion drives and Vorn gravity drives are normal (3d+0), and antimatter and archaic chemical drives are touchy (2d+0).

If overall ship damage means an engine cannot restart (like a 2d+0 roll with a -2d penalty), the engine is considered "busted". It cannot be restarted until enough Hits are repaired to make the roll possible. An adventurer who is a ship's engineer can use Fate to assist engine restarting rolls.

If a ship has taken an overall penalty from damage, the total thrust of working engines is reduced by the level of the penalty. This does *not* affect fuel consumption, it just means that overall system damage has compromised the efficiency of maneuvering the ship. *The engines might be working fine, but using them at full thrust might tear them loose from damaged mountings!*

Damaged engines will have different hazardous long-term side effects, depending on their fuel. Archaic rockets have cryogenic propellants leaking about, fission engines have radiation, fusion engines have plasma breaches and antimatter drives have some combination of the above. This may also affect the difficulty of repairing them, but this is for after the combat is over.

Fuel: If the hits cross a damage threshold, half of any remaining fuel is lost. If a fuel system occupies multiple hit locations, only half of the fuel at that location is lost. So, if you had full tanks and fuel took up two hit locations, crossing a damage threshold from a hit to *one* fuel location would drop your fuel by a quarter instead of by half.

If a "fuel" hit knocks out the last of a vehicle's Hits, fuel tankage catches fire or does something else unpleasant. If a vehicle has multiple engines using different types of fuel, choose one randomly. Fuel systems for any given engine type are assumed to be crosslinked so that in the event of rupture or damage, a fuel tank can power any engine of the appropriate type.

Fuel leakage has varying effects. Aside from chemical rockets, most engines use water or hydrogen as their main reaction mass. The small quantities of fissionables or antimatter in these types of engine are usually contained within the engine itself and do not count as "fuel". So, a ship with ruptured fuel tanks and working fission or antimatter engines may simply need to patch the tanks and refine some reaction mass to get under way again.

Passenger: A random occupant is hit, using the vehicle armor and worn armor as layering (EABA, page 4.9). The vehicle loses no more than 1 Hit from the attack unless it is an explosion, in which case the vehicle and *all* occupants in that area take hits. Passenger hits are not subject to damage limit. That is, the vehicle may take no Hits from the damage that penetrates armor, but the effect on a passenger is whatever got through the armor.

Bridge, quarters, labs, sick bays, brigs, grand ballrooms, and anyplace a person could be expected to be stationed or sequestered count as passenger areas. A passenger hit means not just that the hit passed through that area, but that the hit *affected* someone in that area. Obviously, there are exceptions. If a ship requires its entire crew to be at posts during combat, then a hit to quarters may destroy someone's personal effects, but no people are there to be hit. On the other hand, a passenger liner would restrict passengers to quarters in a combat situation, so a hit to the grand ballroom would hurt nothing except the silverware.

Any passenger area hit will cause a hull breach in that particular section. This could be anything from a slow leak to an explosive blowout. All ships have numerous pressure-tight doors to minimize atmosphere loss, and crew of military ships never enter combat unless fully suited up (and are trained to operate all their controls this way).

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Cargo: A random stored item is affected just like a passenger would be on a passenger area hit. If the cargo area is empty, treat as a body hit. You don't have to have a full cargo manifest and see exactly which crate is hit, but it is worth it to note how many (if any) of the ship's Hits were lost to cargo area damage and then assign a monetary loss based on the percentage of total Hits lost compared to the percentage of Hits that is represented by cargo area.

EXAMPLE: If a ship has three cargo locations (about 8% of the ship) and 20 Hits, then about 2 Hits worth of the ship is "cargo holds". If this ship loses 1 Hit from damage to a cargo hold location, then about 1/2 of the cargo has been damaged. If the same ship had twelve cargo locations (about 33% of the ship or 7 Hits), then losing 1 Hit to the cargo hold means about 1/7 of the cargo has taken damage.

If a location is designated as spares or stores, you would figure the percentage of damage the same way, but only count the locations designated as spares or stores (not cargo in general). If stored items take damage, you can assume about a quarter of the material is outright destroyed, about half is damaged but salvageable (but not sellable), and the rest has cosmetic damage that greatly devalues it, but does not affect its function.

Hangar bays are handled slightly differently. Damage that penetrates the ship's armor to breach a hangar bay is applied to a random vessel in the hangar bay as though it were a separate hit. This hit could have its own location effects. A hangar hit could damage a ship in the hangar, and *that* damage could hit a person in that ship (just plain bad luck).

It is normally an Average(7) piloting task to dock or undock in a hangar. If the ship has crossed a damage threshold, then the pilot of any ship attempting to dock or undock is affected by the current penalty on the ship (to represent debris, damaged docking clamps, etc.).

Gizmo: A random gizmo is hit, affected just like a passenger would be on a passenger area hit. If there are no gizmos, treat as a body hit.

A Rozkhov Drive is counted like a normal engine if it is hit (even if no ship Hits are lost) or a damage threshold is crossed. It gets one 3d+0 roll to match or beat a difficulty of 5 (an undamaged ship normally does not have to roll). If it fails the roll as the result of the Rozkhov Drive taking damage, *all* accumulated energy towards a jump is lost, and the astrogator must recalculate jump parameters using the current penalty the ship has from damage. If the ship crosses a damage threshold and the Rozkhov Drive was not hit, the Rozkhov Drive simply takes the penalty on its chance to activate the next time a jump is attempted.

EXAMPLE: If a ship is fifty-nine minutes into a one hour charging cycle and is hit in the Rozkhov Drive for 5 Hits and fails its roll, then you have to start charging again from zero, *and* the astrogator has to recalculate the jump with a -1d to their skill roll. If a ship is fifty-nine minutes into a one hour charging cycle and is hit *elsewhere* for 5 Hits, the ship now has an overall -1d penalty, which means the Rozkhov Drive rolls 2d+0 instead of 3d+0 against a difficulty of 5 when it comes time to jump.

A reactor hit is similar to an engine hit. The power plant either shrugs off the damage, or it initiates a safety shutdown. Accumulators can blow circuit breakers, be shorted out and have to be removed from the circuit and rerouted, and so on.

Accumulators and solar arrays are considered durable power plants, fission and fusion reactors are normal power plants, and antimatter reactors are touchy power plants. Both antimatter engines *and* reactors have rigorous safety systems to prevent accidental (or deliberate) catastrophic explosions. If a ship equipped with such crosses the -2d damage threshold or more, it will be impossible to restart it with a base 2d+0 roll. In these cases, it is safe to assume that the reactor or engine has done a controlled jettison of its antimatter. While an engine may retain reaction mass in the form of water or hydrogen, there is no antimatter for it to react with. This *cannot* be repaired. The physical damage can be fixed, but you cannot make your own antimatter to refuel the drive or reactor. In addition, safety protocols to prevent terrorism make it almost impossible to transfer antimatter out of a power plant or reactor *except* as emergency jettisoning.

Antimatter - Antimatter is the new status symbol for ship propulsion and on-board power systems. Aside from engineers, few people actually realize exactly how powerful antimatter is. If the period at the end of this sentence were a drop of water made from anti-hydrogen and anti-oxygen, it would have a mass of about five micrograms. This holds the same amount of energy as roughly a hundred kilograms of high explosives! A two milligram amount (a drop filling a lower-case 'o') would have the power of forty tons of high explosives. To put it in other terms, this represents the total production of a square kilometer of Mercury's solar arrays for an hour, or enough energy to theoretically push over a ton of payload to Earth's escape velocity. *Not bad for something you can barely see.*

The easiest way to use antimatter is to combine it with a much larger amount of normal matter, with a small amount of matter-antimatter annihilation heating and accelerating a large reaction mass. This mass has the advantage that it absorbs much of the radiation produced by the matter-antimatter annihilation.

Fuel systems that handle antimatter thus have to deal with microgram amounts of antimatter fuel and the kilogram amounts of specially purified reaction mass and other high-tech consumables the system will use each second of operation. Bulky compared to what they manipulate, they have multiple safety measures to insure safe containment and transport of the antimatter fuel.

All ships and power plants using antimatter fuels are strictly regulated by the U.W., requiring frequent safety inspections. Inordinate amounts of paperwork will haunt the unfortunate ship owner who even in an emergency situation has to crack the tamper seals on an antimatter-powered system. All data on use of antimatter power systems is routinely downloaded from ship computers to make sure that both safety and efficiency standards are being met, *and* to make sure no antimatter is diverted to other uses. Currently, antimatter is only available for civilian use through StarForces-approved facilities to clients who have passed rigorous background checks.

K12 reference: Antimatter - reference he598699.136341.511173 - .00Cr

▼ **Note** - In EABA terms, a two milligram quantity of antimatter has an explosive potential of something like 19d+1, which is sufficient to mess you up pretty badly at ranges of a hundred meters or more.

Sensors: Sensors are distributed arrays, and short of direct hits to the central processor (on the bridge) are difficult to completely take off-line. In general, the damage threshold the ship is at is a penalty to the sensor operator's skill roll or the autoscan skill roll.

EXAMPLE: A ship has crossed a -1d damage threshold. The ship is now considered to have a 2d+0 autoscan roll instead of 3d+0. If the sensor operator had a skill of 4d+0, they now only roll 3d+0.

Weapons: Weapons are more discrete systems than sensors. They are complex and do not handle damage well. On the other hand, they are built to focus large amounts of energy under conditions of extreme acceleration. All weapons are counted as a normal engine (3d+0 roll) and like engines, have to make an Easy(5) roll to continue functioning if it is hit and crosses a damage threshold. As with engines, the damage penalty applies to this roll.

EXAMPLE: A ship's point defense laser is hit by damage that crosses the -2d threshold. The laser operator makes a 1d+0 roll and tries to get a 5 or better. If they succeed, the weapon escapes serious damage or its redundant systems are good enough to compensate. If they fail, the weapon goes off-line, and the operator can make one attempt per starship turn to get it going again.

All energy weapon damage except for missiles is reduced by any damage threshold crossed. The system does not get full power or fully regulated power, either of which will adversely affect weapon performance.

Stealth: Stealth covers both surface coatings and structural design. Damage can affect either of these. If damage to this system crosses a damage threshold, the effect of the stealth is reduced by the damage penalty (-3 per -1d penalty).

Streamlining: This also covers surface coatings and structural design. Any damage threshold crossed is a penalty to all skill rolls that would be affected, including re-entry, atmospheric maneuvering or evasion, and landing.

Countermeasures: This is handled similar to sensors. In general, the damage threshold crossed is a penalty to the effect of the countermeasures.

Screens: If a ship with magnetic screens takes a damage penalty, the effect reduces the protection of the screens.

Body: No special effect, the vehicle just takes any appropriate hits. Armor is a part of a ship's structure, and is not degraded by damage taken.

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▼ **STARSHIP COMBAT CHECKLIST** - Whether or not an attack hits a target is determined by a skill roll on the part of the gunner for that weapon, as per normal **EABA** combat. However, that is only one step in several; adventurers may engage in several actions during the course of a starship combat turn.

1. If a ship can be seen, it can be shot at. To spot a target, an Sensor Ops roll must be made by one person or entity per available sensor available to that observer. The roll is based on the quality of the ship's sensors and the Sensor Ops skill of the observer, against a base difficulty for range, modified by enemy ship size, concealment measures and other visibility modifiers.

A ship's AI (if any) may not be linked to weapon targeting systems nor pass sensor information to them. Full information AI's is on [page 10.32](#).

Once a ship is locked in, it stays spotted until a change makes it harder to see, when another roll is needed to maintain the lock.

2. Determine the chance to hit. The base difficulty is based on the range, and is adjusted by ship size, weapon accuracy, and the combination of attacker's and defender's acceleration. A ship that is not able to use **any** acceleration is -10 difficulty to be hit. Remember that weapon Accuracy can never do more than cancel out the range. Low tech weapons can have a *negative* Accuracy, and this *must* be applied unless you are in the same hexagon as the target (which includes point defense tasks).

3. Attacker makes their skill roll. To hit, the attacker must make a "best three" roll on their skill against the previously determined total. Each 2 points this roll is made by is an extra hit for a beam or projectile weapon system. A gunner may fire more than one weapon system in a turn, but each one after the first is another major action (-1d penalty on each). Weapons listed as having a "bonus" may fire at the listed number of targets before extra major action penalties begin to happen. This is common on weapons meant for a point-defense role, so they can shoot at multiple missiles in the same turn at no penalty.

If the attack misses, the attacker's action is over and play moves to the next combatant. If the attack is successful, roll for hit location and damage.

▼ **SHIP DESTRUCTION** - When a starship has lost all its Hits from damage it becomes a hulk. Many internal systems may still function, but they lose the ability to communicate with each other unless they are at the same hit location. Weapons and engines can no longer be run from the bridge, pressure doors must be cranked by hand, etc. For anything to operate, a crewman has to be physically present at the system in question. Since sensors are no longer linked to weapons, combat becomes problematic, although individual gunners can still aim and fire from the weapon itself (provided the weapon still has power).

If a starship crosses any damage threshold past its Hits, it is no longer a starship, but a collection of parts flying in formation. All power distribution is disrupted and only emergency systems function. The ship is no longer capable of any maneuvering more substantial than a facing change without tearing itself apart. In any atmosphere or gravity well the ship will disintegrate. Safe re-entry is impossible, and anything that survives re-entry will shortly hit the ground at terminal velocity.

▼ **ADVANCED RULE: DECOMPRESSION** - A hull breach can occur whenever a starship loses Hits to an attack or when it is penetrated by damage, even if no Hits are lost. A breach in a pressurized compartment may cause decompression. This leakage of air into the vacuum of space can be gradual, slowly rendering the compartment unfit for human life, or explosive, hurling unsecured objects and crew members into space.

Fortunately, dispensers built into most starship hulls automatically spray a fast-hardening foam that quickly seals off most breaches. These are much like 20th century sprinkler nozzles, except they aim themselves at the ultrasonic whistle of escaping air before firing. In case these systems fail, most starships are equipped with pressure doors that can be closed to isolate a holed compartment and prevent the entire ship from losing pressure. Military ships generally keep all hatches sealed, even when no alert is sounded. Civilian vessels often leave hatches open until there is a perceived reason to close them. If a starship has an internal door, it is usually a pressure-tight door, with an armor of about half that of the ship (at least 1d+0). External hatches usually have the same armor as the rest of the ship.

Each time an attack does a Hit to a pressurized area of the ship, roll 1d+0 for Late Atomic Era hulls, 2d+0 for Early Post-Atomic Era hulls and 3d+0 for Post-Atomic Era hulls. Failing to make an Easy(5) difficulty means that section of the ship has been holed beyond the automatic systems' ability to compensate. A ship gets +1d to its roll to seal a puncture which penetrates armor but does no Hits. The overall damage penalty the ship has applies to this roll.

EXAMPLE: The *Aurora*, a tramp freighter with a Post-Atomic era hull, takes a hit to the bridge from a pirate ion cannon. The *Aurora* has a 2d+0 roll to get 5 or better to avoid depressurizing the bridge.

If depressurization occurs, make a 1d+0 roll on the Decompression Effects chart to determine the severity of the pressure loss, ranging from a minor annoyance, requiring damage control parties to don envirosuits before attempting repairs, to a calamity, sucking unprotected crew members into the void of space. Give +1 to the roll for damage from explosive or kinetic missiles, -2 for hull breaches from hand-held weapons.

On military ships headed into combat, all non-essential compartments are depressurized before starship battles to reduce the hazard of sudden decompression. All crew don environment suits before combat whenever possible and strap themselves into acceleration couches, keeping their helmets handy if they serve in a pressurized compartment. Note that if a crew member suffers any hits through their e-suit armor, it will have been punctured; potentially lethal in a decompressed compartment.

To prevent excessive bookkeeping, the game-master should use the decompression rules only if key compartments suffer hits, such as the enemy pirate's bridge or a compartment containing the adventurers.

Decompression Effects(roll 1d+0)

- 1 **Slow Leak.** Compartment depressurizes to vacuum in 23 minutes (four starship turns).
- 2 **Gradual Leak.** Compartment depressurizes to vacuum in 6 minutes (one starship turn).
- 3 **Steady Leak.** Compartment depressurizes to vacuum in 1.4 minutes.
- 4 **Rapid Leak.** Compartment depressurizes to vacuum in 23 seconds.
- 5 **V.rapid Leak.** Compartment depressurizes to vacuum in 6 seconds.
- 26 **Explosive Decompression.** Compartment is instantly voided to space. Any unsecured people or objects are expelled into space.

▼ **ADVANCED RULE: MISSILE COMBAT** - A missile is a bit different than other weapon systems. It just wants to get in your face and blow up, or preferably just to collide with you. At the speeds missiles can reach, the kinetic energy in their moving mass is often far more than any explosive warhead. And unlike beam weapons, missiles can easily alter the damage limit of a ship to the point that a single missile can do significant, even catastrophic damage.

▼ **Note** - To put it in perspective, a 1 ton kinetic missile that has accelerated at 6g for two starship turns has kinetic energy equal to a .2 kiloton nuclear bomb. Fortunately, at a speed of over 40 kilometers per second, this damage is directed more or less in a straight line down the path of impact, but the spray of white-hot molten metal and vaporized components radiates out from the site of impact like a hellish explosion. Compare this to the relatively trivial fragmentation warhead the missile might use if it is a near-miss instead of a hit.

The down side is that the accuracy of starship weapons is such that even small, agile missiles are a trivial matter to hit, and any damage that affects a missile's guidance or maneuvering virtually guarantees a miss.

Missiles have rudimentary sensors and guidance systems in starship combat terms. They usually get much of their sensor data from the firing ship or any friendly ship in a group that has reasonable sensor data on the target. The missile does not need a precise targeting solution. It just needs to get close enough to see the target and home in from there. A group of missiles fired at the same time is counted as a single action by a gunner. These missiles travel in a pack in the same hexagon.

A missile gets an "Agility" based on the level of its acceleration (find the level that corresponds to the acceleration of the missile). It uses this roll against the similar "Agility" of the target, further modified by the size of the target ship. It's really just an oversized melee attack.

EXAMPLE: A 4.5g missile has an "Agility" of 9, for an Agility roll of 3d+0. A 2.5g ship with a size modifier of 7 has an acceleration penalty of 7, which is modified by the ship size to an Agility of 0, for an Agility roll of 0d+0.

It would seem then that a missile will always hit, unless the target is faster and fairly small. And in an environment where there is nothing to hide behind and the only thing out there that isn't empty space is probably your target, this is the case. But note that stealthy hulls and/or highly maneuverable ships can make it more of a challenge.

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In addition, a ship has the advantage of better computers, more power and better sensors. This can be used to jam a missile's guidance systems, create false targets and otherwise make it hard for missiles to be in the right spot at the right time. All it takes it a fraction of a second of confusion in a missile's tiny brain, and it has flashed by the target, often going too fast to turn around and try again. The sensor operator on a defending ship can roll their skill, modified by the quality of their sensors against the similar roll of whoever is sending data to the missile. If the defender wins the roll, the missile cleanly misses. If more than one missile would intercept on a turn, the defender can make one extra missile miss for each 2 points they beat the attacker's sensor operator. Missiles operating on their own sensors without a controlling ship have a 3d+0 roll.

EXAMPLE: A defending ship whose sensor op has a roll of 5d+2 is trying to spoof four missiles that got through point defense systems. The enemy sensor operator has a roll of 4d+1. The defender's "best three" roll is 16, while the enemy roll is only 14. The defending ship manages to divert two of the four missiles, but the other two will slam into their ship.

Spoofing enemy missiles requires the full effort of a sensor operator. If they are doing it as an extra major action on a starship turn, they take penalties on the roll, just as for attempting multiple sensor locks.

Shooting down missiles usually just means hitting them with something. A missile gets a 2d+0 roll against a difficulty of 5 to remain operational after each time it takes damage, and this is adjusted by any damage penalty on the missile itself.

When a ship is hit by explosives or the identical effect of a hypersonic kinetic missile, the damage limit is increased by 1 for each full die of damage that penetrates a ship's armor.

EXAMPLE: A ship with a damage limit of -4 and an armor of 6d+0 is hit by a 15d+0 kinetic missile. This gets 9d through armor, so the ship's damage limit is raised from a -4 to a 5 for purposes of how many hits this attack can do. A 9d+0 attack will certainly do 5 Hits. *Wham! That's one-eighth of a cruiser's Hits from the impact of one missile!*

If a starship expects to ever fight anyone except the Vorn (who don't use conventional missiles), it will have at least one point-defense weapon, and if a civilian ship only has one weapon, it will probably be a point-defense turret.

▼ **ADVANCED RULE: AIMED SHOTS** - Normally, hits are done to random locations of a ship. However, an attacker may use relevant sensor data to try and specify particular regions of a ship, especially the weapons, reactors and engines, which have readily identifiable signatures, even over the noisy environment of combat.

Ship descriptions will list the size of components. The difference between their size and the size of the ship they are in is the extra penalty to aim at that system. Systems inside a ship or those which are not major energy emitters are double this penalty. Those which are protected *and* quiet would be triple this penalty.

EXAMPLE: Aiming at a size 4 engine on a size 8 freighter would be +4 difficulty. Aiming at the size 4 protected bridge of a size 8 military ship would be +12 difficulty (not an emitter, inside the ship), and even if successful, the defender could likely have one of the protecting systems take the damage.

Missiles may also be specifically targeted. The extra difficulty adds to the roll the defender gets to dodge the missile. If a missile appears to be targeted at a specific ship system, a sensor operator can detect this, and choose such a missile as a priority target for point defense, spoofing, or as a last resort, notifying the crew in case they want to evacuate that part of the ship...

▼ **ADVANCED RULE: RE-ENTRY COMBAT** - It takes a ship about one starship turn from the time it hits the top of an atmosphere to when it stops glowing from the heat of re-entry. During this time, it is extremely difficult to get a lock on a ship, communications are down and weapon fire is interfered with by the glowing cloud of plasma around the vessel. On any turn a ship is re-entering an atmosphere, it cannot fire weapons, pass or receive targeting data, or communicate with other vessels. It also gets +4d to its armor against all hostile fire and is +4 difficulty to be hit (it's easy to track the fiery trail, but hard to pinpoint exactly where the ship is inside it).

Even ships built to withstand re-entry are not built to withstand the stress for prolonged periods of time, so you cannot hide in the re-entry zone to avoid hostile fire for more than a turn.

▼ **ADVANCED RULE: ATMOSPHERIC COMBAT** - Ship to ship combat may take place within or across an atmosphere, which requires certain adjustments.

A lifting body hull only gets normal acceleration for avoiding enemy fire when in an atmosphere. Its stub wings or minor maneuvering surfaces provide no additional benefit. A ship with full wings is 2 points harder to hit. It's aerodynamic "bite" lets it do more extreme evasive maneuvers than ships without them.

EXAMPLE: A shuttle with an acceleration of 3.2g is +8 difficulty to hit when dodging enemy fire. If it had full wings for atmospheric use, it could be +10 to hit when in an atmosphere.

Of course, starship weaponry at these ranges is likely to hit *anyway*, but it can be important if a ship without streamlining (in orbit) is trying to shoot down a ship in the atmosphere. This is only possible if the firing ship is more or less above the target, and is counted as a range of at least 1 hexagon.

The maximum velocity a streamlined ship can attain in an Earth-like atmosphere is a speed of one hexagon per two turns in the upper atmosphere, and speed is *not* retained from turn to turn. This is doubled in thin atmospheres, halved in thick ones, and quartered for non-streamlined ships. Among other things, it means that kinetic missiles can't achieve the velocity that makes them such killers. Their damage dice are not counted as explosive for purposes of affecting a ship's damage limit.

On worlds with clouds from water or other chemicals, these can be used to provide cover from beam weapons and sensors. Cloud cover is anywhere from +1 to +10 difficulty to be penetrated by sensors and will *directly* add anywhere from 1d (light cloud cover) to 10d (inside a thunderstorm) to a ship's armor rating (do *not* use layering). This does not affect missile damage. To reflect the potentially hazardous atmospheric conditions, all piloting rolls in protective cloud cover are +1 difficulty for each 1d of armor the clouds provide against beam weapons.

When both ships are in an atmosphere, the ship with the *highest* acceleration can decide the range, and whoever has the *lowest* acceleration decides on how close to the ground they want to fly. Ground clutter provides a sensor benefit much like clouds, but also adds to piloting difficulty (one hopes to avoid hitting the ground at Mach 3). The pursued party sets the base difficulty of following the terrain and *then* adds the modifier. If the pursuer is not willing to make a roll at the same difficulty, they cannot fire on that turn. Failing the roll means a crash landing, at best.

▼ **ADVANCED RULE: 3-D COMBAT** - Modeling three-dimensional movement on a two-dimensional playing surface is cumbersome and generally not recommended. But if it absolutely *must* be done, four hexagons of movement vertically (up or down) takes a ship to an adjacent "level" above or below the normal plane of combat. When attacking a target on a different level, a ship adds one range band per level of difference. It is suggested that players keep track of the level a ship is currently on with a counter, six-sided die or scrap of paper so that everyone involved can see where everyone else is at.



If there is no altitude difference, planets can provide cover from direct fire. If there is an altitude difference, a planet's cover "shadow" is equal to half its diameter (round up) above and below the mid-plane. Thus, Luna is

between three and four hexagons across, so it extends two hexagons above and below the plane of combat. In order to fly over instead of around Luna, a ship would have to rise above those two hexagons. This would be one "level" of difference in altitude.

▼ **ADVANCED RULE: FACING** - A moving starship maintains its acceleration-based evasion ability as long as it continues to fire its engines in the direction of its most recent thrust. Any time a ship can move, it can pivot to any facing its pilot wants (e.g., to bring a forward-pointed weapon to bear on a chasing ship), but if it doesn't want to *travel* in that direction it will have to temporarily shut off its engines, and thus cannot use them to dodge about.

Firing a weapon on a target outside its normal firing arc reduces a ship's evasion ability by 2 points for each +1d in damage that weapon has because of its limited arc mounting. This affects both your ability to hit and be hit.

EXAMPLE: A ship with 3.2g acceleration (level 8) has a 60° arc forward-facing laser cannon (+2d to damage), but is being pursued. The ship can either use its full acceleration potential and be +8 difficulty to be hit (and be unable to shoot), or it can spend part of the turn coasting forward and *facing* backwards. This lets the forward-firing weapon shoot at the target to the rear, but also reduces the ship's ability to evade by 4 points, making it +4 to hit (and be hit) instead of +8.

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▼ **SAMPLE COMBAT** - Due to surreptitious sabotage to her transponder and comm systems, the *Sesterce* is mistaken for a raider and attacked by a colonial SF-102, and has to make it through a round of combat before the adventurers can figure out a way to bypass the problem and call off the attack.

The *Sesterce* looks like this:

		First roll					
		1	2	3	4	5	6
Second roll	1	C ₁	C ₁	W ₂	Q	Q	Q
	2	C ₁	C ₁	C ₄	Q	Q*	G ^S
	3	E	R	R	Q	Q	Q
	4	W ₁	R	R	Q	Q	Q
	5	C ₂	C ₂	C ₃	L	P ₁	P ₁
	6	C ₂	C ₂	C ₃	P ₁	P ₁	P ₁

The important numbers are that she is a size 5 ship with an acceleration of .2g (level 0), a damage limit of -2, an Armor of 3d+2 and 28 Hits. She also has a point defense laser and a small long range laser.

While an SF-102 looks like this:

		First roll					
		1	2	3	4	5	6
Second roll	1	F	F	W ₂	P ₁	S	S
	2	E ₁	E ₁	G	P ₁	S	S
	3	E ₁	E ₁	P ₂	P ₁	S	S
	4	E ₂	E ₂	P ₂	W ₁	W ₁	W ₁
	5	E ₂	E ₂	W ₁	W ₁	W ₁	W ₁
	6	F	F	W ₁	W ₁	W ₁	W ₁

What is important is the weaponry, sensors and skills of the SF-102's crew, since the *Sesterce* does not want to fire on legitimate planetary authorities. A stock SF-102 has a short range laser, a point defense laser and carries up to eight kinetic missiles.

Early rounds: The *Sesterce* was detected by orbiting starport sensors, and an SF-102 dispatched to investigate. The starport passes sensor data to the SF-102 until the fighter's sensors pick up the *Sesterce*. The starport continues feeding any data it gets, in case the SF-102 loses sensor lock for some reason.

This SF-102 has mostly stock equipment, which is hopelessly out of date against modern ships, but its main laser is a fairly recent model, with an Accuracy of -4. Combined with all the other factors in this situation, it gives it a realistic maximum range of about 22,000 kilometers (22 hexagons). However, the missiles it carries, though old tech, have an acceleration of 4g's, and can reach the *Sesterce* long before the SF-102 can. These missiles have a duration of eighteen turns.

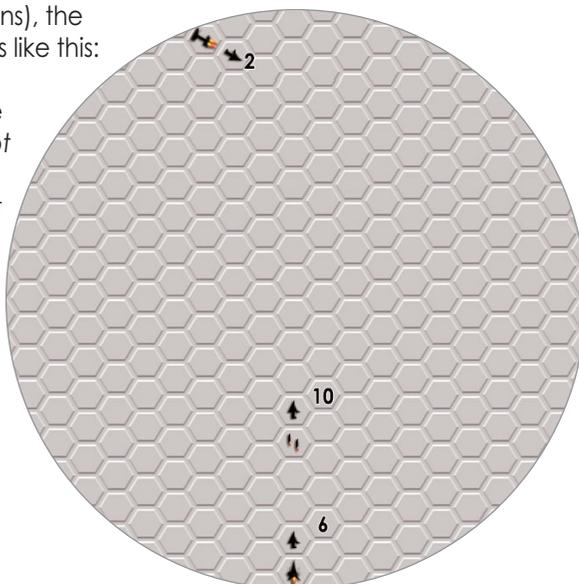
EABA

While the adventurers frantically scamper about trying to figure out what to do, they turn the *Sesterce* around in an effort to slow down and gain a little more time to figure out a solution. With their low acceleration of .2g, it will take five turns to reduce their speed by 1, so odds are that the situation will have resolved one way or the other long before they can stop and start heading the other direction.

Combat begins at a range of 25 hexagons, when the SF-102 fires a pair of missiles. After they accelerate 2g, the SF-102 is closing on the *Sesterce* at a speed of 6 hexagons per turn, and the *Sesterce* is closing with the SF-102 and the more distant starbase at a speed of 2 hexagons per turn. After acceleration, the SF-102 fires its missiles. The missiles keep the vector of the SF-102, so they are moving 6 hexagons per turn even if they don't use their 4g engines. However, they do light up, and add 4 hexagons to this, for a movement of 10 hexagons.

Movement sequencing isn't that important on this turn, but since the maneuvering level of the *Sesterce* is 0 (0d+0 roll), the level 6 acceleration of the SF-102 (2d+0 roll) and level 8 acceleration of the missile (2d+2 roll) will *always* have the option of moving first. The gunner of the *Sesterce* has a skill roll of 4d+2, and the SF-102 gunner has a roll of 4d+1. The sequencing of these might be important later, but not immediately. What is important is that the *Sesterce's* sensor operator needs to acquire some targets. We'll assume the *Sesterce* already has a "detection lock" on the SF-102, and sees the missile launch. The *Sesterce's* sensor operator tries to get a targeting lock on the pair of missiles. At the end of the first turn of movement (which started at a range of 25 hexagons), the situation looks like this:

Note that the *Sesterce* is *not* facing the wrong way, it is just turned so it can try to reduce its speed by thrusting in the opposite direction.



Right now, the important thing is that the missiles need to be acquired. A targeting lock has a base difficulty of the range level. A range of 13,000km is a difficulty of 10. The *Sesterce's* main sensors have a +0 modifier, and the missiles are a size of -1 (1 point harder to be hit), so the sensor operator needs an 11 or better. They roll a 14, and have no problem. This only acquires one of the missiles for targeting, however. This allows a weapons operator to take a pot shot at it. This is way, way past the range of the point defense laser, but the small long range laser can try. This is an older model weapon, with an Accuracy of -8, shooting at a size -1 target, and the total acceleration of the *Sesterce* and the missile is another -8. This is +17 difficulty on the base of 10 for the range, so the laser operator needs to roll a 27 or better! *Not going to happen.* The laser operator curses the fool that bought this antiquated hunk of equipment, but it gives them an idea. A quick call to the engineer sets a plan in motion to *maybe* save someone's bacon.

Second turn: The SF-102 and its missiles move first. The missiles have the higher roll and move first, accelerating another 4g and course correcting so they can hit the *Sesterce* this turn. The SF-102 jinks about to make itself harder to hit, but does not add any thrust (everything it does evens out), so it continues on the same course at a speed of 6. The *Sesterce* is still trying to decelerate, so after the missiles make their run, the *Sesterce* will move another 2 hexagons in the direction it has been moving.

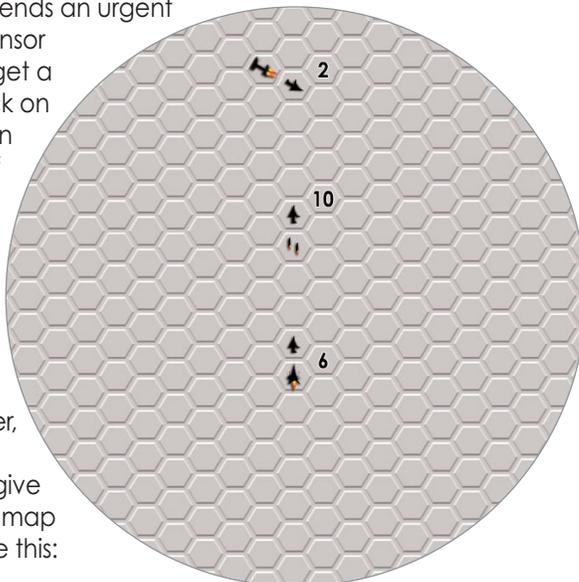
The *Sesterce's* sensor operator has a fairly easy task to acquire the other missile as it closes in, and does so without any problem. The laser operator switches his console to the point defense laser. It has an Accuracy of 10 and a bonus of 2, the latter meaning that it can fire at two targets per turn without taking an extra action penalty. The Accuracy does not make the missiles any easier to hit, it just cancels out the range penalty for the very short range at which they will be targeted. So, the shot becomes the acceleration penalty(+8) and the size penalty for the missile(+1), for a total difficulty of 9. Both missiles are easily hit, once each. *This does not necessarily mean they were destroyed!* Missiles have a damage limit of 7 and 10 Hits. Each missile ends up taking 7 hits, which is a -1d penalty. The missile normally has to roll a 5 or more on 2d to stay operational after taking damage, but now only has a 1d roll. One of the missiles fails the roll, and starts pinwheeling uncontrollably. *The other makes its roll, and while it sputters a bit, is still on collision course!*

A missile normally rolls its "Agility" (based on its acceleration) against the Agility and size of the target. The *Sesterce* has zero for its Agility and a size of 5, which means the missile has a roll of 1d+2 (its acceleration roll, minus the 1d of damage penalty), against the *negative* 1d+2 roll of the *Sesterce*. The *Sesterce* is a sitting duck, and the missile plows into it for 14d+0 damage.

Missiles count as explosive damage for purposes of a ship's damage limit. The *Sesterce* has an armor of 3d+2, which means 11d+0 get through. This 11d raises the *Sesterce's* damage limit for *this hit* by 11, from -2 to 9. Damage of 11d+0 will easily do 9 hits, almost a third of the *Sesterce's* 28 hits. *Ouch*.

Hit location is going to be *extremely* important. The players argue that since the missiles came in from the rear, that the roll should be shifted. The gamemaster agrees to a -1 modifier on the first roll. The damage rolls are 3, 5, which becomes 2, 5, a hit squarely in cargo pod 1. Given the amount of damage, the gamemaster says the pod and everything in it is a completely writeoff. The shift of mass unbalances the ship, making it harder to maneuver, and debris and outgassing atmosphere makes sensor operations more difficult. The *Sesterce* takes an overall -1d penalty to all its actions. To add insult to injury, the SF-102 fires another pair of missiles, and arms two more.

Meanwhile, the ship's engineer has been working frantically with a soldering wand, a wrist communicator and the main laser. A sophisticated computer virus has disabled all the *Sesterce's* comm systems, including their interface with ship's sensors, including those on the *Sesterce's* shuttle, but the really simple hardwired devices were unaffected. The engineer spends the six minutes of the turn wiring their personal communicator into the modulator of the main laser cannon, defocuses the beam, and sends an urgent call to the sensor operator to get a weapons lock on the SF-102. An exchange of "are you nuts?" goes back and forth, but seeing more missiles on the way convinces her, and she prepares to give it a shot. The map now looks like this:



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Third turn: The laser and sensor operators roll off against the Agility of the missiles to see who goes first. The 2d+2 roll of the missiles is no match for the skills of the *Sesterce's* crew, so they can hold their action or act immediately. They act immediately. The *Sesterce* shuts down her engines, they aren't really helping in evading the missiles. As a side note, on the following turn the SF-102 might have to make another sensor lock, since if the *Sesterce* is powering down, it will change the difficulty of spotting it.

The sensor operator crosses their fingers and makes a targeting roll. The range is 9,000km, which is a difficulty of 9, against a size 3 ship, for only a final difficulty of 6. Even with the -1d penalty on the sensor operator's roll from damage to the *Sesterce*, this is an easy roll. Now, the laser operator tries to hit the SF-102, not with a pinpoint laser burst, but with a wide and harmless beam that has the desperate message "we surrender! we're not who you think we are! we're powering down! please don't blow us up!"

The difficulty for range is 9. The SF-102 has an acceleration of 2g, which is +6 difficulty, but it is size is -3 to difficulty, and the poor Accuracy of the laser is +8 difficulty, for a total of 20. However, the gamemaster gives the laser operator the difference in difficulty between a target sensor lock and a communications sensor lock, which is 4 points, dropping the difficulty to 16. The laser operator has a normal skill roll of 5d+0, but this is reduced to 4d+0 by damage to the *Sesterce*. The player chooses to roll 3d+2 instead of 4d+0, and to use their Fate to get an extra die on the roll, for a final roll of 4d+2. They get lucky, and get a total of exactly 16.

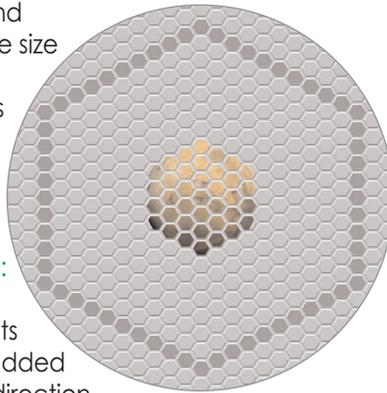
The gamemaster, feeling generous, not wanting to completely destroy the adventurers and desiring to reward some clever action to get out of a sticky situation, decides the SF-102 crew notices the message coming in on a non-standard laser frequency, sees that the *Sesterce* has indeed powered down its engines, and disarms the missiles in flight (but leaves their engines hot in case they need to be activated later). It alters course to match the *Sesterce*.

Combat is over, and the major headaches of explaining what is going on and repairing the *Sesterce* begin.

▼ **OTHER STARSHIP TOPICS** - Before we get into the meat and potatoes of starship design, there are several other topics particular to starship use and abuse.

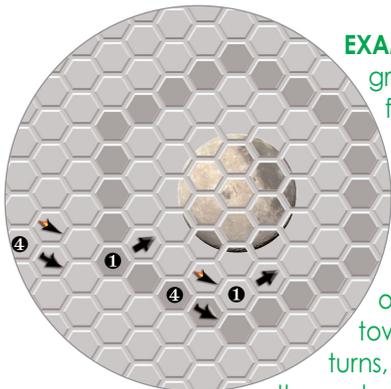
Gravity Wells - A gravity well around a planet or star acts to accelerate nearby starships. The gravity well extends as many hexes past the body as the body's size. So, as Earth has a thirteen hexagon diameter, its gravity well is thirteen hexes in each direction around. Black holes and other spatial anomalies will have larger (and stronger) gravity wells than the size of the body would indicate, while some low-density worlds have a smaller gravity well.

EXAMPLE - Mars has a diameter of seven hexagons, so its gravity well looks like this:



A ship in a gravity well gets an additional one hexagon added to its move each turn, in the direction that would be toward the gravity source at the moment it entered the gravity well. That hex of movement is added at the end of the turn that it entered the gravity well, and is applied to the ship's movement on subsequent turns, whether it is in or out of the well, until the ship counters it by using a hexagon of movement in the opposite direction. Acceleration from gravity wells is a constant and does not affect targeting or being targeted.

If the ship is pulled to the planet's surface, it only collides with the planet if its available thrust doesn't exceed the planet's gravity. At that range, it can be targeted by atmospheric interceptors or even ground-based weapons at non-starship combat ranges, at least for a moment as it rockets by.



EXAMPLE: The ship enters the gravity well of a moon in the first shaded hex, and is pulled one hex directly toward the moon. But, this does not occur until the end of regular movement, the ship is simply jogged to one side instead of plunging toward the planet. On future turns, it gets jogged again at the end of the turn. This is a simple "gravity slingshot"; the ship got a +1 hex movement in a specific direction each turn for free.

Low-Density Worlds - The convention that a planet's diameter equals the radius of its gravity well works for gas giants and most terrestrial worlds, but some low-density planets (mostly made up of ice, instead of metal and rock) can have radically different gravity wells than their sizes would suggest. These worlds are listed below with their corrected gravity wells.

Planet	System	Gravity Well Radius
Pluto	Sol	0 hex
Hypnos	Alpha Centauri B	0 hex
Tinirau	Lalande 21 185	1 hex
Tyr	Epsilon Eridani	3 hex
Ymir	Epsilon Eridani	2 hex
Hachiman	61 Cygni A	9 hex
Mizu-Ha-No-Me	61 Cygni A	4 hex
Kura-Okami-No-Kami	61 Cygni A	4 hex
Midir	Epsilon Indi	6 hex
Ogmios	Epsilon Indi	3 hex
Sese	Tau Ceti	2 hex
Kay	Omicron Eridani A	3 hex
Tristram	Omicron Eridani A	4 hex
Mordred	Omicron Eridani A	2 hex
P'ril	70 Ophiuchi A	0 hex
T'lex	70 Ophiuchi A	1 hex
Fu Shen	Sigma Draconis	1 hex

Orbits - A stable orbit around a planet requires a varying speed, ranging from about a half the depth of the planet's gravity well each starship turn for a close orbit, to about a quarter the depth of the planet's gravity well for a geosynchronous orbit.



If a ship is in a stable orbit around a planet, the constant tug of the planet's gravity well is balanced by the forward motion of the ship, so that the pull toward the center of gravity doesn't cause the ship to crash, but instead bends its straight-line motion into a circle. The faster a starship is moving, the closer it has to be to the planet's surface in order for the two forces to balance.

Liftoff - To reach a minimal orbit from the ground, a ship enough acceleration sufficient to reach orbital velocity, which for simplicity's sake we'll say is twice the gravity of the planet. This is a generalization, so if a ship is close, don't sweat it. Shallow gravity wells will usually have less in the way of drag-creating atmospheres, while deep gravity wells will have dense atmospheres that require extra power to push through. Once in a stable orbit, engines of even a very small thrust can eventually accumulate enough speed to reach a planet's escape velocity.

Gravity well	Example	Acceleration to reach orbit
3g	-	6g
2g	-	4g
1.5g	Thor(ϵ -Eridani V)	3g
1.2g	Hephaistos(α -Centauri B IV)	2.4g
1.0g	Earth(Sol III)	2g
.8g	Hachiman(δ 1 Cygni A VI)	1.6g
.6g	Hell(α -Centauri AI)	1.2g
.5g	Tyr(ϵ -Eridani VII)	1.0g
.4g	Mars	.8g
.3g	Limbo(α -Centauri A IV)	.6g
.2g	Tinirau (Avatea I)	.4g
.15g	Luna	.3g
.1g	P'ril (70 Ophiuchi A II)	.2g

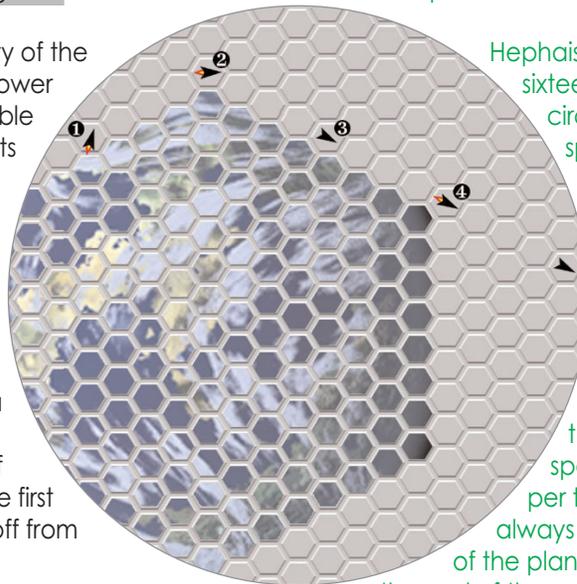
To reach orbit, a ship is fighting the gravity of the planet all the way. A ship with acceleration lower than the gravity of the planet will never be able to liftoff from its surface. A lifting body hull gets a fifty percent acceleration bonus in normal density atmospheres, and a fully winged hull gets a one hundred percent bonus. In these cases, the ship takes a more sloping ascent path and uses its wings to assist getting out of the denser parts of the atmosphere. If a ship can reach orbit, it usually only takes a few starship turns, with a one turn penalty if a ship has to rely on wings or lifting surfaces to make it. Remember to subtract the gravity of the planet from the ship's acceleration on the first turn, and that movement on the first turn (liftoff from the ground) will be halved.

Because the planet will be revolving under the ship as it climbs out of the gravity well, the straight vertical ascent will appear to curve increasingly away from its launch point the higher it rises. To show this, after the first turn of liftoff movement, each turn should be plotted on a curving course away from the planet. Once the ship achieves the required acceleration, its engines can be shut off, allowing it to coast in a circular orbit around the planet, or a total thrust equal to the gravity well can be applied to take the ship out of orbit around planet's gravity well (by cancelling the "thrust" of the planet) and letting the ship move into interplanetary space.

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EXAMPLE: The planet Hephaistos, in orbit around Alpha Centauri B, has a gravity of 1.2g. In order to liftoff from its surface and achieve a stable orbit, a starship would need to have an acceleration of at least 2.4g. If the ship has an acceleration of 3.0g, in its first turn of movement it moves like it had an acceleration of 1.8g (subtracting the planet's gravity). This would normally be two hexagons of movement, but movement from a standing start is halved, so it is only one hexagon. Or, you could just take an Acceleration(8), subtract the planet's Gravity(5) and get Distance(3), or 1000km, or a full hexagon of movement. The ship ends at position ①.

This gets the ship into a suborbital path around Hephaistos with a residual velocity of two hexagons per turn, which would put it midway between ① and ②, after which it would fall back to the planet. Just for reference, this would be like a suborbital shuttle flight, one turn of liftoff, one turn of freefall, and one turn of re-entry, for a twenty minute cross-country flight (plus two hours going through security checkpoints at the spaceport).



Hephaistos has a diameter of sixteen hexagons, so a low circular orbit requires a speed of four hexagons per turn. Since we have two of those hexagons already, we need to thrust for 2g for one more turn, which puts us into a stable orbit one hexagon above the surface, with a speed of four hexagons per turn, an orbit which is always parallel to the surface of the planet and puts us at ② at the end of the second turn.

After two turns of this, drifting to ③ and ④, the ship decides to break orbit. To break orbit, we just need to add another 1.2g of thrust to our movement. This will counter the planet's pull, and allow the ship to coast out of the gravity well at its current speed of four hexagons per turn.

So, the combination of liftoff, stable orbit and escape velocity cost this ship a total of about two turns of full thrust (3g on the turn of liftoff, 2g to stabilize the orbit, and 1.2g to reach escape velocity).

"When those cosmonauts from the old Soviet Union burned up on re-entry, government censors kept all but a few amateur radio operators from hearing their dying screams. When the first American space shuttle blew up, fake transcripts of their last words floated around the datanets for decades. But everyone on Gawaine heard that comm officer's non-stop report as the freighter Shepherd made its 500 kilometer plunge into Launcelot. Or at least they said they did."

- Brian Maloney, journalist, 2236CE

Re-entry and Landing - Entering an atmosphere at hypersonic speed is always stressful on a ship. Ships need to be moving at no more than three hexagons per turn for safe re-entry in any atmosphere with sufficient "bite" for wings or lifting surfaces to work. Making the right calculations usually involves having working sensors or working communications with someone else who does. Pre-entry maneuvering is an Average(7) task on the pilot's skill, assuming their sensor data is perfect. Add +2 to the difficulty if it less than perfect, and +4 if it is badly compromised.

A basic re-entry is an Average(7) task on the pilot's skill, assuming they have their astrogation, thermal protection and all maneuvering thrusters in good order. Damage penalties to the ship will apply to the pilot's skill roll (the effect is internal to the ship, of which the pilot is the effectively the brain). A non-streamlined ship capable of safe re-entry (because of sufficient magnetic shielding) is at +4 difficulty on its re-entry maneuvers.

A properly executed re-entry maneuver counts as a 6d+0 lethal attack to the front and bottom of the ship. An improper re-entry maneuver will do more than 6d+0 damage, with the upper limit depending only on how badly the maneuver was botched. Failing the roll means the ship takes +1d damage from re-entry for each 2 points the roll is failed by, rounding up. A non-streamlined ship without magnetic shielding will suffer damage from re-entry, no matter how well armored it is (lots of protruding bits will simply be melted off). In such a case, the ship will take 1 Hit per 1d of improper re-entry damage, even if armor would normally stop all the damage (minimum of 1 Hit damage).

Only ships with full or partial aerodynamic surfaces can do multiple re-entry maneuvers. Non-aerodynamic ships of sufficient size and power have been known to survive re-entry, but have seldom been in any condition to take off again.

A starship's damage limit does *not* apply against either re-entry or crash landing damage, since these are effects that, like explosions, affect a large portion (or all) of the ship at once.

To avoid the massive weight required by conventional armor, most streamlined ships will have ceramic tiles or panels on the surfaces that will take the most thermal stress. While these are next to useless against weapon fire, they can easily handle the extreme but controlled heat of re-entry. A ship with some form of specialized armor will have that facing listed with a "+xd" after the normal armor, like "Front: 3d+0(+4d)" to represent a ship with a normal armor of 3d+0, but 7d+0 against a specific type of damage, such as re-entry damage.

Starships with magnetic shielding are not *required* to have streamlining for safe re-entry, since they can tailor the magnetic fields into an ovoid streamlined shape. However, such ships still take the 6d+0 lethal damage to their shields and should have sufficient protection to avoid damage. If a ship has neither streamlining nor magnetic shields its pilot suffers a +6 difficulty on the re-entry maneuver.

If damage from re-entry exceeds a starship's armor, roll location once for *each* Hit done. Each location hit is damaged just as if the ship had been in combat, and the Hits inflicted are applied to the ship's total.

EXAMPLE: The ship from the detailed hit location example (page 8.18) is neither streamlined nor has shields, but we'll force a re-entry maneuver on it anyway. If 2d+0 gets through armor and does 7 Hits, the ship is going to take some serious hurt. Since only one major damage threshold will be crossed (on the fifth hit), we just roll for that one. The rest can wait until later. The roll for location is 1, 3, which is the main engine. If the engine conks out, this ship will have one turn (at best) to get it restarted or the ship is going to be smoking confetti around a very big hole in the ground.

Once re-entry is accomplished, a ship will generally be going about 1 hexagon per turn (10,000kph, or somewhere around Mach 9) in the rarefied reaches of the upper atmosphere. If the ship is unpowered and unstreamlined, it will hit the ground at the end of that turn for 7d+0 lethal damage, for which neither armor nor damage limit really applies. It's messy and fatal, though a few people have miraculously survived in cases where there was a water landing, overloaded agrava generators and/or trained rescue crews immediately at hand. A unpowered ship with vestigial aerodynamic surfaces (a lifting body hull) can glide 1 hexagon of distance before having to touch down, and one with full wings can glide 2 hexagons. If a ship has an adjusted thrust that exceeds local gravity, it can fly around as long as the fuel holds out. Non-streamlined ships get only their basic thrust, lifting body hulls get a fifty percent bonus to meet this threshold, and fully winged hulls only need thrust of half the local gravity to remain aloft. A ship in the denser parts of an atmosphere is realistically restricted to a speed of one hexagon each four turns, regardless of its armor or acceleration.

Once in the atmosphere, a ship can attempt to land without further incident. A powered horizontal or vertical landing is usually an Average(7) task. An unpowered horizontal landing is a Challenging(9) task, and an unpowered vertical landing is called a crash. Failing a safe landing roll means the ship usually takes 1d+0 hits, for which neither armor or damage limit applies. The pilot lands hard and collapses part of the landing gear, skids off the runway, doesn't spot ground debris and impales the landing engine on something, and so on. Any reasonable commercial landing pad with a nav beacon setup is good for a -2 to landing difficulty. Safety and rescue equipment will not prevent damage, but can contain fuel leaks, put out fires and generally keep damage from getting any worse.

Collisions and Ramming - Minor incidents like docking a bit too hard are treated as a normal attack to a random or appropriate system ("Take 1 hit to whatever system the hangar is next to..."). Hits by kinetic missiles have already been mentioned, but ship collisions at deep-space intercept speed are almost invariably fatal to all involved. Each ship will do a number of lethal *dice* to the other equal to half (round up) its level of *mass* (not size) plus *dice* equal to the relative movement at the moment of impact.

EXAMPLE: A 200 ton ship (mass of 23) moving at a speed of 2 hexagons(2,000km) per turn (distance of 5) would do 14d+0 damage, just like a kinetic missile.

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▼ **REALITY CHECK** - This is far, far less than what would *actually* be done. Kinetic energy (that of a moving object) is based on its mass, times its velocity, times its velocity again. So, if you take something moving ten times faster than a rifle bullet (a hundred times the energy) and that something masses a few million times more than a rifle bullet...it's a lot of energy. A 200 ton ship moving at 5.6 kilometers per second (2 starship hexagons per turn) has the same energy as a fair sized nuclear bomb, and while it may not leave as big a crater, the hole it will leave is still impressive.

Collision damage of this type is counted as an explosion and damage limit does apply. Trying to collide and avoid collision would be done like a missile hit. While there have been terrorist and heroic kamikaze attacks, they are fortunately very rare, and targeting computers are very good at picking up target behavior that would indicate such an attack. Vorn *do not* engage in such behavior. Committing suicide does not proclaim one's fitness to the universe. However, Vorn *have* used drone ships built on their standard fighter as massive kinetic missiles. StarForces analysts believe these were available well before the Interstellar War and were originally designed by the Vorn to be used against other Vorn cityships.

Non-Starship Combat - While a battle is raging in space not everyone on a ship can sit it out strapped into an acceleration couch. Trying to engage in combat in a rapidly dodging starship where the floor can become the ceiling on a moment's notice is difficult, as is trying to repair a damaged fusion engine when tools are flying around the engine compartment like chromium-plated missiles.

The direction of acceleration is usually dictated by the thrust axis of the main engines, but in combination with maneuvering thrusters, a ship's acceleration is be randomly applied as it jinks about to make itself hard to hit.

The level of acceleration a ship uses in this manner causes a penalty to the firing of starship weapons. This penalty also applies to any combat inside the ship, and double this penalty is a difficulty for Agility rolls when trying to move around.

EXAMPLE: If a ship is jinking around at 3.2g (an acceleration level of 8), then any sort of successful movement will have a base difficulty of 16!

Adventurers can take some steps to improve their stability, such as taking extra time, using both hands to cling to things while they move, and so on; a successful zero-g skill roll against the acceleration difficulty negates the penalty for a walking movement rate as the adventurer nimbly anticipates ship maneuvers and lithely bounces off the walls. However, in these conditions the zero-g skill is a major action, so trying to do anything except movement will be at a penalty.

Anyone failing an Agility or skill roll against the acceleration difficulty when trying to move will suffer consequences ranging from embarrassing to fatal; e.g., the acceleration level becomes a die roll of half-lethal damage from getting slammed into things on a failed movement attempt. Adventurers can coordinate with bridge crews to leave short lulls in maneuvering to allow work parties to get from point A to point B without problem ("You've got ten seconds...run!").

EXAMPLE: Former StarForces marine Matt Danziger is trying to thwart hijackers while his ship's pilot is engaging in a 2.3g evasive maneuver. Simply staggering down the corridor requires an Agility roll against a difficulty of 14 (twice the acceleration penalty). If he fails, he falls down and rattles around the halls like a pinball (taking 2d+1 half-lethal damage per turn until he makes the roll), so he is forced to cling to stanchions and wait for an opportunity to move. If he clings to a railing and tries to shoot a hijacker, his attack is at +7 difficulty. Fortunately, the hijackers take the same penalty.

Automated ship systems, such as internal defense turrets or computer-fired weapons, are unaffected by acceleration as long as they can communicate with the tactical computers (the ship can fully compensate for the acceleration at these tiny ranges). Robots or mobile systems that can communicate with the tactical computers only suffer half the acceleration penalties (round down). An exoskeleton or cybernetic limb linked to tactical computers would take half penalties as well.

Hand-held weapons vs. starships - Handheld weapons are capable of damaging starships, with limitations.

First, the weapon has to do more damage than at least half the ship's armor (round halved armor up). *The internal bulkheads of a ship are less sturdy than the outer armor.* An attack from the outside uses the normal ship's armor and magnetic screens if applicable.

Second, the weapon has to do enough damage in dice or quantity to do 1 Hit. This could be a burst of fire from a laser rifle that does enough hits to raise damage limit to 1, or simply a well-placed demolition charge.

Last, the damage is done to the ship location where the person doing the damage is (or has placed the weapon). If you want to sabotage the bridge, you have to be on the bridge at some point.

EXAMPLE: Trooper Danziger dives on a hijacker during a lull in the evasive maneuvers. In the ensuing struggle, they wrestle over a grenade launcher and it goes off, causing a 5d+0 lethal hit to what the gamemaster determines is the Quarters section of the ship. The ship has a damage limit of -2 and an armor of 4d+0. For internal hits, the armor is halved to 2d+0, and the 3d that get through this armor raise the damage limit to 1. So, the 5d+0 grenade blasts down the corridor and strikes a wall, doing 1 Hit. *There's a breach in the hull!* A roll shows that the hull systems fail to seal the breach. Pressure doors come down to seal the damaged area, but meanwhile, Danziger doesn't have an envirosuit on and air pressure is dropping fast...

Unarmed attacks are unlikely to ever damage a starship. A ship's thermal insulation, triple-layer porthole materials, and spalling barrier are usually worth 2d+0 armor against most melee weapons, regardless of how small the ship is. That is, even a tin can lifepod with 1d+0 armor will count as 2d+0 protection against unarmed or melee attacks.

Powering a starship - Like adventurers, starships and other vehicles have Strength. This can be direct, in the form of thrust (like a vehicle power plant), or indirect, like electricity used to power a weapon (or a thrust-producer like an ion drive).

Systems that generate Strength produce it each turn. Unless there is a way to store it, any unused amounts are lost. Systems that consume Strength (weapons, sensors, artificial gravity, etc.) need to have a sufficient supply whenever they are used. The combination is the ship's energy budget.

Each +1d in Strength represents double the power, so a reactor that produces 10d+0 of Strength can run one system with a Strength of 10d+0, two with a Strength of 9d+0, four with a Strength of 8d+0, etc. The difference between the total Strength produced in a starship turn and that spent by the systems that are usually on (life support, sensors, etc.) is what can be spent on weapons fire in a given turn, or used to recharge drained or accumulator banks, or used to charge a Rozhkov Drive.

The Strength from reactors or other power sources is fairly easily allocated. Any two items of a given Strength combine to be one source of that Strength plus 1d. Any total Strength that is more than 1d less than the next highest amount is ignored, otherwise it combines to be the highest Strength plus 1d.

EXAMPLE: A ship has systems that use 20d+1, 18d+2, 18d+0 and 12d+0 Strength. *Difficult?* Not at all. The 12d+0 is so far below the next highest Strength that it can be ignored. The 18d+2 and 18d+0 combine to be 19d+2 (the bigger of the two, plus 1d), and the 20d+1 and that 19d+2 combine to be 21d+1 (the bigger of the two, plus 1d). As long as the ship's reactors can provide 21d+1, all systems can be powered. If total power output dropped to 21d+0, then something would have to be turned off. Again, we ignore the 12d+0 drain, it is insignificant compared to the other energy drains (12d+0 is 1/64th the drain of 18d+0). If we turn off either the 18d+2 or 18d+0 drains, then the 20d+1 is the largest by more than 1d, so all the other power drains can fit in the difference between the 21d+0 output and the 20d+1 drain.

▼ **Note!** - Yes, you can optimize ship design to take advantage of this rounding.

You don't need to worry about this just yet, but consider it a "heads-up" for later and remember that +1d in a ship's system generally involves doubling the energy or output of that system.

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▼ **STARSHIP DESIGN** - We've gone over the nuts and bolts of how you maneuver, use and blow up these extraordinarily complex and expensive bits of technology. Now, some rules on how to *build* them. These are an expansion and elaboration of the simple vehicle design rules in **EABA**, with some tweaks and modifications for the **Fires of Heaven** universe. Specifically, ships will perform a lot better and cost a lot less than they probably would in the "real world". *It's futuristic tech, it's space opera, enjoy it!*

Most of the design examples will involve the construction of the *Sesterce*, a fairly small, lightly armed freighter of the kind that adventurers might be able to pool resources to acquire.

Starship Technology Levels - There are five levels of ship technology, of which only three are readily accessible to adventurers.

Late Atomic Era: This is workhorse technology that became obsolescent at the end of the 21st century; late 20th and early 21st century technology (Atomic Era) wouldn't be found anywhere outside of museums or junkyards. This era includes solar sails, ion drives, fission reactors and fission engines. These older technologies are still used, but virtually all mainstream ships are more advanced than this. The first Rozhkov Drives were built at this level, but hardly anyone would be caught using one that bulky (no interstellar ship can be economically competitive if it has to use a Late Atomic Era Rozhkov Drive).

Etherean ships use this level of technology. Their ship-creatures have biological fission piles, lasers in turrets like a chameleon's eyes, magnetic shieldings and kinetic missiles they can use like a porcupine's spines. But what makes a ship-creature dangerous is the Ethereans on board, using the creature's vast neural system to amplify their psionic abilities to a level that equals the best starship weapons, and which can affect an entire crew through the best armor or shielding. There will be no particular design notes for Etherean ships for the simple reason that no one has ever beaten one (even the Vorn leave them alone).

Early Post-Atomic Era: This includes fusion engine and reactor technology and the most common level of sophistication for Rozkhov Drives. Most currently manufactured civilian ships and second-string military vessels are built with this level of technology. It has been around long enough for most of it to be standardized, its quirks well known, and its details standard curriculum for any technical field that uses it.

Post-Atomic Era: This is the cutting edge of technology in the United Worlds, and includes antimatter engines and reactors. It has been used in military ships for several years and is beginning to trickle down to select (and expensive) civilian markets. Efficient and compact antimatter power is the most powerful item of Post-Atomic tech, but commercially available, cheap artificial gravity is the best-known Post-Atomic era item, ubiquitous on any new ship design.

Late Post-Atomic Era: This level of technology is largely unfathomable to human science, though minor breakthroughs have been made, such as human use of artificial gravity derived from captured Vorn technology. Vorn use many of the same technologies as other races, but they have a few which are exclusively theirs, like their gravity-bending reactionless drive and gravitational shearing weaponry.

Advanced Era: This (or somewhere beyond it) is the level the Progenitors presumably used. There are no reliably working examples of Progenitor ship technology, and samples of their structural or armor materials have resisted all attempts to duplicate them. Advanced Era technology and beyond is such that we cannot understand the basic principles ninety-nine percent of it works on. The only bit we have ever even partially deciphered is that which allowed us to build the Rozkhov Drive.

As a rough guide, a ship of a given technology level is perhaps equal in combat to a lower tech ship of a point of size per fraction of a tech era. So, a Late Post-Atomic Era Vorn fighter (size 3) is often a match for an Early Post-Atomic Era frigate (size 5). Those 2 points of size represent about an eight-fold difference in mass (which is why Early Post-Atomic Era humanity got its butt kicked so soundly by the Vorn the first time around).

Legalities - The United Worlds government regulates all space travel, including the construction of space vehicles. Much like late 20th century Earth automobile safety standards, the U.W. government sees space vehicles as an aspect of commerce, which the government has a monopoly in regulating. Planets control their orbital space (within the gravity well for inhabited planets, plus research outposts on otherwise uninhabited worlds). In-system travel is within planetary enforcement authority, following United Worlds guidelines, analogous to a water-based navy operating in international waters. Enforcement of those guidelines varies, however, depending on the sophistication of the local star system. Newly independent or resource-poor systems may just not be able to afford an expensive regulation and inspecting system, and it can take the U.W. government years to authorize manpower and equipment subsidies.

In addition, the U.W. regulates production, sales, and possession of starship weapons. These laws take precedence over planetary laws; worlds can have stricter laws but never weaker ones. Vessels may get "breaks" in certain systems as a way of encouraging use of those planets as home ports for tax purposes, but a "home port" is one where the ship's weapons *must* be legal.

The categories for weapons and other equipment are Open, Restricted, Military, and Illegal.

Open: No restrictions on sale or possession. In practice, there are very few things that are in the open category. The U.W. bureaucracy really wants its fingers in everyone's pie. On StarForces ships, even writing utensils have to be "zero-g approved" to be bought on contract. "Open" simply means the paperwork and regulations, while there and legally enforceable, are really just a formality.

Restricted: Requires a permit to purchase and possess. Permits are fairly easy to obtain as long as the applicant can show a good reason for needing the equipment and has no criminal record of a type that would cause the permit to be denied. Much of the time a "restricted" technology just means that there is government oversight and occasional inspections (e.g., "Is your fission pile operating safely?"). Similarly, those qualified to work on these restricted items may be also be regulated. Being intoxicated on duty can cost you your pilot's license or reactor engineer certification! Restricted items also give the government the right to inspect, delay, or otherwise harass ships and their owners, especially if those owners have reputations that would warrant such treatment. The gamemaster can always find an "official" reason to delay a ship the adventurers own or are on.

Military: Restricted to government use. The equipment is never sold *directly* to civilians, but if it is found on the market legally (e.g., in scrapped or salvage sale Navy vessels) it counts as Restricted. Military items used in the commission of a crime will be confiscated or impounded until the accused is exonerated or the planetary equivalent of the Attorney General releases it (whichever comes first).

Illegal: Against the law to manufacture, sell, or possess under any circumstances. Pretty much an "arrest, confiscate and ask questions later" level of enforcement. Possession of an illegal technology or item assumes the owner has an intent to use it, and is treated accordingly. The StarForces have special dispensation to carry nuclear weapons (now being upgraded to antimatter weapons), but have never yet used them. Cruisers, battleships and carriers may regularly deploy with nukes, but most are stockpiled at military starbases.

The more civilized a region of space is, the more likely officials are to look askance at civilians with military hardware. If a ship has a record of just making the safe Earth-Alpha Centauri run, people are going to wonder why it mounts a long range ion cannon. On the frontier or where piracy is a problem, no one will look twice at a rack of missiles.

Starship Systems	Level
Accumulators	Open
Solar arrays	Open
Fission reactor	Restricted
Fusion reactor	Restricted
Antimatter reactor	Restricted
Ion drive	Open
Fission engine	Restricted
Fusion engine	Restricted
Antimatter engine	Restricted
Sensor drones	Restricted
Kinetic-kill missiles	Restricted
Short starship range weapons	Restricted
Long starship range weapons	Military
Nuclear Missiles	Illegal
Armor	Open
Magnetic shielding	Open
Sensors	Open
Civilian bridge	Open
Military bridge	Restricted
Rozkhov Drive	Restricted
ECM pods	Military
Stealth hulls	Military
ECM	Military
Concealed systems	Military
Any Vorn technology	Illegal

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Star systems are High, Moderate, or Low security, corresponding (with few exceptions) to presence of Alpha-, Beta-, or Gamma-class starports; Delta-class starports are likely to have little (if any) security. These classes will correspond to 3d+0, 2d+0 and 1d+0 "suspicion" rolls. In high security systems, officials board and do a cursory check of *all* non-military ships before they are allowed into controlled space, with an Easy(5) chance of a thorough ship check if anything suspicious turns up. These systems are likely to have ship plans for all standard designs on file (another Easy(5) roll), quite handy for detecting potentially illegal modifications. High security systems treat passengers and crews about the same as 21st century airports do in major countries, and handle shipping and cargoes about the same as 21st century seaports in those countries.

Systems with moderate security have similar chances of doing a detailed search *if they have suspicions*. They hail and visually check incoming ships (close enough that disguised systems require rolls), with basic ship checks done after docking and before cargo is unloaded, mostly to check for unwanted lifeforms that could affect the local ecosystem. Security is on par with 21st century airports or seaports in minor countries. Security is a concern, but there are more loopholes and less safeguards against corruption and other abuses.

Systems with low security don't really care or are too poor to mount a serious customs presence. Incoming ships are hailed, asked for a flight plan, and left to go on their way unless something seems suspicious about the ship or the information given, in which case there is the normal chance that someone will be sent to intercept (if possible). Security is about the same as a 21st century backwater airstrip or minor seaport in a minor country.

In *any* star system, detection of an Illegal ship system is grounds for seizure, and the arrest of the captain and other officers. A ship with a military hull or systems (especially systems) may get some official and unofficial scrutiny (as will its officers) for the duration of its stay, even after the ship's paperwork and the story of how it acquired such devices is checked and approved. This may just take the form of electronic traces placed on crew ID's, as opposed to physical surveillance. The charging of double docking fees for "the added security of other starport patrons" would not be unusual for a ship with military-grade weaponry. In systems with low security Military systems are worth raising an eyebrow for, but not much else.

▼ **STARSHIP CONSTRUCTION** - Starships are built like other **EABA** vehicles, but to make things easier, **Fires of Heaven** will "containerize" the design process, giving a selection of pre-designed systems and hulls that can be combined in any way that will fit.

Ships are built around the concepts of size and weight (and of course, money). Two ships of the same size might be of greatly disparate weights because of things like armor. So, the same engines in ships of the same size may give different levels of performance.

Ships will have a cost based on what is in any given hexagon of space. For **Fires of Heaven**, these costs will usually be as follows, and deviate from the standard **EABA** rules to make things a little faster to design.

Hulls	Cost per hexagon
Late Atomic Era	3,000 Credits
Early Post-Atomic Era	4,000 Credits
Post-Atomic Era	5,000 Credits

Modifiers	Cost per hexagon
Pod/frame hull	half cost
Military hull	double cost

Non-military systems*	Cost per hexagon
Late Atomic Era	10,000 Credits
Early Post-Atomic Era	12,000 Credits
Post-Atomic Era	16,000 Credits

Military systems*	Cost per hexagon
Late Atomic Era	40,000 Credits
Early Post-Atomic Era	48,000 Credits
Post-Atomic Era	64,000 Credits

For this table, a "military" system is any system *other than* a weapon that is defined as "military" (weapons have individual costs), and "non-military" systems are everything else.

EXAMPLE: If you have a size 3 ship (about 125 hexagons), you know a Post-Atomic Era hull will set you back about 625,000 Credits.

This gives you a starting point when working off a limited budget. Remember that these cost estimates would be for new construction. Used vessels are usually less, often significantly so.

Hulls - The main factor in starship design is hull size, the amount of space its hull encloses, and thus the space available for other ship systems to be crammed into. Hulls generally come in four types:

Winged: Has full aerodynamic surfaces, making it efficient for atmospheric use, but not for deep space use. Winged hulls only need thrust of half local gravity to remain aloft in atmosphere (but must still double local gravity to reach orbit). The overhead for winged and lifting body hulls takes into account the wasted space and less efficient utilization of volume in such hulls.

Lifting body: A good compromise for medium-sized ships. While *theoretically* possible, no one has ever attempted a winged or lifting body starship hull larger than size 7 (the largest *conventional* aircraft ever built in the **Fires of Heaven** universe is size 6).

Enclosed: Not streamlined, but compactly built so that all systems take the minimum amount of space. Virtually all military hulls are enclosed or lifting body design. Enclosed hulls are capable of safe re-entry (at increased difficulty) if they have magnetic shielding which when combined with normal armor, provides sufficient protection against re-entry damage (armor by itself is *not* sufficient for this hull type).

Pod/frame: The cheapest and easiest to build, but impossible to apply certain technologies like stealth or magnetic shielding to. These hulls are not designed for re-entry or atmospheric use under any circumstances.

Hull chart Size	Usable hexagons			
	Winged	Lift body	Enclosed	Pod
-2	.23	.45	.7	.7
-1	.65	1.3	2	2
0	2	4	6	6
1	5	11	16	16
2	15	30	45	45
3	42	83	125	125
4	117	233	350	350
5	333	666	1,000	1,000
6	933	1,865	2,800	2,800
7	2,665	5,330	8,000	8,000
8	-	-	23,000	23,000
9	-	-	64,000	64,000
10	-	-	181,000	181,000
11	-	-	500,000	500,000
12	-	-	1,450,000	1,450,000

Usable hexagons refers to the hexagons that are *not* dedicated to aerodynamic surfaces. The actual size of the vessel in normal hexagons is equal to the number in the Enclosed or Pod column.

The minimum practical size for a starship range missile is size -1, and the minimum manned vessel (a work pod) is size 0. The smaller sizes are simply for reference designing sub-systems on a ship. For comparison of usable space to non-starship items:

Ship	Size	Comparison
Missile	-1	Motorcycle
Work pod	0	Car
Shuttle	3	Tractor-trailer
Fighter	3	B-1 bomber
Yacht	4	Yacht
Small freighter	5	Six boxcars
Frigate	6	Frigate
Medium freighter	7	Fifty boxcars
Destroyer	7	Heavy frigate
Cruiser	8	Light cruiser
Large freighter	9	Four hundred boxcars
Carrier	9	Med. aircraft carrier
Battleship	9	V.large nuclear sub
Vorn hvy. freighter	10	Graf Zeppelin
Bulk ore carrier	12	Supertanker
Vorn cityship	20	Long Island

EXAMPLE: A size 3 ship is 125 hexagons of space. However, a size 3 ship that is a "lifting body" only has 83 hexagons of usable space. The other hexagons are structure, surfaces, landing gear and controls related to atmospheric use. The United States space shuttle would be about a size 4 lifting body hull.

Large ships have a huge number of hexagons, but it is important to remember that the systems on such ships also take up a lot of space. And when it comes down to things like detailed hit locations, there are really only thirty-six or so system possibilities.

EXAMPLE: We start the design of the *Sesterce* by figuring the size of her hull and the hull configuration. The *Sesterce* will be a size 5 pod freighter, which means she has about 1,000 hexagons of usable space. Adventurers are on a budget, and will be buying a used ship, so we'll say it is a Late Atomic Era pod/frame hull, which would have a new cost of 1,500 Credits per hexagon, for a basic hull cost of 1,500,000 Credits.

You seldom need a detailed floor plan for a naval battleship, nor will you need one for a space-going dreadnought. At most, you will want to make a floor plan for something of interest to the adventurers, like the bridge, engine room or a generic section of corridor.

▼ **Note** - You can use the *Starship Universal Chart* to rough out basic hull costs. Take the ship's Size level times 3, add 5, then add the Money level of one hexagon of hull.

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Hull Stress - The technology used to construct a ship determines how much stress it can handle from acceleration, and how responsive it can be with a trained pilot. The maximum stress a hull can be rated for is based on the technology used and the size of the ship. U.W. scientists and naval architects have not been able to build hulls of any size that can reliably exceed 12g.

Tech	Hull stress level
Late Atomic Era	13 minus size
Early Post-Atomic Era	14 minus size
Post-Atomic Era	15 minus size
Late Post-Atomic Era	16 minus size

EXAMPLE: A Late Atomic Era size 5 ship like the *Sesterce* has a maximum stress level of (13 minus 5), equals 8. The *Starship Universal Chart* (page 8.10) shows this is a maximum acceleration of 3.2g. If this were a Post-Atomic Era hull, it would have a stress level of 10, or 6.4g.

▼ **ADVANCED RULE: OVERTHRUSTING** - A ship can easily have thrust that exceeds its hull rating, either because the engines were installed without the structural concerns taken into account (improvised or jury-rigged repairs), or because the hull has taken damage that affects performance. Exceeding the rated structural limits of a ship causes structural damage the first time the excess thrust is used and on any subsequent use that would thrust the ship in a *different* direction. The safe thrust that can be used is reduced by 1 level for each -1d of damage penalty. Hits from overthrusting are *not* subject to damage limit.

EXAMPLE: The *Jack of Spades*, a 2.3g-rated freighter, has engines that can produce 2.3g of thrust (level 7) and a hull to match (Late Atomic Era, size 6). If it takes a -1d damage penalty, the maximum safe thrust is level is now 6 (1.6g). If the *Jack of Spades* uses more than 1.6g of thrust, it will take 1 Hit of damage, but as long as the ship continues thrusting in the same direction, it is only 1 Hit. If the ship changes course and uses too much thrust again, it will take another 1 Hit.

Damage from overthrusting is applied to a random hit location and represents something stretching, snapping or otherwise getting bent out of shape by too much acceleration.

Cost & Weight - All hulls have a weight of .1 ton per hexagon. This is the default structure weight for space not filled with anything else. For instance, cargo holds have a variable weight in tons per hexagon (when loaded), which takes into account both the cargo type *and* the weight of the hull in that area. Area taken up by any aerodynamic surfaces is always .1 ton per hexagon.

As mentioned earlier, hulls have a cost of 3,000 Credits per hexagon for Late Atomic Era, 4,000 Credits per hexagon for Early Post-Atomic Era, and 5,000 Credits per hexagon for Post-Atomic Era hulls. Frame or pod hulls are at half cost. New military hulls in are double cost. Surplus military hulls are normal cost, but come with a military bridge (civilian hulls have to buy their bridge separately). Unlike weight, the cost for hulls is for all hexagons, even if they are used for other purposes.

EXAMPLE: The *Sesterce* is a size 5 pod freighter, built with Late Atomic materials and tech. Since this hull size has 1,000 usable hexagons, the empty hull has a weight of 100 tons. This hull will likely be filled to the last broom closet with economically useful space.

Hull modifications and other systems may have a size based on the hexagons taken by a ship some sizes smaller than the actual vessel. For instance, a system that takes "size-1" space on a size 4 ship will take up the hexagons of a size 3 ship.

If using advanced hit locations, systems of a given relative size will occupy the following number of hit locations:

System size	% of ship	# of hit locations
Size-1	≈35%	12-13
Size-2	≈12%	4-5
Size-3	≈4%	1
Size-4	≈1.5%	1 for 2
Size-5	≈.6%	1 for 6
Size-6	≈.2%	1 for 18
Lifting body	33.3%	12
Full wings	66.6%	24

EXAMPLE: A ship of any size that has a particular subsystem that is ship's (size-3) in size will take up about 4% of the ship, and occupy one hit location.

Anything of size-4 or smaller is generally added on to a location with some other system, like putting the hostile atmosphere sealing and fuel skimmers in the same hit location.

Hull modifications - The basic starship hull is airtight, has conduits, plumbing and other life support, power, computer, sensor and other infrastructure, but is otherwise an empty shell. An exception is that the cost of a hull covers the cost of the basic fittings for all quarters (since all the infrastructure of ventilation, plumbing and electricity is already paid for, the cost of adding furniture is minimal). Extremely luxurious fittings will cost what the ship designer wants to spend. This otherwise empty shell of a hull can be modified for specific purposes.

For purposes of space and cost, systems can take up fractional hexagons. This is often the case on very small vessels. For instance, a sensor drone (size-1) built for hostile atmosphere use will have (size-6) space taken up by the special sealing.

Streamlining: Ship streamlining is built in and virtually impossible to retrofit. Winged and lifting body hulls have the potential to survive re-entry, but they have to have sufficient armor as well. For simplicity's sake, all ships capable of re-entry are assumed to be able to do vertical take-off and landings. However, vertical landings are 2 points more difficult than a traditional runway landing. The cost and space taken by streamlining has already been covered.

Hostile Atmosphere Sealing: Some planetary atmospheres are corrosive, insidious, extremely poisonous, or have other side effects that are not tolerable in any amount. Any ship can have extra sealing, including protection for sensors, extra airlock filtering, decontamination sprays, special hull coatings and the like. This takes up hexagons equal to (size-5). These hexagons have no extra weight (use normal hull weight of .1 ton for these hexagons), but are counted as non-military systems of the same tech as the full for purposes of ship cost.

EXAMPLE: A size 10 hull (181,000 hexagons) built with hostile atmosphere sealing would require size 5 (1,000 hexagons) devoted to this system. On a Late Atomic Era hull, this would cost 10,000 Credits per hexagon, for a total cost of 10,000,000 Credits.

This modification can take up a hit location, and a hit to this location would represent a specific filter or decontamination system rather than the overall sealing of the ship.

Fuel Skimmers: Fuel skimmers allow a starship to collect the raw materials for a fusion plant, or reaction mass for a fission, fusion or antimatter engine, and each is tailored for one particular type of system; a fusion skimmer won't collect fission engine reaction mass. Skimming requires a ship with aerodynamic surfaces or full magnetic shields. Skimmers are non-military systems that take up space equal to (size-5), have a weight of .5 tons per hexagon, and a cost based on the tech of the engines they refine fuel for. Skimmers use empty fuel tankage for storing unprocessed fuel. This limits the amount that can be usefully skimmed (if you fill your tanks with unprocessed fuel, where do you put the processed fuel?).

A successful re-entry roll is required for a safe skim, the ship taking normal re-entry damage. Practically speaking, a ship needs to be doing orbital velocity and have an acceleration of half the planet's gravity to touch the upper atmosphere, skim some raw fuel and then accelerate back out. A good skim fills any desired amount of the ship's empty tankage with raw matter, which must be processed into the type usable by the power plant by the skimmer's purification unit. The purification unit uses its (size+10) in Strength from a power source and can process its own size in hexagons of fuel per day. Fission reaction mass is processed quickly, but it isn't practical to skim fuel for a fusion plant (though it is sometimes absolutely necessary), since processing is twenty times slower, and only about one percent of the skimmed materials are usable (in reality, it is actually even less).

EXAMPLE: An Early Post-Atomic Era size 5 exploration ship has hostile atmosphere sealing and fuel skimmers. Each of these systems takes up 6 hexagons of space (size level of 0) and costs 72,000 Credits. The hostile atmosphere sealing has no additional weight, while the fuel skimmers add 3 tons of weight to the ship and use 15d+0 Strength from the ship's reactors *while in operation*. The fuel skimmers can process 6 hexagons of conventional reaction mass per day, or refine 6/20th of a hexagon per day of deuterium for use by fusion engines. However, each hexagon of deuterium requires 100 hexagons of raw material. For this reason, refueling deuterium for fusion engines is best done on a planetary surface where you can just run a hose into the nearest source of hydrogen (like water, methane or ammonia) and dump the deuterium-depleted (and perfectly safe) processed water back into the ecosystem or use it to top off your ship's life support stores (everyone prefers fresh water over recycled water...).

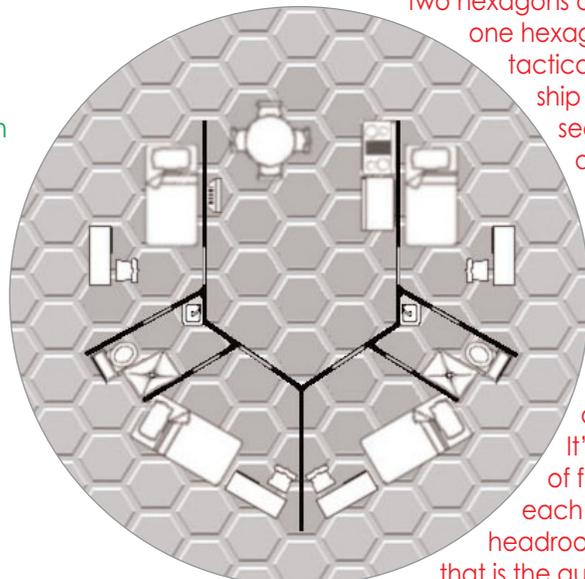
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Spin Hulls: Fighters and system vessels with patrol durations of less than two weeks have never been required to have artificial or simulated gravity. Deleterious health effects were negated by having enough planetside downtime between patrols. Passenger ships, freighters, and long-duration military vessels require some form of gravity for health purposes. Before artificial gravity was developed, the only practical means of generating "down" was to have a rotating habitat ring or pod. Because ship thrust is usually down the long axis, spin quarters usually rotate around this axis, and may be canted or adjustable so that "down" is towards the floor under normal thrust. It is usually impractical to generate more than about a quarter of a gravity because of the size and spin rate required.

In terms of ship design, this really just means that hulls earlier than Post-Atomic Era should have any "quarters" locations towards the top or bottom of the detailed hit locations chart, to represent being on the outer periphery of the hull. One quarters location can be deep inside the ship to represent a radiation shelter, special zero-g accommodations, etc.

▼ **Note** - Crew requirements and quarters is next. Aside from being a design exercise, this is the space adventurers will be occupying in the event of things requiring a map (i.e. combat). For making a floor plan, about half the space of a "set of quarters" is actually the quarters, and the rest is halls, dining areas and such. Remember to add in any separate space taken up by the bridge, weapon stations, etc. For space with headroom (like quarters), each

two hexagons of quarters is one hexagon on a tactical map. So, a ship with four sets of second class accommodations (120 hexagons of volume) might look like this. It's not very big, but it does provide for the needs of a small crew. It's 60 hexagons of floor plan, since each hexagon has headroom, and half of that is the quarters, the rest being a common area.



Quarters & Crew - A starship will require a certain number of crew to effectively operate it. This is just to make sure it can reliably move from point A to point B, and does not include housekeeping staff, gunners or that cute cook on Deck C. The required crew is based on the vehicle's size and tech era. The main caveat is that cargo or other empty space like fuel tankage generally does not count towards vehicle size for determining crew. Round the space used to the next lowest table entry.

Vehicle space	Size	Crew
1 hexagon	-2	1/16
2 hexagons	-1	3/32
4 hexagons	0	1/8
8 hexagons		3/16
16 hexagons	1	1/4
32 hexagons	2	3/8
64 hexagons		1/2
125 hexagons	3	3/4
250 hexagons	4	1
500 hexagons		1 1/2
1000 hexagons	5	2
2000 hexagons	6	3
4000 hexagons		4
8000 hexagons	7	6
16000 hexagons	8	8
32000 hexagons		12
64000 hexagons	9	16
125000 hexagons	10	24
250000 hexagons		32
500,000 hexagons	11	48

Technological Era	Size
Late Atomic Era	+2 rows
Early Post-Atomic Era	+1 row
Post-Atomic Era	+1 row
Late Post-Atomic Era	+1 row
Advanced	+0 rows

Ship type	Amount
Military vessel	+1 row
Short haul vehicle	-1 row
Very short haul vehicle	-2 rows

Automation	Amount
Lower tech system (x1/2 veh. cost)	+2 rows
Ship equipped with AI	-2 rows
Extra automation (x2 veh. cost)	-2 rows

A vehicle with a crew requirement of less than one can operate unattended, and vehicles with insufficient crew can often still operate, but cannot keep up the maintenance needed, or operate all ship functions at full effectiveness.

A "military" vessel is not a military hull, but a vessel using military procedures (all stations manned at all times). A short-haul vehicle is one that typically spends less than a week away from a starbase at a time, and a very short haul vehicle is one that typically starts and ends the same day docked with a larger vessel or facility. A fighter would be a very short haul military vessel.

A ship with an AI can handle many of the routine monitoring tasks a crew normally has to handle, reducing the crew requirement. A starship with extra automation has dedicated maintenance drones, fault-tolerant systems, highly automated diagnostics and other systems also designed to reduce the need for a crew. A ship that has less automation requires extra people to do these tasks, either because the systems are poorly designed, or are so new or specialized that all the bugs haven't been worked out yet. Adjusted costs for automation apply to the whole ship, so you simply halve or double the final cost.

EXAMPLE: The *Sesterce* is a size 5 pod freighter built with Late Atomic tech. The tech shifts the crew requirement by +2 rows, so the *Sesterce* needs a crew of 4 to adequately operate and maintain all its systems. However, this number assumes that the full size of the *Sesterce* is systems that require crew. If thirty percent of the *Sesterce* were "dead" space like cargo holds and fuel tankage, the *Sesterce* would only be 700 hexagons (instead of 1,000). This would put the *Sesterce* on the 500 hexagon row with a two row shift, for a required crew of 3.

How the required crew is allocated is generally in proportion to the space taken up by the various systems that require crew when the ship is in space. This would typically be power sources, engines, labs, sensors, weapons, and bridge. You may subtract the captain and executive officer (if any) from the total before dividing it up, but on small ships the captain will actually be doing some other role as well.

EXAMPLE: If a ship has 300 hexagons of reactors, 500 hexagons of engines, 100 hexagons of sensors, and 100 hexagons of bridge, this is a total of 1,000 hexagons. So, in this case, each 10 hexagons is one percent of the crewed systems. If it had a crew of 6, you strip out the captain, leaving 5. Since 800 hexagons are devoted to engines and reactors, 80% of these 5 crew (or 4 of them) are on the engineering staff in one capacity or the other, and are constantly working on maintaining the engine and reactors and everything they are connected to. The other 1 person is the flight crew, the pilot, sensor operator and astrogator (in combination with the captain). Remember that some of these people may be cross-trained.

For a civilian ship, not all stations are manned at all times, though personnel are always on call. For military ships, the crew complement is split between two or three shifts, hence the need for an executive officer or other commander when the captain is not on duty.

Once you have figured out how much crew a ship needs, you have to put them somewhere. Most military ships will use 8 hexagons per person (size 1 for 2 people), which represents stacked bunks, shared bathrooms and showers, narrow hallways and the occasional need to duck to avoid banging your head on something. This is something akin to the space constraints on a submarine. Military quarters are an unavoidable side effect of buying a surplus military hull. You may be able to knock out bulkheads to make the quarters bigger, but the interior of the ship will never be roomy or luxurious.

Third class civilian accommodations are about 40 hexagons (size 2) per person. Increase this to about 60 hexagons (size 3 for two) second class, and increase it to 125 hexagons (size 3) for each first class accommodation. Full lieutenants and above on a military vessel usually get the equivalent of third class accommodations, commanders get second class and the captain gets first class. Smaller ships may not be able to afford this luxury, but ranking officers will still have some space advantages. All quarters of third class and up can sleep two at no penalty to life support but at a penalty to elbow room.

# of berths	Size			
	Military	3rd cl.	2nd cl.	1st cl.
1		2		3
2	1		3	
3		3		4
6	2		4	
9		4		5
18	3		5	
27		5		6
54	4		6	
81		6		7
162	5		7	
243		7		8
486	6		8	
729		8		9

▼ **Note** - Size is listed for quarters so you can figure their total size in comparison to the ship, remembering that each tripling of the number of berths will increase their size by 1.

EXAMPLE: If one first class berth is 125 hexagons (size 3), then three of them would be 375 hexagons (size 4) and nine would be 1,125 hexagons (size 5).

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The space for quarters also includes hexagons taken up by corridors and anyplace else a person could be expected to go. It *does not* include the maintenance crawlways and other tight spaces around other starship systems. Quarters also include in their cost and mass the ship's life support systems, which require electrical power of their equivalent size+6 to operate. Post-Atomic Era quarters include artificial gravity, which uses their equivalent size+7 to operate (size+6 when gravity is off). Emergency life support (dim lighting, less temperature control) uses 2d less power to operate.

Quarters have their cost and mass built into the hull cost, for a weight of zero tons per hexagon. Spending 1,000 Credits per hexagon will make the quarters luxurious (within the limits of their size), and 2,000 Credits per hexagon will make them opulent.

For purposes of advanced hit locations, a ship with more than one quarters location may specify a particular one as a life support node, a place where some critical reprocessing equipment is. Only a hit to that location will affect the life support functions, otherwise, quarters hits simply result in a hull breach.

EXAMPLE: We know the *Sesterce* needs a maximum crew of 4 to adequately operate and maintain all systems (we don't know yet exactly how much cargo space she has yet). In addition, its operator put in two second-class berths to carry the occasional paying passengers (otherwise, small, valuable cargoes are carried in the quarters). The captain also gets a second-class berth, and the rest of the crew has third-class berths. This is a total of three second-class berths (180 hexagons) and three third-class berths (120 hexagons), for a total of 300 hexagons (out of a total of 1,000). This is a little less than a third of the ship, so the full accommodations are eleven hit locations. No extra money is spent on the quarters, so they are effectively free. The *Sesterce* is a Late Atomic Era ship, so it has a spin hull to provide artificial gravity. An area of 300 hexagons rounds to the equivalent of a size 4 ship, so life support requires a reactor output of size+6, or 10d+0 for full power, and 8d+0 for emergency life support. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.50MCr
Quarters	300	4	0	11	0MCr

In real-world terms, the entire space taken up by the quarters for six people is about the same as a small house (≈120m² or ≈800ft²).

ADVANCED RULE: OVERLOADED LIFE SUPPORT -

A ship's ability to carry people is based on the *area* that has life support, not the number of bunks. If you divide the total quarters area by eight hexagons (round up), this is the number of people a civilian ship can (in theory) support. Double the support capacity for military hulls. Double *this* amount is the most that can actually fit (which *will* overload life support). This maximum capacity involves stacking people in corridors like cordwood, and don't even think about the lines for (or conditions in) the bathrooms. However, carrying anything more than the *designed* amount adds 1d to the Strength requirement for each time the normal number of passengers is doubled.

EXAMPLE: The *Sesterce* normally carries up to 8 people (4 crew, plus up to 4 (double-bunked) in the extra second-class accommodations). However, the 300 hexagons can theoretically *support* up to 38 people (and *carry* up to 76 people in a "boatload of refugees fleeing an impoverished Caribbean nation" level of crowding). Carrying 32 people would double the capacity twice, so if overloaded to this level, life support would require 12d+0 Strength to keep up with the load.

Overloaded life support goes through any supplies proportionately faster. A ship which is loaded *beyond* maximum life support capacity will cause all passengers to take 1d+0 in unrecoverable non-lethal hits per day, per time the capacity is exceeded (overcapacity is 1d+0 damage, 2x overcapacity is 2d+0 damage, etc.). Damage taken after Strength + Health is exceeded counts as lethal damage.

A ship which has taken a damage penalty has its effective life support capacity reduced by half per -1d penalty. This normally does not make a difference unless the ship is already near capacity.

EXAMPLE: The *Sesterce* has to pick up 50 refugees from a vessel badly damaged by pirates. These people cram the hallways and every possible habitable space in the ship, and they strain the *Sesterce's* life support to the breaking point. After one day, the air begins to go foul and people start complaining of headaches and fatigue that won't go away. If the *Sesterce* cannot make port in a few days, people *will* start dying.

Armor - The armor of a starship represents both physical and energy defense, protection from stray (and directed) radiation, micrometeorites, and other space debris. Starships are required to have an overall minimum armor *level* of at least their Hull size *plus* 1d (remember that the default armor for an unarmored ship is 1d+0). This is a United Worlds safety requirement, not a structural requirement. Jodoni and other ships have no such legal requirement, and U.W. ships may have certain exceptions.

EXAMPLE: The *Sesterce* has a size 5 hull, so it is required to have an average of 2d+2 armor (level 5 would be 1d+2, then add +1d). A size 8 hull is required to have an average of 3d+2 general armor.

For ships that carry external cargo pods, the armor requirement only applies to the main ship structure. Cargo pods have their own requirements, again, based on their size. Large cargo pods (size 4, 350 hexagons) are required to have an armor of at least 1d+1 for bulk goods, 2d+1 for items requiring minimal protection from radiation or temperature extremes, and 3d+1 for pods carrying goods that require any sort of pressurized atmosphere, hot/cold temperature control or life support. Very large cargo pods (size 5, 1,000 hexagons) require 2d+0, 3d+0 or 4d+0 armor for the same categories. In addition, cargo pods can be designed for re-entry (once) and parachute landing. These are used (rarely) for re-supply of colonies and military forces, and can also be used on streamlined ships as an external cargo space that can survive re-entry stress.

Ships can mount several kinds of armor. The base armor of a ship depends on its size and tech era:

Tech	Base armor
Late Atomic	7d+2
Early Post-Atomic	8d+1
Post-Atomic	9d+0
Late Post-Atomic (Vorn)	9d+2

A ship cannot have more *tons* of armor than half its *hexagons* of space, so for instance, a 1,000 hexagon ship cannot have more than 500 tons of armor. This not a mandatory limit, just a suggested one. If you want to make a space station out of a hollowed-out asteroid, it can be almost all armor, but then you start getting into issues like having so much armor that it starts taking up internal volume of the ship, and we'd rather not get into that.

A vessel gets a bonus to this base armor amount based on the weight of armor applied, and a penalty based on the size of the ship:

Armor mass	Effect
.06 tons armor	-4d penalty
.12 tons armor	-3d penalty
.25 tons armor	-2d penalty
.5 tons armor	-1d penalty
1 ton armor	+0d bonus
2 tons armor	+1d bonus
4 tons armor	+2d bonus
8 tons armor	+3d bonus
16 tons armor	+4d bonus
32 tons armor	+5d bonus
64 tons armor	+6d bonus
125 tons armor	+7d bonus
250 tons armor	+8d bonus
500 tons armor	+9d bonus
1,000 tons armor	+10d bonus
2,000 tons armor	+11d bonus
4,000 tons armor	+12d bonus
8,000 tons armor	+13d bonus
16,000 tons armor	+14d bonus
32,000 tons armor	+15d bonus
Each doubling	+1d bonus
Each +25% (up to twice)	+1 bonus
Each -25% (once)	-1 penalty

Completely unarmored ships are assumed to have a minimum final armor of at least 1d+0. Armor has a cost appropriate to the hull tech. Armor does not take up any hexagons of space. You just base the cost on the tonnage of armor, times the cost for one hexagon of hull (do not count hull type modifiers). To properly give the effects of making it hard to hurt large ships, the penalty for vehicle size is capped at -8d, regardless of size.

Vehicle size	Damage limit	Armor effect
-2	9	-0d penalty
-1	7	-2d penalty
0	5	-3d penalty
1	4	-5d penalty
2	3	-6d penalty
3	1	-7d penalty
4	0	-8d penalty
5	-2	-8d penalty
6	-3	-8d penalty
7	-5	-8d penalty
8	-6	-8d penalty
9	-8	-8d penalty
10	-9	-8d penalty
11	-11	-8d penalty
12	-12	-8d penalty

Armor modifiers	Armor effect
Each +25% extra (up to twice)	-1 penalty
Each -25% less (once)	+1 bonus

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EXAMPLE: You have a size 7 destroyer at Post-Atomic Era tech, and you want to know how tough it will be with 2,000 tons of armor on it. Start with the technology base for the Post-Atomic Era of 9d+0. Apply +11d for the weight of the armor, then -8d for the size of the ship. The result is 12d+0, and a damage limit of -5.

This is a passable level of armor, on par with the front of a modern tank. It isn't all that compared with a ocean-going warship. But you also have to take the damage limit of -5 into account. It takes six hits from any weapon that penetrates this armor to raise the damage limit to 1. The seventh hit does 1 Hit, then the damage limit is reset back to -5.

The armor for Post-Atomic Era ships costs 5,000 Credits per ton (same as hull cost per hexagon), so 2,000 tons of armor will cost 10,000,000 Credits.

EXAMPLE: Just because the *Sesterce* is a pod freighter doesn't mean that the framework can't be strengthened, or that key systems can't be protected against damage.

The *Sesterce* has a tech era armor base of 7d+2, with a -8d penalty for its size, and a damage limit of -2. To meet minimum U.W. guidelines, the current armor rating of *negative* 0d+1 needs to be increased to 2d+2 (equivalent of its hull size, plus 1d). This requires adding 3d+0 in armor (yes, you *must* buy it up from the negative level). We decide to add 6d+0 in armor. Looking at the table on the previous page, we need 64 tons of armor to add +6d, at a cost of 3,000 Credits per ton for a total of 192,000 Credits for a final armor rating of 5d+2. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr

▼ **Note** - The minimum armor mandated by the U.W. is *not* for protection against pirates, but for protection against the hazards of space itself. Ships transiting out to a Rozkhov Radius reach speeds where grains of sand are potential hull-breaching projectiles, and debris the size of a pebble can hit with the force of a cannon shell. The minimum armor requirements may not stop such debris, but it will slow it down and prevent it from blasting in one side of a ship and out the other. Repairing micrometeor hits is part of the constant maintenance any ship in space has to keep up with.

Facings: Armor normally applies equally to all facings (front, rear, top, bottom right, left), but you may remove 2d (or 2 points) of protection from a side or combination of sides to give +1d (or 1 point) to another side. You can only do this if you have armor of more than 1d+0 on the side you are removing armor from.

EXAMPLE: A ship with an armor of 2d+2 on all facings can remove 0d+2 from the top, right and left to give +1d to the bottom (the top, right and left each contribute 0d+1, for a total of +1d bonus).

Specialized armor: Armor can be specialized for certain uses. You sacrifice 1d of protection on a given facing to get +2d protection against a particular type of damage. This bonus to armor has zero effect against other types of damage. The types of damage armor can be specialized for are:

- Laser damage
- Plasma bolt damage
- Re-entry damage

Base armor cannot be reduced below 1d+0 for specialized armor purposes.

EXAMPLE: A shuttle with 4d+0 front and bottom armor needs to be able to survive re-entry damage, which is at least 6d+0 to the front and bottom of the shuttle. It gives up 2d+0 of normal protection on these facings to get +4d protection against re-entry damage. Added to the remaining 2d+0, this gives the shuttle 6d+0 armor on the front and bottom against re-entry stress, but only 2d+0 against all other attacks.

Most StarForces ships do not have armor specialized for any purpose except re-entry damage. No form of armor has proven more effective against the Vorn gravity shear, so the main strategy has simply been to apply heavier armor to the facing you expect to take the brunt of the damage.

▼ **Note** - As long as a ship had sufficient armor before specialized armor was applied, it will meet U.W. safety requirements. So, in the previous example, a ship with 6d+0 re-entry protection but only 2d+0 normal protection counts as having the original 4d+0 armor for purposes of meeting regulatory requirements.

Magnetic shielding - Magnetic screens are a separate form of armor. They count as an extra layer of armor (using normal **EABA** armor layering rules), and are based on superconducting lattices built into the hull and powered by the ship's reactors, consuming Strength each turn they are on. They work against particle beams, ion cannons, plasma bolts, re-entry damage, hypervelocity guns, and most forms of ionizing radiation. Magnetic screens can be retrofitted onto winged, lifting body or enclosed hulls that originally didn't have them. They have no effect on lasers and most other projectiles. It is easier to protect small ships with magnetic screens as they have a proportionately smaller surface area to protect. Any level of magnetic screens negates the extra penetrating effect of particle beams or ion cannon.

The conduits, wiring and control systems of magnetic shielding take up space equal to size-4 hexagons. The system weighs .5 ton per hexagon and costs like a non-military system for the tech of the hull it is mounted on (ignore military modifiers).

The Strength of energy pumped into the system each turn, minus the armor effect for that size ship, counts as an extra layer of armor, using normal **EABA** layering rules (assume the shielding is halved). You cannot get a larger bonus than half (round up) of the *conventional* armor on that facing or +3d, whichever is smaller.

EXAMPLE: The size 7 destroyer from the previous example mounts magnetic shielding. This takes up the same space as a size 3 ship (125 hexagons). A size 7 ship has a -8d armor effect, so if this ship pumped 15d+0 energy into shielding each turn, they would get a 6d+0 armor. This is halved to +3d and added to the physical armor level of 12d+0, to get a result of 15d+0 protection against plasma bolts, ion cannon, and re-entry damage, since +3d bonus is the most a ship with 12d+0 armor can have.

This shielding system weighs 63 tons, and costs 16,000 Credits times 125 hexagons, equals 2,000,000 Credits.

On a ship record, the protection from screens will already include any halving, and be listed just as its bonus under maximum reactor power or the maximum power needed for full protection. Each 2d less power applied to the shields reduces effect by 1d (because of the halving).

EXAMPLE: A shield listed as "+3d" means that if full reactor output is applied to shields, the vessel gets +3d to armor against applicable attacks. If you can only spare reactor output minus 2d, then shields only provide +2d protection.

Engines - Engines provide thrust, not electrical power. Just because a fission engine contains a superhot radioactive core does not mean that it generates any power for ship's systems. Fission, fusion, and antimatter engines do produce enough power to run their own subsystems as a safety measure, but can only provide their Strength minus 8d of spare power (much like an automobile's engine produces electrical power through an alternator, but not as its primary function). On many ships this is sufficient, but is seldom a viable proposition for charging Rozkhov Drives or powering starship weaponry. The advantage of using engines as thrust *and* power source is most often seen on short-duration, high-thrust ships like fighters, unlike civilian ships which will find it more efficient to run reactors that last for years for their power needs rather than idling a huge and fuel-hungry engine that they can afford to feed for a period of weeks at best. Starports also frown on having drive reactors powered up while you are docked.

▼ **Note** - An engine that is producing electrical power but not thrust (like an idling automobile engine) is only consuming fuel at a tenth the rate it would under full thrust. So, a fission engine with 20d+2 thrust which uses 3 hexagons of fuel per day could be used as a 12d+2 power reactor (thrust minus 8d) that uses .3 hexagons of fuel (as coolant) per day.

A starship's top speed is more or less unlimited. The vacuum of space provides no resistance to continued acceleration, so a ship can keep increasing in speed until the erosion and secondary radiation caused by impact with interplanetary dust become a concern. Practically speaking, U.W. ships simply can't carry enough fuel to reach these speeds (or are smart enough to stop accelerating before reaching that point).

A ship can have widely varying masses within a given size. An unarmored pod freighter will be much lighter than a heavily armored cruiser. The same engines on the freighter will power it to a higher acceleration than they would the cruiser, even though both ships are the same size.

In **Fires of Heaven**, engines are extraordinarily powerful for their size, and ships can routinely mount engines and carry enough fuel allow accelerations at reasonable thrust for weeks at a time. *And they need it.* Just the transit time to and from a Rozkhov Radius will take a 1g ship a little more than a week.

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In **EABA** terms, engines have a Strength level, which is compared to the mass of the ship. Take *half* the engine Strength (rounding to nearest 0d+1), subtract the adjustment for mass, and check on the table to the right. The end result is the acceleration the ship can do. All the examples involving specific engines will refer to the numbers on the ship system chart on [page 8.73](#).

Ship mass	Level	Strength adjustment
1 ton	0	+0d bonus
2 tons	3	-1d penalty
4 tons	6	-2d penalty
8 tons	9	-3d penalty
16 tons	12	-4d penalty
32 tons	15	-5d penalty
64 tons	18	-6d penalty
125 tons	21	-7d penalty
250 tons	24	-8d penalty
500 tons	27	-9d penalty
1000 tons	30	-10d penalty
2000 tons	33	-11d penalty
4000 tons	36	-12d penalty
8000 tons	39	-13d penalty
16,000 tons	42	-14d penalty
32,000 tons	45	-15d penalty
64,000 tons	48	-16d penalty
Each doubling		-1d penalty
Each 25% extra mass (max +50%)		-1 penalty
Each 25% less mass (max -25%)		+1 bonus
Atmospheric movement		+1d bonus

If remaining Strength is between table entries (even with +1 or -1's factored in), count it as whichever one it is closer to, rounding ties to the faster amount (but you have to have at least -4d Strength for any sort of legal starship).

▼ **Note** - The reason you are using half the Strength is because this makes results compatible with the normal **EABA** vehicle system, which gives results for engines in terms of top speed, rather than acceleration.

To do it backwards, you can take the Strength remaining for the acceleration you want, then add the mass adjustment, then double the result. This gives you the engine Strength you need.

EXAMPLE: If you want an acceleration of 2.0g in an 8 ton ship, you take the Strength for 2.0g (6d+2), add the mass adjustment for 8 tons (-3d), giving 9d+2, then double that to get the necessary engine Strength of 19d+1(18d+4).

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Strength remaining	Acceleration	Level
-(4d+0)	.1g	-2
-(2d+1)	.15g	-1
-(1d+1)	.2g	0
0d+0	.3g	1
1d+0	.4g	2
1d+2	.5g	2
2d+1	.6g	3
3d+1	.8g	4
4d+1	1.0g	4
4d+2	1.1g	5
5d+2	1.6g	6
6d+2	2.0g	6
7d+0	2.3g	7
8d+0	3.0g	7
8d+1	3.2g	8
9d+0	4.0g	8
9d+1	4.5g	9
9d+2	5.0g	9
10d+1	6.0g	9
10d+2	6.4g	10
11d+0	7.0g	10
11d+1	8.0g	10
12d+0	9.0g	11
12d+1	10.0g	11
12d+2	11.0g	11
13d+0	12.0g	11
13d+0	12.5g	12
13d+1	13.0g	12
13d+2	15.0g	12
14d+1	18.0g	12
14d+1	18.6g	13
14d+2	20.0g	13
15d+0	23.0g	13
15d+1	24.8g	14
15d+1	25.0g	14

EXAMPLE: At this point, we decide that the *Sesterce* will have an empty mass of about 500 tons and will be able to pull .2g when empty (more if it drops its cargo pods). Since an acceleration of .2g requires a residual Strength of *negative* 1d+1, and a mass of 500 tons is a -9d penalty, we subtract 1d+1 from 9d to get 7d+2, then double that to get 15d+1 (14d+4). The *Sesterce* will need engines with a total thrust of 15d+1. We have yet to decide what type of engines will be used, but at least we know *about* how powerful they need to be.

▼ **Note** - If the gamemaster wants faster ships to zip around their **Fires of Heaven** universe, they can alter the table numbers by a constant of their choosing. For instance, adding 2d+1 to all engine Strengths effectively doubles their thrust in g's.

As a very good approximation, it takes an extra residual Strength increase of 2d+1 (about double the engine mass) to double your acceleration (+2 levels) and an extra 1d+1 of Strength to increase it by about half. It takes staggeringly huge amounts of energy to push a ship at high acceleration for a significant amount of time. Look at the fuel it takes for a Space Shuttle to thrust for one starship turn. Even rockets a hundred or even a thousand times as efficient will burn through a *lot* of fuel in a day's time (240 starship turns).

At this point in the design process, you will have to decide how heavy your ship is when empty and when loaded, and what kind of performance it is going to have. With a few regulatory exceptions, all U.W. ships have to be able to accelerate at .1g at 100% engine and cargo capacity for at least a week.

EXAMPLE: We figured the *Sesterce* would want engines with a thrust of 15d+1 to push an empty mass of 500 tons (-9d Strength adjustment) at .2g. A thrust of .1g is a Strength 2d+2 less than this. If we look at the table on the previous page, that would be a Strength adjustment of -11d+2, which would be a mass of 3,000 tons. The "gross vehicle weight" of the *Sesterce* would be 3,000 tons, the maximum mass it could push at .1g. Starports will not load cargo that would cause the *Sesterce*'s loaded mass to exceed this amount. We need to know all this because as a cargo ship, the *Sesterce* could carry anything from lightweight exotic woods to loads of heavy metals, and it is possible that the *Sesterce* would have to travel with empty pods to meet legal weight requirements because of heavy cargoes in the other pods.

Engines will have a fuel consumption, a power consumption, or both, depending on the type of engine. Power consumption is a continuous drain. If the engine is running, it uses this much electrical power. Fuel consumption is the same. The listed amount is the hexagons of fuel that engine uses per day of full thrust. Engines do not have to use full thrust, but are not any more fuel efficient at lower thrust levels. You have the same *total* thrust in a fuel load, whether you use it 1g of thrust for a day, or .1g of thrust for ten days.

Power and fuel consumption are proportional to thrust. Losing 1d of thrust Strength reduces power consumption by 1d and fuel consumption changes in proportion to the change in acceleration.

EXAMPLE: A ship with an ion drive that has a residual Strength of 3d+1 has an acceleration of .8g. If the ship reduces thrust to 1d+0 (.4g acceleration), the reactor output to run the ion drive is reduced by 2d+1, and fuel consumption is cut by half (since the acceleration was cut by half).

Multiple engines *do not* add Strength. Ships with multiple engines of the same thrust get +1d Strength each time you double the number of engines, and the total Strength is used to figure ship acceleration.

EXAMPLE: A one ton missile (+0d Strength adjustment) with a 20d+0 engine has a residual Strength of 10d+0 and an acceleration of 6.0g. The same missile with two of these engines would have an engine Strength of 21d+0 (+1d for two engines), but this is halved to give a residual Strength of 10d+2, for an acceleration of 6.4g.

A ship with one large engine will be more efficient than one with two smaller ones. The Jodoni accept this limitation for the increased reliability you get with two engines. The only time you will find a Jodoni ship with one engine is if it is a design that is always deployed in pairs (though things like work pods are assumed to be "paired" with their mothership, and so only need one engine.

When you become more comfortable with the design process, you can refit a multiple engine design with a custom built single engine that is more efficient, or an engine that is somewhere between the sizes listed in the component guide.

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Engine types - Now that you have some idea of how much power you need, you can decide on what will be used to provide it.

Turbothrusters: A turbothruster is a reactor-powered turbojet or turbofan designed solely for atmospheric flight. Steam or some other working fluid drives half of a turbine, while the other half moves air like a jet engine, although without burning fuel. Turbothrusters come with gimbaled nozzles allowing a ship to hover in midair. In thin atmospheres, turbothruster output is -1d, and it is +1d in thick atmospheres. Turbothrusters may not be used to reach orbit by themselves, but can provide up to half the acceleration needed by other rockets to do so. Turbothrusters have a weight of .5 ton per hexagon of space they occupy.

EXAMPLE: An 8 ton (-3d Strength penalty) winged shuttle uses turbothrusters (powered by a 10d+2 compact fusion reactor) for unlimited cruising range in atmosphere. A pocket turbothruster has a thrust of 10d+2, is halved to 5d+1, and takes a -3d mass penalty, which gives a final Strength of 2d+1 and a final acceleration of .6g, more than enough for a winged vehicle in a 1.2g or less environment (because of the one hundred percent bonus a winged vehicle gets in normal atmosphere). The shuttle cannot use these jet turbines to escape the atmosphere, but it can use the 2d+1 thrust for evading enemy fire, and it will decrease rocket engine thrust needed to reach orbit. If something happened to the reactor that dropped total power by 2d (to 8d+2), then the adjusted Strength would be reduced by 1d down to 1d+1 (half the Strength, minus 3d for mass), and acceleration would drop to .5g, barely enough to keep it aloft in a 1g gravity well.

Turbothrusters as genuine old-fashioned fuel-burners (burning synthetic hydrocarbons) have +2d Strength and burn 1.2 hexagons of fuel per day per hexagon of turbothruster, and their listed size includes 2.5 hours (25 turns) of fuel at no extra size or mass penalty. They do not require an external power source, but they do require an oxygen-containing atmosphere (15-25%) at a pressure of at least half Earth-normal to not more than double it. Performance will vary with oxygen content and pressure. Fuel-burning turbothrusters do produce electrical power as a side effect, just as most other engine types do.

Fission Rockets: These are Late Atomic Era, largely phased out, but durable and still in use in a lot of places where their small size and ready fuel supplies make them more attractive than bulkier but more fuel-efficient fusion engines. They use a fission reactor to superheat reaction mass for thrust. Every few years of use the reactor core will need to be replaced or refurbished at about a quarter of the cost when new. It will also be inspected for radiation leaks annually by U.W. authorities, and possibly more frequently by local governments. Fission rockets have a weight of .5 ton per hexagon of space they occupy.

Fission piles are powered by standardized pellets of a uranium isotope that doesn't produce weapons grade plutonium, manufactured in a limited number of tightly controlled facilities. Keeping the environment clean of low-level contamination is an ongoing process at high-traffic areas like landing fields. Ships using fission rockets are charged double for landing permits at planet-side facilities, may be forced to land at far less convenient locations and use special landing approach corridors.

EXAMPLE: An old 16,000 ton (-14d Strength penalty) "tramp steamer" equipped with a large fission drive (thrust Strength of $25d+2$, 40 hexagons of space). This gives a residual Strength of $-1d+0$, good for a passable acceleration of .2g. This engine consumes 24 hexagons (about 12 tons) of hydrogen as reaction mass per day. If this ship carries two week's worth of maneuvering fuel, it will take up 168 tons of the ship's total mass allotment of 16,000 tons, at a cost of 16,800 Credits.

Reaction mass for fission rockets is typically just purified water, which is broken down by the engine into hydrogen (as needed for thrust) and oxygen. Most of the latter is wasted, but most ships can scavenge small amounts to supplement life support systems. Fission reaction mass costs 50 Credits per hexagon.

Ion Cruise Rockets: These are Late Atomic Era, but still widely used on civilian vessels because they are small, extremely fuel-efficient, and the same reactor that charges up the Rozkhov Drive can be used to run the ion drive on the way out to the jump radius. However, they do not provide much thrust and consume prodigious amounts of electrical power, often more than the ship's reactors can provide. Ion rockets use the electrical output from a ship's reactors to accelerate gas or metal ions to extremely high speeds and then expel them as reaction matter. This expelled material could be argon, xenon, cesium, cadmium, mercury, or something similar. An ion drive requires its Strength output plus $5d+2$ from ship's power reactors per turn. Ion drives do not work in an atmosphere (firing one up in atmosphere would ruin it). Ion drives have a weight of .5 ton per hexagon of space they occupy.

Ion drive reaction matter is usually argon or xenon gas. More primitive models may use heavy metals like mercury or cadmium. Most localities have regulations against aiming an older ion drive at a planet as a ship accelerates away, to avert any risk of heavy metal contamination, even though most heavy metal drives have been scrap for a century. Ion drive reaction mass costs about 1,000 Credits per hexagon.

EXAMPLE: A 4,000 ton bulk hauler (a -12d Strength penalty) mounts a large ion drive (Strength of $17d+0$). The residual Strength of $-3d+2$ gives this ship an acceleration of about .1g. This ion drive will use .65 hexagons of xenon gas fuel each day at full thrust, and use $22d+2$ of reactor power. Since this ship is probably several thousand of hexagons in size, it can carry a few months of fuel (say 40 hexagons worth) at little penalty. Fuel isn't the problem, power is. It would take a very large fusion reactor (640 hexagons) to power this one engine, which for the record, represents *several thousand megawatts* of constant output. Which, by the way, is why you want a full-time certified engineer on your ship, because even a one tenth of one percent imbalance somewhere in this system is something like several megawatts of uncontrolled power doing nasty things to your engine room...

EXAMPLE: We've decided on the performance the *Sesterce* needs (.2g), the Strength required (15d+1), and for sheer economy it will use ion cruise rockets. To get the performance we want, we can use a pair of medium ion drives or one large one. While the large unit would give us a higher overall thrust, the adventurers like the redundancy of having a pair of drives. It also meets with the approval of a Jodoni adventurer, who would consider only one engine a very inauspicious thing.

A medium ion drive has a thrust of 13d+2. Since +1d represents a doubling of power, a pair of these drives gives a thrust of 14d+2. This is a little less thrust that we calculated, but the adjusted Strength comes out to -1d+2, which still rounds to the desired acceleration of .2g. This will, however, drop the gross vehicle weight of the *Sesterce* to 2,500 tons (instead of the 3,000 tons we estimated before).

This will take only 20 hexagons of space (a little less than size 1). Since it is a Late Atomic Era technology, it costs 10,000 Credits per hexagon, for a total engine cost of 200,000 Credits. We'll also need to eventually get a power reactor with a Strength of *at least* 5d more than the total thrust (reactor power of 19d+2), and probably more than this since we want to run other systems as well.

Each engine goes through .15 hexagons of fuel per day. If we want to have a month's worth of fuel on board, this will be 30 days times .15 hexagons times 2 engines, equals 9.0 hexagons of fuel. We add a touch more to make an even 10 hexagons. The fuel tankage has no cost by itself, but filling the tanks costs 10,000 Credits, for an engine operating cost of a bit more than 300 Credits per day (and you thought your SUV was bad...). So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr

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Fusion Rockets: These are Early Post-Atomic Era - what most current ships use. They use the plasma vented from a specialized fusion reactor to provide thrust. They do not provide as much thrust as a fission engine of the same size, but are a lot more frugal with their fuel and produce less radioactive pollution. Every few years of use the reactor core will need to be replaced or refurbished at about a quarter of the cost when new.

Fusion fuel is typically deuterium (found in small quantities in most sources of water, as well as methane or gaseous hydrogen) mixed with a small amount of rarer helium₃. The fuel is completely safe to handle and store in basic containers, but it does emit alpha particles, so spilled fuel is a minor radiation hazard.

EXAMPLE: The old 16,000 ton (-14d Strength penalty) ship from the fission engine example is retrofitted by adventurers to mount a very large fusion engine (Strength of 25d+2, 160 hexagons of space). The engine has the same Strength as the fission engine (so the same overall performance), but it is four times as large. However, the *fission* engine and two weeks worth of fuel took up 376 hexagons (40 for the fission engine, 336 more for the fuel). For the *fusion* engine, the total is 328, for a space savings of 40 hexagons. While the deuterium is four times more expensive per ton, it goes through it at a slower rate. It still costs twice as much to operate, but this may be offset in the long run by reduced maintainance costs for the newer fusion engine and long-term profits from having an extra 40 hexagons of space each trip and less hassles from starport authorities and nuisances like having to use parking orbits much further away to avoid potential contamination problems.

Antimatter Rockets: These are Post-Atomic Era, usually only seen on newly constructed military vessels or civilian ships on well-traveled intersystem runs.

When antimatter fuel (anti-hydrogen, denoted as \bar{H}) comes into contact with the normal matter of a ship's reaction mass, the two annihilate each other, producing superheated plasma that is aimed backwards by magnetic fields. The antimatter reaction also produces massive amounts of radiation when the engine is operating, requiring heavy shielding and making the back end of the engine even more of a bad place to be than on other types of rockets. Only recently have civilian ships been allowed to mount antimatter reactors and engines, and the United Worlds government keeps a very strict accounting of production and use.

EXAMPLE: A 125 ton fighter design (-7d Strength penalty) mounts a large antimatter drive with thrust boosters (Strength of 27d+1, 32d+1 boosted). The residual Strength of 6d+2 gives this ship a normal acceleration of 2g and the boosted Strength of 9d+1 gives an acceleration of 4.5g. This antimatter drive uses 3.0 hexagons of fuel (about 1.5 tons) per day in normal mode and the same amount per hour when boosted, and typically won't carry more than a day or two of normal fuel use, devoting the rest of its space to weapons and armor.

The amount of antimatter used in each refueling of a ship is minimal as it produces millions of times more energy by weight than the chemical fuels of 20th-century rockets, but because of U.W. restrictions on the amounts of antimatter storable in any ship at one time they have to be refueled as frequently as ships using other fuels, with antimatter fuel usually only available at military depots or Alpha-class facilities.

Every few years of use the engine core will need replacement or refurbishment at about a quarter of the cost when new. Antimatter refueling involves purified water, as for fission drives, and microgram to milligram amounts of antimatter, typically in large, self-sufficient containment vessels that are swapped in for empty or partially depleted units in a few standard sizes.

Vorn Reactionless Drive: Vorn drives create quantum gravity wells in front of their ships into which they constantly "fall" forward. These drives consume a fair amount of electrical power, but all Vorn ships use antimatter reactors and generally have power to spare.

EXAMPLE: The Lucifer-class Vorn fighter (93 tons, 6d+2 Strength penalty) mounts a large gravity drive (Strength of 32d+0). The residual Strength of 9d+0 gives this ship an acceleration of 4.5g, but it requires 19d+1 Strength from reactors to power it. The Lucifer-class fighter only mounts antimatter reactors with a Strength of 16d+0, which is 3d+1 less than its drives require, so if using the reactor alone, its performance is dropped by half this amount to 7d+2, or 3g. The Lucifer-class fighter makes up for this deficit by using a sixteen hexagon accumulator bank, which stores 21d+2 energy, sufficient by itself to run its drive at full power for a time level of slightly more than 2 (21d+2 minus 2 time levels is 19d+1). Vorn carry external energy banks like conventional fighters have extra fuel pods, to increase their full-power combat endurance. We'll explain reactors and accumulator banks in detail a little later on.

The Vorn reactionless drive operates in combat just like any other drive in terms of vectors and thrust, but it has the advantage (and limitation) that when it is turned off, the ship immediately (within one starship turn) loses all the vectors gained by the drive. Vorn ships cannot "coast" with their engines off like human ships can.

Reaction Mass: This is almost always purified and filtered water. Most drives use their inherent extreme heat or a separate electrical power source to separate the water into elemental hydrogen and oxygen, and either expel both as superheated gas, or filter out the oxygen and store it in the life support system.

EXAMPLE: Even a fuel-hungry engine like a large fission drive (20 tons worth) only goes through reaction mass at the rate of one kilogram each seven seconds, well within the ability of an electrical "water-cracker" to split into hydrogen and oxygen.

In a pinch, virtually any hydrogen-containing liquid, such as methane, ammonia, or lighter hydrocarbons like gasoline can be used, although all of these are likely to have severe side effects on the engine (corrosion, contaminant buildup, extra maintenance, etc.). Substances heavier than hydrogen are markedly less efficient as reaction matter, and most engines aren't designed to handle them.

Because of the extreme conditions under which most engines operate, fuel quality is critical, and commercial reaction mass vendors not only have to worry about getting repeat customers, but also about lawsuit possibilities if impurities in their fuel wreck someone's expensive engine or strand a ship in uncharted space. In general, samples of all fuel deliveries are taken "at the pump" and stored or assayed in case there are later questions.

▼ **ADVENTURE SEED** - Someone's starship is missing, and oddly enough, so are all the records and samples relating to its last fuel delivery. The family of someone on the missing ship hires the adventurers to track down whatever information they can.

Fuel tanks for reaction mass have no extra cost, and are .5 ton per hexagon when full (.1 ton when empty). Refueling a ship involves both replenishing any reaction mass, and specialized consumables like antimatter or fission pile components. When a ship is refueled, all components of then fuel system are assumed to be topped off. This is taken into account in the differing fuel costs for different engines.

Refueling costs	Per hexagon of fuel
Ion cruise engine	1000Cr
Fission engine	50Cr
Fusion engine	200Cr
Antimatter engine	500Cr

Maneuvering Jets: Along with primary engines, all starships have maneuvering jets for steering and fine positioning (during docking, for example). These can thrust a ship violently in directions other than where the main engine is pointing. Maneuvering jets are part of the basic hull structure, cost and mass. In most ships, these thrusters use minor amounts of thrust vented from the main engines or power reactors, and usually have their own small, separate fuel or reaction mass tanks (using hydrogen and oxygen cracked from normal water reaction mass). In an emergency, lateral thrusters can be used as a source of fuel or emergency thrust, but would likely be damaged or destroyed after such abuse. As long as a ship has any Hits left, some maneuvering jets will likely remain online.

▼ **ADVANCED TOPIC: SLOW STARTS** - Most of the time, starting a starship's systems is not an instant process. It usually takes a few minutes to warm things up to where full power is available. If a ship has to move or fight from a non-combat status, assume all power and thrust from non-accumulator sources is at a -1d penalty on the first starship turn. This would be *in addition* to moving half the normal distance on the first turn of movement from a standing start.

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Thrust Boosters: A ship can be modified so that it can increase its thrust from an antimatter, fusion or fission engine by consuming reaction mass at higher than the standard rate. The thrust boosters required for this option are added to the size of the engine they are mounted on; damage to one damages the other. A thrust booster adds only slightly to the size of each engine it is mounted on, but more than doubles a ship's acceleration and radically increases the engine's fuel consumption. A booster adds twenty-five percent to the hexagons taken by a fission, fusion or antimatter engine (about +1 to its size). It adds +5d to the Strength of that engine (which effectively doubles acceleration), but it also changes listed fuel consumption from "per day" to "per hour". Use of a thrust booster is always optional.

EXAMPLE: The fighter from the antimatter engine example had thrust boosters. It has the potential of cruising for a day at 2g on a given amount of fuel, or boosting for an hour at 4.5g on the same amount.

Military ships often have thrust boosters, which are used only in combat or emergency situations. Any use of thrust boosters will radically increase the maintenance requirements of the engine using them (an hour of thrust booster use is like a week's worth of normal wear and tear).

Rozhkov Drive: The Rozhkov Drive (or its alien equivalent) is the only means known to cross interstellar distances in less than a lifetime. The size of a Rozhkov Drive is mostly dependent on ship size, but drives have not yet been made to generate stable translation fields for ships of less than a mass level of 23 (200 tons). A Rozhkov Drive includes integral power capacitors necessary for the near-instant jump through space, capacitors which are typically charged by ship's reactors over the time immediately preceding the jump, and which are designed to release all their stored energy in a single burst. That is, when the charging is done, the ship must either jump, or lose all the accumulated energy and start over.

Cross-charging the Rozhkov Drive from the ship's accumulators or powering ship systems from the capacitors requires a successful Electronics roll (with Starship Engineering as a complementary skill). It is a fiendishly difficult task, and the results of a failed roll can range from a failure to transfer any power from one to the other, to an uncontrolled transfer that burns out systems in the resulting power surge.

The size of a Rozkhov Drive is based on the hexagons taken by a "ship" one or more sizes smaller than the ship it is in.

Tech Era	Drive size	Energy to Jump
Late Atomic	Ship size-1	Ship size+26d
Early Post-Atomic	Ship size-2	Ship size+26d
Post-Atomic	Ship size-3	Ship size+26d

EXAMPLE: A size 6 ship is 2,800 hexagons. A Late Atomic Era Rozkhov Drive that was "size-1" in size would take up the same space as a ship of size 5, or about 1,000 hexagons (a third of the ship).

The "Strength used" is basically the output of the power source used to charge it, plus the time level (in starship scale) spent in charging. The size of the ship is dice added to this Strength.

EXAMPLE: A size 6 ship using an Early Post-Atomic Rozkhov Drive needs to accumulate 26d plus 6, equals 32d of power in order to jump. A large fusion reactor (20d+2 Strength) will take a time level of between 11 and 12 (about 5 hours) to charge this drive. A very large fusion reactor (24d+2 Strength) could do it in a time level of between 7 and 8 (about 1.5 hours).

EXAMPLE: The Sesterce mounts an Early Post-Atomic Era Rozkhov Drive. For a size 5 ship, this will be a size 3 system, which will take up 125 hexagons, mass 62.5 tons and cost 12,000 Credits per hexagon, for a total cost of 1,500,000 Credits. *Ouch.*

For a ship this size, the Rozkhov Drive will require a total Strength input of 31d+0. When putting in the ion drives, we determined we would need reactors of at least 20d+1. If that's *all* we have (a difference of about 11), it will take about a time level of 11 (4.2 hours) to charge the drive, provided we aren't using the ion cruise drive at the time. So far, the Sesterce looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr

Jumpgates: These are Late Atomic Era Rozkhov Drives mounted in the equivalent of size 8 or larger hulls. They provide a portal through which non-jump ships can travel (one or more sizes smaller than the gate). Jumpgate travel is one-way. You need a jumpgate at the other end to get home if you do not have a Rozkhov Drive. Jumpgates are expensive to construct, and are usually not built until at least one planet in a colonized star system has achieved independence.

Charging time for a jumpgate is based on the size of the ship going through, not the size of the gate assembly.

EXAMPLE: A minimum jumpgate is a size 8 hull (23,000 hexagons) with a size 7 Rozkhov Drive (8,000 hexagons). For the maximum ship size that can pass through this jumpgate (size 7), eight very large fusion reactors (combined Strength of 26d+2) can reach the required 33d+0 charging Strength in a time level of 7 (or 1.1 hours). Smaller ships could pass with considerably greater frequency.

If a jumpgate has sufficient power output, it can hold a Rozkhov portal open continuously. A jumpgate that can pass a size -10 ship each turn can be used to transmit laser or radio messages through the jumpgate to the destination.

EXAMPLE: The previous jumpgate has reactors with a power output of 26d+2. Since a Rozkhov Drive requires 26d+0 plus the size of the ship, this jumpgate could hold a portal open for one ship of size 0 per turn. So, each starship turn (of 6 minutes) it could transfer a total volume of 6 hexagons. At a density of water (6 tons), this would be about sixteen kilograms per second. There isn't much economic potential in this. However, we only need 16d+0 of reactor output to hold open a communications portal, and interstellar message traffic is a thriving business.

If a destination system has a jumpgate, the two can be linked so that ships entering one will exit at the other. This requires *both* jumpgates be powered, but the destination gate simply has to expend enough energy for a communication portal for the origin gate to lock onto. As a side note, ships exiting jump space will usually do so at the Rozkhov Radius of the destination system, but ships can also be precipitated out of jump space by any gravitational or jump space anomalies along the transit route.

Sensors - A working set of sensors is almost required to engage a starship or any other target outside of visual range, as without them, skill at spotting a target would be using starship weapon sights, and impossible with non-starship weapons and targeting systems. Sensor suites come in multiple sizes and levels of sophistication, but all have certain common characteristics: a full 360° arc, 1,000x optical (infrared, visible, ultraviolet) sights, broadband audio and video transceivers, radar, lidar and radiation monitors. Sensors mass .5 tons per hexagon and cost as non-military systems per their tech era.

A ship with a working bridge but without sensors is assumed only to have broadband audio and video at +10 difficulty for the tech era of the equipment. It *can* get communication locks, but cannot not detect anything outside visual range. Such systems are really only good for comm use at ranges up to one hexagon, or low orbit to surface use. Such limited systems *can* receive sensor data from other ships using standard United Worlds data protocols. Work pods and lifeboats typically don't have sensors (but do have comm systems that can be linked to standard navigation controls).

A ship with sensors but without a working bridge would be something like a missile, whose bridge is of negligible size anyway (about .025 hexagons). Such a ship can be programmed and communicated with remotely, provided you have the correct access codes, but otherwise it just executes pre-programmed commands.

Operating starship sensors properly requires Sensor Ops skill. Larger sensor suites have better skill rolls for cutting through interference. Sensors can be used in active mode (like radar) or passive mode (like infrared telescopic). Passive sensors operate at +4 difficulty, but use 3d less Strength and a ship can use them while "powered down" without losing its bonus (if there is sufficient accumulator power). Sensors use power every turn they are in operation. Passive sensors cannot be used for weapons targeting unless the target is maneuvering or using active sensors.

Multiple sensors trained on the same target give a +1 bonus for each extra sensor, or multiple sensors may allow different sensor operators to provide sensor bonuses to spot separate targets without having to share equipment. The extra sensor must have as modifier no more than 1 point less capable than the main sensor in order to give a bonus.

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EXAMPLE: The *Sesterce* has Late Atomic Era sensors, a medium sensor array and a minimal one as a backup. The large provides a +0 difficulty to spot things, while the small one is +3 difficulty. The difference in capability is too great for linking them to be of any benefit. These sensors will take 20 hexagons and 1 hexagon, mass 10 tons and .5 tons, and cost 200,000 Credits and 10,000 Credits. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr

As mentioned earlier, a sensor can have its data collection split between several targets, losing 1d off each roll per extra target. Normally there is an overall sensor operator who decides priority of targets for allocation of sensor resources.

A ship can link its targeting system to the sensors of any friendly (and technically compatible) ship, effectively giving it an extra sensor for a +1 bonus (if the data is of sufficient quality). One ship is the main source of data, and the skill roll is based on its sensors and sensor operator. The choice of which ship's sensors to use depends on the quality of the equipment, the proximity to the target, and other variables.

EXAMPLE: A cruiser is wary of possible ambush in an asteroid field, so it launches a sensor drone far ahead of its position. The cruiser links to the sensor data from the missile's much smaller sensor array and lesser skilled computer. But combined, the drone gets the advantage of +1 skill from the cruiser's extra data, and the benefit of a shorter range to any possible targets.

Bridge - A ship requires a centralized location for its command crew, even if this is just a pilot. The bridge of a ship is a minimum of two hexagons (a cramped acceleration couch), but is usually larger. The normal size is the ship size-4 for military vessels, and ship size-5 for civilian ones. About a third of the volume taken by a bridge is packed with various equipment, and the rest can be devoted to any floor plan. Each person who can operate a sensor or weapon needs at least two hexagons of bridge space. Fewer hexagons than this means one person is doing multiple tasks each turn (at a penalty).

The difference is in the quality and flexibility of the equipment. On a civilian bridge, all stations are dedicated to a particular task. If something happens to that station, it's gone. On a military ship, cross-linking and redundancy means that in an emergency, the navigator can fire weapons, the sensor operator can do an emergency reactor shutdown, or the captain can run sensors.

In addition, a civilian bridge can only make one sensor roll per hexagon of space, and any given weapon can only be directed against a particular hexagon of space. That is, a sensor operator could track several missiles in the same hexagon, but could not do that and make a sensor roll against a ship in a different hexagon. Similarly, a gunner would not be able to get targeting information for targets in different hexagons on the same turn.

Any bridge counts as military equipment for cost purposes, but only those with the military capabilities are "military" equipment for regulatory purposes (and you are much less likely to find a used military bridge at a discounted cost). A civilian hull can have a military bridge, and a surplus military hull can mount a civilian bridge. Remember that surplus U.W. military hulls come with a military bridge (which must usually be left in place in case the ship is pressed into service).

AI's: A ship which spends twice as much on its bridge can have an AI to manage ship operations (aside from combat-related tasks). It takes the bridge facilities of a size 6 ship to have a genuine AI. More details on AI's are on page 10.34. The StarForces do not use AI's on military ships, and civilian ships with military bridges are prohibited from having AI's.

As a quick note before you spend your money: It takes a size 8 ship to have a ship's AI of intelligence approximately equal to that of a human. For role-playing purposes, remember that a third of bridge volume is computers and whatnot. So, to upgrade an AI, you really just need to add a third of the size of a larger bridge. If you want a size 9 ship's AI in a size 8 ship, you add a third of a size 9 ship's bridge to that of a size 8 ship's bridge, and call the entire assemblage "the bridge".

EXAMPLE: The *Sesterce* has a simple civilian bridge. For a size 5 ship, this will be a size 0 system (about 6 hexagons). Of this, about 4 hexagons is available for people to move around in, which would be a space of about 2 or 3 hexagons on a floor plan after you take into account headroom. So, there's room for two chairs, each with a console and display, and that's about it (it's a .2g pod freighter, what do you expect?). The bridge costs 40,000 Credits per hexagon, for a total cost of 240,000 Credits. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	150	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr
Bridge	6	0	3	0	.240MCr

A ship may also have an emergency or auxiliary bridge, which can do anything a normal bridge does, but at +2 difficulty. This would be 1 size smaller than a normal bridge of that type. Last, the inter-connectivity of a ship's systems means that it is possible to tediously route information through just about any system that the bridge normally communicates with. This works both ways, but doing it from the receiving end is at +4 difficulty. So, if a ship's bridge was completely obliterated, a reactor tech could take over from their engineering station, but all their tasks would be at +4 difficulty. In a non-combat situation, either of these penalties would normally be offset by taking extra time to do things.

Power systems - All these goodies and the stuff yet to come (like weapons) use electrical power. Sometimes (okay, most of the time) a *lot* of it. While ships can have emergency batteries and solar arrays, for the most part any practical vessel is going to need a reactor (or several of them) to operate. There are about half a dozen power systems in known use. These are:

Power system	Tech era
Solar panels	Late Atomic
Accumulators	Late Atomic
Fission reactors	Late Atomic
Fusion reactors	Early Post-Atomic
Antimatter reactors	Post-Atomic

Since we are referring to components in terms of both size levels and hexagons, each time you double the size of a power plant in hexagons, it gets +2d Strength (not +1d), mainly because of economy of scale (one big reactor is more efficient than two small ones). Each +1 in size is +3d to Strength. The two are different ways of getting the same result (+2 to size is eight times the hexagons, and both are +6d to Strength).

Solar panels: These are a Late Atomic Era technology that converts light into electrical power. They actually were developed early in the Atomic Era, but reach the peak of theoretical efficiency late in the era. For an energy-intensive starship, they are not really practical. A mobile platform can mount solar panels taking no more space than half its size (round down), minus 1 (which would be virtually every exposed surface). Since at best, half of a ship can be facing the sun, the maximum amount you can gain benefit from would really be one size less than this (or half the ship's size, minus 2).

Solar panels have (under Earth-normal lighting conditions), a Strength of 4d+2 for a size of -1 (2 hexagons), and get +3d Strength for each +1 size. Lose 1d from the output outside the life zone of a system's primary, lose 2d in any zone that supports jovian worlds, and lose 4d anywhere in the "outer reaches" of a solar system. On the other hand, add +1d if you are inside the life zone of a system's primary. Solar panels are .5 ton per hexagon of space used.

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Like maneuvering jets, solar panels are in a lot of places on a ship, so as long as the ship has some Hits left, solar panels will continue to provide some power. Solar panels do need a hit location to represent power distribution nodes, but the panels themselves will survive the destruction of the hit location the distribution node is at.

EXAMPLE: The *Sesterce* needs 8d+0 power for emergency life support (see page 8.42). Half the *Sesterce*'s size is 2, minus 2 more is 0, so no more than size 0 in solar panels (about 6 hexagons) can be effective at any given time. This will provide a total power output of 7d+2 in the life zone of a system. This is not enough to power life support, even at emergency levels, though it could manage if closer to a sun than normal or if the quarters were not fully occupied.

This would end up using 6 hexagons of space, massing 3 tons and costing 60,000 Credits. Now, as a reality check, you don't normally think of solar panels costing 10,000 Credits for a hexagon of panels. Don't think of it that way, think of each hexagon as *half a ton* of solar panels, which would be upwards of 200 hexagons of the ship's surface, plus the cost of the power conditioning equipment to make the output compatible with ship's systems. Regardless, the *Sesterce*'s designers decide to pass on this option.

If they did buy them, and they were stuck using them as the only power source to recharge their *Rozkhov Drive*, they would probably lose 2d from the output for being fairly far out in that solar system, leaving them 5d+2 to charge a system needing 31d+0 accumulated Strength. This would be a time level of about 25, or about a three week wait, freezing their butts off in their e-suits, since no power is going to life support...

Solar panels require virtually zero maintenance, as do accumulator banks, so the combination still sees use on colonies and long-duration research drones or monitoring stations. A colony that might not want to worry about maintaining a fusion reactor might have a large solar array sufficient for the colony's needs, along with an accumulator bank to cover in case there is an extended cloudy period.

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Accumulators: Accumulators are temporary storage banks. Strength drained from them is lost until recharged by a reactor of some kind. They are most commonly used as emergency power supplies or peak load providers for a major weapons system. Unlike solar panels, accumulators did not top out in efficiency at the Late Atomic Era. An accumulator with a size of -1 (2 hexagons) holds the listed energy:

Tech Era	Size	Energy stored
Late Atomic	-1	13d+2
Early Post-Atomic	-1	14d+1
Post-Atomic	-1	15d+0
Late Post-Atomic	-1	15d+2

Each +1 to size is +3d to the energy held, or each doubling of hexagons is +2d to Strength held. *The Strength listed for accumulators is how much they can provide for 1 starship turn.* Subtract the time level power is needed for to get the power that can be provided for that time level.

EXAMPLE: An Post-Atomic accumulator bank of size 1 (16 hexagons) will hold 21d+0 energy. This could be 21d+0 for one turn (time level 0), 19d+0 for two turns (time level 2), 15d+0 for eight turns (time level 6) or 1d+0 for four days (time level 20).

Every time you double the space taken by the accumulators, you add +2d to their Strength. Most military ships will have accumulator banks to power their weapons and possibly magnetic screens for the short duration most space combats will last. A ship running systems only on accumulators and not using any active sensors or engines is counted as "powered down" for purposes of being spotted.

Accumulators are charged by taking surplus power output and devoting it to that purpose. The power output plus the time level equals the energy restored.

EXAMPLE: An accumulator bank which holds 20d+0 Strength could be recharged by a Strength 16d+0 reactor in a time level of 4.

A normal set of accumulators is akin to a high discharge battery, while those in a Rozkhov Drive are closer to the discharge circuit for a laser weapon or xenon flash tube. You cannot usually use one for the purposes you would use the other. It has been successfully done a number of times, but the number of times when accumulators were used for a Rozkhov Drive and failed is unknown, since *those ships never came back...*

Reactors: These are designed solely to produce electrical power for use by ion drives and ship's systems. Reactors generate a certain amount of Strength each turn. Systems like sensors, magnetic screens, and life support are usually working all the time, and are a draw on this power.

▼ **Note!** - In terms of EABA vehicle design, reactors have about a -10d penalty to power plant output. This represents the inefficiency of converting their output to electricity (instead of directly to motive power), the increased fuel efficiency (refuel once per year at full output) and their ability to operate in an airless environment. In addition, specific reactor types have bonuses depending on the type of fuel they use (fission, fusion, antimatter).

It is not a one hundred percent accurate conversion, but the table below gives you an idea of the output of a given power source. A gigawatt is one billion watts and a terawatt is one trillion watts. The '2000CE equivalent' is an item or region whose total electrical generating capacity is about that level.

Strength	Output	2000CE equivalent
0d+0	250 watts	automobile
2d+0	1 kilowatt	
4d+0	4 kilowatts	portable gen.
6d+0	16 kilowatts	
8d+0	64 kilowatts	
10d+0	250 kilowatts	767 airliner
12d+0	1 megawatt	
14d+0	4 megawatts	diesel locomotive
16d+0	16 megawatts	Togo
18d+0	64 megawatts	aircraft carrier
20d+0	250 megawatts	
22d+0	1 gigawatt	Hoover Dam
24d+0	4 gigawatts	Romania
26d+0	16 gigawatts	Finland
28d+0	64 gigawatts	Canada
30d+0	250 gigawatts	Japan
32d+0	1 terawatt	United States

EXAMPLE: One very large antimatter reactor (Strength of 26d+1, 640 hexagons) could meet the 2000CE power needs of the entire nation of Finland (or one very large ion drive), is about the same as sixteen Hoover Dams, and it takes about this much power for three hours to make one interstellar jump in a size 10 battleship.

A reactor dedicated to the power needs of a particular system gets 0d+2 extra output, but may only be used for other electrical output at the default Strength minus 8d level. It requires major work (at least that of repairing 1 Hit) to reroute this power for use as a normal reactor.

EXAMPLE: If a ship has a 15d+0 reactor just for charging the Rozkhov Drive, it gets an output of 15d+2 for *this* purpose, but only can supply 7d+2 for *other* uses.

All reactors are assumed to be shielded so that they are safe to be around. Occasionally one finds unshielded power systems where weight is a major concern or where shielding is not needed. For instance, unmanned deep space probes may find it more efficient to shield a small amount of electronics instead of a large amount of reactor. For their size, unshielded reactors have 0d+2 more Strength than their shielded equivalent.

▼ **Note** - Reactors are designed for long and fairly maintenance-free life (one year between refueling at *maximum* output, usually two or more years of normal use). Reactors can be designed to go through their fuel faster (within limits), and get +1d output for halving of their refueling interval (up to a +2d maximum bonus for refueling each three months at maximum output).

If you look at the starship component table, you'll see that fission and fusion reactors have the same output for a given size. In **Fires of Heaven**, fission reactors are at their maximum theoretical efficiency, while Early Post-Atomic Era fusion reactors are not. Core world-manufactured fusion reactors are available at full Post-Atomic Era efficiency (0d+2 Strength bonus) at Early Post-Atomic Era costs. These are not available at "used" prices.

One important difference between fission and fusion reactors (and engines) is that fission reactors can be "cold-started". Fission power sources simply need their fuel moderator rods pulled to begin the chain reaction that generates power. Fusion sources require a pulse of power from accumulators equal to their *electrical* output in order to get them "jump started", after which they work normally.

EXAMPLE: We've determined that the *Sesterce* can manage on 19d+2 Strength, and since it is an older ship, we'll assume it uses fission reactors. One large fission reactor generates 20d+2 Strength. If we install one, we'll be able to run the ion drives at full power (19d+2) and have plenty left for other purposes (nothing else even comes close).

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We install one 20d+2 reactor, and add a pocket fission reactor (5d+0 Strength) as an emergency backup. The smaller reactor won't run any of the key systems or even add to the total output in a measureable way, but it is a source of power to keep the lights on in case the main reactor goes down. Compared to the energy needed by the ion drive (19d+2), that needed by the sensors and life support is minimal. However, the lack of spare power means that the *Sesterce* almost certainly has to be coasting in order to charge her Rozkhov Drive effectively (since we have 1d surplus power, we can charge the Rozkhov Drive with 19d+2 strength while using the ion drive, or at 20d+2 while coasting).

The main reactor is 160 hexagons, 80 tons and cost 1,600,000 Credits, while the smaller one is 1 hexagon, .5 tons and costs 10,000 Credits. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr
Bridge	6	0	3	0	.240MCr
Reactor 1	160	3	80	6	1.600MCr
Reactor 2	1	-1	.5	0	.010MCr

Most modern ships use fusion reactors rather than fission reactors for power, as fuel is far easier to come by (free if you have a skimmer), and the power plant is essentially inert when powered down (instead of intensely radioactive), making tear-down maintenance a lot easier and cheaper. Many Early Post-Atomic Era military ships used fission reactors simply because they were a proven technology and had the ability to be cold-started. The current crop of Post-Atomic Era ships are using antimatter power plants mostly because of the incredible increase in power output.

▼ **Note** - In an emergency, a fusion reactor's fuel can be used to power a fusion drive. In such a case, assume about half of the reactor volume is usable fuel. The fuel would normally have to be transferred manually from the reactor to fuel tanks, and the reactor would normally be shut down during the process.

Where are we? - At this point, the *Sesterce* has everything a ship needs to get from one star to another. So, we can see where we are money-wise, mass-wise and space-wise.

So far, the *Sesterce* has used up 643 hexagons of space, 335.5 tons of mass and burned a 5,117,000 Credit hole in someone's wallet. We have a few things left to buy, but we can make a stab at what her hit locations will look like. It takes about 28 hexagons to make one hit location on the *Sesterce*, so we can get an idea of what we have to combine where in order to get things to add up. We'll put the bridge and main sensor together and call it 'GS'. Most of the main reactor will be "P". We'll put the ion drives, their fuel and the rest of the main reactor together and call it 'E'. The small reactor will be added to the quarters, which are 'Q', with the particular location that is important being 'Q*'. So, she sort of looks like this:

	First roll					
	1	2	3	4	5	6
1				Q	Q	Q
2				Q	Q*	GS
3	E	R	R	Q	Q	Q
4	R		R	Q	Q	Q
5					P	P
6				P	P	P

We have a few things left to add, but this shows the engines at the back, with the main reactor as a counterweight for the spin habitat quarters, the Rozkhov Drive in the middle, and leaving the rest of the locations for cargo pods and the last few necessities. We'll be adding several more combined locations later, like putting a sick bay in one of the spots with quarters. If the person designing the *Sesterce* wants to think about a floor plan, we can imagine a set of spin quarters with the bridge in front, with an access tube across to the main reactor and an another access tube down the spine of the ship, through the center of the Rozkhov Drive and back to the ion drive. Since we plan to add cargo pods to the remaining empty locations, there will probably be branching access tubes to those, and possibly to the manual controls for whatever weapons we eventually mount.

Weapons - Many starship weapons are merely enlarged and *extremely* accurate versions of those found on tanks, atmospheric fighter planes, or even in the hands of ground troops. Others are unique to the vacuum of space.

Lasers: Due to the extended range at which starship lasers operate, complex and bulky techniques are needed for both the precision aiming and long-range collimation of the beam. Low-power guide pulses are fired a fraction of a second before the main beam. Reflections and interactions with gas molecules and space dust are analyzed and used to fine-tune the main pulse. Due to the cost, relative ease of maintenance, and familiarity by engineers with the technology, civilian ships with a single weapon mount will probably mount a laser, possibly a point defense weapon rather than a starship range laser. Lasers are available at the Late Atomic Era and later, and are available for point defense, short and long starship ranges.

Ion Cannons: These are intensely more powerful and accurate versions of hand-held particle beam weapons that use magnetic fields to accelerate high-energy particles. As starship weapons they are available at the Early Post-Atomic Era and later. Ion cannons treat any vessel without magnetic shields as having inappropriate armor (reduce armor by 1d *before* applying weapon damage). Ion cannons are available for short and long starship ranges.

Plasma Bolt Cannons: A plasma bolt is a self-contained fusion plasma wrapped in a magnetic field, similar to an ion cannon, and available at the same levels of technology. The velocity of the discharged plasma is extremely high, but nowhere close to that of particle beams or lasers. This limits these weapons to short starship combat ranges. They are slightly more energy efficient than either lasers or ion cannon, but cannot be used in (or into) an atmosphere. Their main advantage is that they count as explosive weapons for purposes of getting hits through a large starship's damage limit. That is, any full dice that get through defenses add to damage limit to determine the maximum Hits that can be done.

EXAMPLE: If a plasma bolt does 4d+1 through the armor of a ship with a damage limit of -2, it will do 2 Hits (the 4d through armor raises the damage limit to 2).

Missiles: Ship missiles are effectively size -1 ships (2 hexagons), available at any level of technology. Missiles have no firing arc and can be aimed in any direction. They can be mounted externally on pod ports, or in reloadable tubes protected under ship's armor but take double the space (4 hexagons per missile). *Internal* missile bays are military systems, but have no mass. Streamlined vessels tend towards internal bays. Civilian ships mounting missiles usually store them in the cargo hold and only mount them if they expect a situation that may require their use.

Missiles have rudimentary self-guidance assisted by ship's sensors, and guidance can be handed off to any friendly ship. If the launching ship loses its lock, the missile uses its own sensors to try and get a lock, and if it loses guidance, any friendly ship with a target lock can pass information to the missile. If a missile fails to hit, it can conceivably turn around and make another pass. Depending on its speed and vector at the time, this could take several turns.

Missiles accelerate at absurdly high velocities and count as 4g, 4.5g or 7g ships (remember: they only move half as many hexagons on the first turn of launch if fired from a stationary platform). Late Atomic and Early Post-Atomic Era missiles have a useful lifetime of about eighteen turns, while Post-Atomic Era missiles can accelerate for over a hundred turns before running out of fuel. Missiles can be programmed to loiter in an area for over weeks or months to wait for a target, using engines as low-output reactors to keep systems going (burn 1 turn of thrust per day). High speed, short duration missiles (3 turns) have half again as much thrust as normal models.

Specialized missile bodies are used to carry small and extremely high-priority cargoes across interplanetary distances that are too deep in a gravity well for a Rozkhov Drive to transit. Research ships may carry probes that are missiles with smaller engines so as to carry more scientific payload.

Hypervelocity Cannon: This is an advanced form of railgun. It uses prodigious amounts of electrical power to accelerate thousands of minute inert particles to ridiculous speeds. Their tiny size is offset by their velocity, and while they are limited in range, the sheer quantity fired in any given burst makes them virtually impossible to dodge.

Due to the tiny particle size, the cannon will not work in any kind of atmosphere or liquid medium (not past a dozen meters or so, anyway). It is a bulky weapon system for the damage it does, and it is seldom used except on stationary emplacements, where its ability to target multiple missiles or nearby ships is an advantage.

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Vorn Gravity Shear: The means by which this weapon type works is unknown, despite analysis of captured examples. What is known are the effects. A gravitic resonance is set up in the target, with unequal gravity stresses shearing and tearing the target apart over the course of several turns. After getting a hit, the Vorn can turn their attention elsewhere, knowing that their weapon's side effects will continue to do damage (the weapon has a continuing effect that drops by 1d each starship turn). All known forms of armor are inappropriate against this attack (reduce ship armor by 1d *before* applying damage). Damage limit *does* apply against this weapon, but it is considered to be an explosive weapon and affects damage limit in the same way as a plasma bolt. Each turn it has effect is considered to be a separate attack.

The only known limitation on the Vorn gravity shear is that the effect is based on the size of the target. A ship being affected which can dock inside a larger ship or land on an asteroid or planet will negate the continuing damage as the gravity waves dissipate into the larger mass. For this reason, it also cannot be used underwater or against planetary bases.

EXAMPLE: The *Sesterce* is a fine enough prize to be worth defending, but not so much that it interferes with profitability. It mounts a point defense laser for use against missiles, and a small (military surplus) long range laser to let people know that while the *Sesterce* may be slow, she can reach out and touch you quite a ways off. The point defense laser is 5 hexagons and 200,000 Credits, while the small long range laser is 40 hexagons and 1,600,000 Credits. The 16d+0 power draw on the larger weapon isn't enough to slow the *Sesterce* down, but she isn't outrunning anyone anyway, so it hardly matters. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr
Bridge	6	0	3	0	.240MCr
Reactor 1	160	3	80	6	1.600MCr
Reactor 2	1	-1	.5	0	.010MCr
Pt. def. laser	5	0	3	0	.200MCr
Sm. long las.	40	2	20	2	1.600MCr

Point Defense Weapons - This is any weapon put into a starship mount that does not have "starship range". These are useless for engagements at starship ranges, but can be used against incoming missiles or unfriendly natives at ranges up to several kilometers. They can be *significantly* more powerful than starship weapons, since they don't need the bulky aiming machinery. Their Accuracy is listed as 20, but this is *non-starship range* Accuracy. They are not usable at starship ranges, and are counted as an Accuracy of 0 when engaging point defense targets in starship combat. In starship combat, they engage missiles, boarding parties and such at ranges from several hundred meters to several kilometers.

Most point defenses weapons have a high enough rate of fire that they can engage multiple targets easier than normal weapons. A gunner can always take multiple major actions to shoot at multiple targets (cumulative -1d penalty on each roll per extra target). A weapon with a bonus can be used on that many extra targets with no extra action penalty.

EXAMPLE: A point defense laser with a bonus of 2 can be used on two targets with no penalty. Firing at three targets would be a -1d penalty on each of the three rolls, firing at four targets would be a -2d penalty on each of the four rolls, etc.

At normal time scale and ranges, each bonus number counts as a level of autofire. So, a weapon with a bonus of 3 would have three levels of autofire in normal combat, and could thus get a lot of hits on short range targets. Do note that even though starship weapons have high accuracy in the normal (non-starship) timescale, they also require aiming actions in the normal timescale, and everything except lasers loses their aiming bonus from recoil penalties after firing.

When a point defense weapon with any bonus (1 or more) gets a hit on a target, each hit will be counted as an autofire attack (**EABA**, page 5.6), so it can get multiple hits on each of multiple targets. This can be important if you are trying to shoot down an incoming missile that might not be knocked out by only one hit.

Weapon modifiers - All weapons listed (except for missiles) are in 360° turrets. A weapon with a lesser arc takes the same amount of space, but more of that space is devoted to the weapon, making the weapon more powerful (and energy-hungry). Weapons with a 180° arc of fire do +1d damage and use +1d Strength. Those in a 60° arc of fire do +2d damage and use +2d Strength, while those in a fixed mount (like the forward facing cannon in a fighter plane) are +3d damage and use +3d Strength. If you add weapon arcs, you need to also use the advanced rule for ship facing on [page 8.26](#).

EXAMPLE: If the *Sesterce* wants its long range laser to have a rear 180° arc, it would do +1d damage (and use +1d Strength), but would suffer penalties if the ship has to fire outside this arc. All fire outside this arc will be at +1 difficulty.

Starship weapons use a variant of the vehicle design rules in **EABA**. Modifiers of particular note:

Weapon	Damage
Late Atomic Era, 5 hexagon weapon	9d+2
Early Post-Atomic Era, 5 hex weapon	10d+1
Post-Atomic Era, 5 hex weapon	11d+0
Late Post-Atomic Era, 5 hex weapon	11d+2

Modifier	Amount
Each doubling of size	+1d
Short range starship weapon	-4d
Long range starship weapon	-6d
Multiple targets (1 bonus)	-1d
Multiple targets (2 bonus)	-2d
Multiple targets (3 bonus)	-3d
Multiple targets (4 bonus)	-4d
Laser	-2
Plasma cannon	-4
Ion cannon	+3
Gravity shear	-4

The modifier for starship range includes both the long range collimation and extra accuracy required at these extended ranges. If used in the normal **EABA** scale, add 30 to the Accuracy. Strength required is simply the damage of the weapon for its tech era and size, and starts at 13d+0 for a five hexagon Late Atomic Era weapon.

EXAMPLE: Late Atomic Era weapons have base damage of 9d+2 and Strength requirement of 13d+0 for a five hexagon weapon. For a long range (-6d) starship laser (-2), then the Strength requirement stays 13d+0, but the damage is only 3d+0. It weighs a couple of tons, uses several megawatts of power, and only does the damage of a carbine, but it can just about carve your initials on the moon.

▼ **SHIPBOARD FACILITIES** - If you've reached this point, you've designed the most important bits of your ship. What follows is some general notes on shipboard facilities. They are not usually going to matter in a starship combat, but they may be of considerable importance in role-playing situations.

Cargo - Cargo holds are normally pressure sealed, have a separate docking port with a large cargo door and have atmosphere support, but are not designed to be used as living space, hangars, or weapon bays. Any jury-rigged use will generally be a +4 difficulty to any rolls involving the space - weapons would fire at +4 difficulty, trying to move a ship into or out of a cargo bay "hangar" is +4 difficulty to piloting rolls, using it as habitable space would be +4 more Strength from reactors than normal, etc.

Cargo holds automatically include hoists and lifts sufficient to lift anything normally expected to fit in them. Compare the hexagons of hold size to ship sizes, for instance, six hexagons of area is the same area as a size 0 ship. The Strength of any cargo assistance device is this level plus 3d. So, a size 0 ship has a "Strength" of 0d+0, so a six hexagon cargo hold has a Strength 3d+0 cargo hoist. Large cargo holds may have networks of three-dimensional grapples, magnetic grapple forklifts and other heavy cargo movers.

Pod freighters carry cargo in externally mounted pods that have their own armor, but while attached to the carrying ship will use the ship's damage limit for simplicity's sake.

The type of a cargo will determine its weight. A ship with a certain rated load may have a full load, but nearly empty cargo holds. Low density cargoes are .5 ton per hexagon. Wood, fuels, consumer goods and agricultural products would be an example. Medium density cargoes are 2 tons per hexagon. Light metals like aluminum, heavy composites, ores and the like would be medium density cargo. High density cargoes are 4 tons per hexagon, and generally represent processed metals like steel or durasteel or heavily armored vehicles like APC's and tanks. Very high density cargoes are rare, and would be 8 tons per hexagon. This would be things like refined fissionables, lead or other heavy metals in bulk form.

For ease of handling at starports, cargo pods come in standard sizes, much like today's freight containers, except they are hexagonal in cross section. Dimensions are width across the end by length, in meters.

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Cargo pods	Size	Hexagons	Dimensions
Drop pod	2	22	3m x 6.5m
Small	2	45	3m x 6.5m
Medium	3	125	6m x 6.5m
Large	4	350	6m x 18.5m
V.large	5	1000	12m x 18.5m

▼ **Note** - The medium cargo pod is roughly the size of a modern ocean shipping container. Cargo pods also have dimensions slightly different than that listed (by a fraction of a meter), so three of one size can fit into a container the next size up.

Small cargo pods are 4 tons empty, medium are 12.5 tons, large are 35 tons and very large are 100 tons. Drop pods are just small pods outfitted as lifting bodies with a parachute and an inertial nav system. They can be used to drop a fire team or supplies into an atmosphere. They are not well liked and only rarely used. A pod carrier normally comes with a full complement of pods at no cost. Extra or replacement pods have an empty cost like a hull that size. Note that a pod's structural stress limit will be based on the tech era it is built at, but most pods do just fine with Late Atomic Era tech.

EXAMPLE: If we add up all the items currently in the *Sesterce*, we will find she has 312 hexagons of space left. That's enough for two medium cargo pods, and about 62 hexagons of space left over for other systems. We'll add a small pod to the design. It doesn't carry much cargo, but the attachment point is something that can be repurposed if the *Sesterce* needs to carry extra fuel, another weapon or if someone chartering the ship has a special request. So far, the *Sesterce* looks like this:

Item	Hexagons	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr
Bridge	6	0	3	0	.240MCr
Reactor 1	160	3	80	6	1.600MCr
Reactor 2	1	-1	.5	0	.010MCr
Pt. def. laser	5	0	3	0	.200MCr
Sm. long las.	40	2	20	2	1.600MCr
Small pod	40	2	4	2	0MCr
Med. pod 1	125	3	12.5	4	0MCr
Med. pod 2	125	3	12.5	4	0MCr

Pods can be purpose-built to avoid the +4 difficulty in using them for non-cargo purposes. That is, the pod is actually packed with something else that is integrated with ship's systems. There are 'passenger pods' (large or very large), 'survey pods' (small or medium), even 'weapon pods' (any size) This is why pirates like pod freighters. They can stash any illegal pods before going into a system to fence their stolen goods. Pirates also like pod freighters as targets, because most captains will jettison the pods, knowing the pirates will probably choose picking up abandoned pods over picking a fight.

External Pods - A pod freighter hull mounts fully g-stressed external attachment points for specialized pods as part of its design, but other ships can mount them as well. A fighter could have missiles mounted externally on pod mounts, or use them for extra fuel tankage, ECM pods, etc.

A pod port does not require a passenger airlock, but it does have a vacuum-tight double door (with safety interlock) for crews to service or enter attached pods (so you could get your arms into the guts of an external, pod-mounted missile). The minimum size for any given pod is usually the hull's size-3, and the maximum is the hull size of the carrying ship.

Pods included as part of a ship's design simply figure into its size in hexagons and total mass. A pod ship can have up to its size in fully stressed pod ports for free. Other ship types can have half this many (round down). Multiple pods combine in the geometric progression of scale: each tripling of pod number increases their total size by 1 (round up). And of course, the total pod mass affects the total ship mass and therefore its performance unless the extra mass is part of the ship design.

EXAMPLE: Three size 4 pods would count as a hull size of 5 for determining penalties. A size 4 ship towing a size 4 pod would be counted as a size 5 ship for targeting purposes. A size 3 tug with a mass of 90 tons (mass of 11) and an acceleration of 2.3g (acceleration of 7) that is shoving a 500 ton load (mass of 18) will have its acceleration reduced by the mass level difference (7 levels), down to an acceleration level of 0 (or .2g).

For pod ports past the free amount, the infrastructure for attaching and supporting pods costs 50,000 Credits per pod, but has no appreciable mass nor takes up any space.

External pods are not protected by armor or screens. In addition to possibly being a larger and slower target, a non-pod freighter carrying pods may take a general +1 difficulty to weapon fire and sensor rolls because the pods may be blocking part of an antenna or weapon arc, leaving blind spots that have to be compensated for.

EXAMPLE: As a size 5 ship, the *Sesterce* can have five g-stressed pod ports for free. Three of those are used for the pods it normally carries. One is going to be used for the *Sesterce*'s externally carried shuttle (a normal docking port could not handle full acceleration stress with a ship attached), leaving one spare port. The designers add four more pod ports at a cost of 200,000 Credits, because they plan on carrying some kinetic missiles in the hold, and if the situation warrants, they now have space to mount five of them in a ready-to-fire position.

External pods are automatically stripped off and lost on re-entry into any atmosphere unless they are also streamlined (missiles are usually not streamlined). Reflecting their size and vulnerability, any pods that are outside the normal designed volume of the ship have to be associated with a particular location on the ship, and any time that location is hit by weapons, there is an even chance for each to be hit.

EXAMPLE: The *Sesterce*'s cargo pods are part of its designed volume, so they occupy normal hit locations. A tug shoving a brace of pods around a starport would have those pods outside the ship's volume, so a hit to the tug might hit a pod instead.

An external pod port on a ship can also be used to dock shuttles and ancillary craft, even during normal acceleration, and is an alternative to an internal hangar. An externally docked ship has the same liabilities and limitations of a cargo pod. Both the carrying ship and the docked ship have to spend 50,000 Credits for the pod attachments.

▼ **Note** - Any ship which does not exceed an acceleration level of 0 (or .2g) does not need to pay the "pod attachment" fee for ships that dock with it. The normal "free" airlock and docking clamps can handle this stress unless you are trying to dock a pair of large ships and *then* accelerate them.

Some ships are specifically designed for use with exchangeable external pods (the pod/frame hull type). Cargo pods, fuel pods, geologic survey platforms, passenger compartments, etc. can be attached to semi-permanent docking ports on these "modular" ships. This gives these ships flexibility, but also has some inherent limits: magnetic shielding can't be used, and concealment is next to impossible, as are stealth hulls and streamlining.

Pod freighter captains also have an advantage against pirates in that they can "cut and run". The pod freighter can jettison one or more pods to increase their performance, making the pirates have to decide between staying to inspect possibly empty pods, or chasing a freighter that is now much more agile and possibly leaving valuable booty behind.

EXAMPLE: If the *Sesterce* at a loaded mass of up to 2,500 tons (acceleration of .1g) were to drop all her cargo pods, she would only mass about 500 tons (acceleration of .2g). Not a big difference, but a hundred percent better than it would have been, especially considering that any pursuers have to chase her, catch her, then slow down and turn around to go get the drifting cargo pods.

Spares - Ships can carry spare parts to cover contingencies or handle routine maintenance and consumables. These can be dedicated to repair of a particular system (engine parts), or could be generalized repair tools. The difference is how easy and how long it takes to make repairs.

To make it simple, repairing damage systems involves restoring the ship's lost Hits. As these are repaired, overall damage penalties are reduced, until systems are at full operational capacity. In most cases a damaged system that contributes to an overall damage penalty is *mostly* operational. A damaged sensor system might need some circuit boards replaced, an engine might need a new turbopump or plasma conduit, but the majority of the ship and its systems are technically intact.

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So, a relatively small amount of parts can make a significant contribution to repairs. In general, it takes about 1% of ship's hexagons in spares to repair 1 Hit. This would mean that one detailed hit location devoted to spare parts is sufficient to restore about 3 Hits worth of damage. It would repair proportionately more if applied to a smaller ship, and less if applied to a larger ship.

EXAMPLE: Spares sufficient for 3 Hits of repairs on your 500 ton ship could be used to repair 1 Hit on a derelict 1,500 ton ship.

In terms of specific game mechanics, a ship with one hit location (about size-3) in spares can use the "inadequate repair facility" and "many repair parts available" modifiers on ship repair for itself ("some repair parts available" for other ships). This means that it can probably eventually negate one damage penalty on a ship, or repair up to three damaged systems.

Spares can also be used for maintenance purposes if a ship is going to be away from a starport for extended periods (more than a month). Each 1% of a ship's hexagons in spares is good for almost a year of routine system maintenance. Most ships are able to spare 1 hexagon out of a thousand to have one *month's* worth of maintenance supplies on hand. They can't actually do any repairs with this small an amount, but the ship won't suffer penalties from poor maintenance if they have to stay away from port for more than a month.

Spares have a cost as a regular system for the tech era most of the ship is constructed at.

EXAMPLE: At this point, the *Sesterce* has 22 hexagons of space left. The builders make room for 10 hexagons of spares (enough to repair 1 Hit), at a cost of 100,000 Credits. This could also be used (somewhat inefficiently) to meet the *Sesterce's* maintenance needs for a year. Having the exact supplies needed picked up at a starport is more cost effective than wastefully going through spare parts stores to get at needed bits (like dismantling a 100Cr circuit board to get the 5Cr chip you need).

EABA

Airlocks - All manned ships of hull size 2 or more (45 hexagons and up) usually come with at least one airlock (smaller ships have docking ports). Normally, one of the airlocks is also a docking port, allowing standard power, communication, and life-support connections to other ships and spacedocks. If a ship has any attachment points for pods, *all* airlocks are considered docking ports. Airlocks or docking ports are part of the cost included in a hull, and a ship will normally have at least 1 extra for each level of size past 2. It may have more, depending on the ship's designed role.

Cycling through an airlock takes about one starship turn for normal use, though it can be done in thirty seconds or less if you wish to be wasteful of atmosphere and bypass any decontamination procedures.

Any ship with a docking port can carry or be carried externally on another ship. The external ship would be assigned to a particular hit location, and has a 50-50 chance of being hit if that location is hit, in which case you would use the docked ship's defenses and damage limit instead of the main ship's.

EXAMPLE: If the *Sesterce* carries a shuttle for moving crew and cargo in and out of gravity wells, it could either have internal hangars for these ships, or carry them on external docking ports. We have already decided on external docking.

A ship can carry externally docked ships at no penalty to its performance if their mass is taken into account in the ship design. Carrying ships whose total hexagons is more than the carrying ship's size-1 will make the combined assemblage 1 size level larger for purposes of chance to be hit.

EXAMPLE: If the *Sesterce* carries a size 3 shuttle (125 hexagons), this is within the limits of what it can carry with no penalty. If the shuttle is 50 tons, then we have to add 50 tons to the *Sesterce*'s loaded mass. The shuttle will be listed on the advanced hit locations as being docked to a particular spot by adding a 'S' to that location.

Laboratories - Laboratories are required for the full use of any scientific or research skill. These usually take 5 hexagons of space (a large broom closet, 2 hexagons of floor plan), will have a minor draw on ship's power when operational (8d+0 Strength), and will allow use of a *specific* aspect of one skill it was designed for at no penalty.

EXAMPLE: If "Xenobiology" was a general skill, a 5 hexagon lab could allow use of this skill for the specific skill "Xenobiology (plants)".

Doubling the size of a lab adds +1d to the Strength required, gives a -2 to the difficulty of the tasks, or allows the benefit of an assistant with the research work, or allows use of the full skill rather than just a specialization. A "science station" takes 20 hexagons of space and may be used on research vessels or larger starships to act as a laboratory for an entire field of skills, rather than a single skill (i.e. a "Planetary Sciences" lab instead of a "Xenobiology" lab). The size of a science station would have to be doubled to allow the main researcher to gain the benefit of any assistants. Labs cost about 10,000 Credits per hexagon and generally use Late Atomic Era technology. Post-Atomic Era labs get a -2 to the difficulty of tasks, but cost 16,000 Credits per hexagon. Post-Atomic Era labs do not make tasks easier if they are for fields of study that *require* Post-Atomic Era tech.

EXAMPLE: A Post-Atomic Era "Planetary Science" lab will take 20 hexagons of space, uses 12d+0 Strength, and gives a -2 difficulty to use of skill rolls on any science in this category. And it *only* costs 320,000 Credits...

Manufacturing Lab: This is a specialized lab that includes computer-controlled mechanical and electronics fabricators. The plant does not include the raw materials needed to make the parts, which are generally double the size of the part itself. A working system can be cannibalized (destroyed) to provide half its hexagons towards rebuilding another system. An already destroyed system can provide a quarter of its size in raw materials.

In terms of ship design, a manufacturing lab can either be considered in terms of hexagons (if you want to make and repair small items), or in size levels, which would allow you to eventually make replacement parts of that size or smaller. If a manufacturing lab is at least as big as a damaged ship system and you have sufficient spares, you get a -2 on the time it takes (your ship gets the "adequate repair facility" modifier instead of the "inadequate" one).

Medical Lab: Med labs provide all the tools a doctor would need for diagnosing and treating patients. All med labs include at least one biostasis tube for handling patients who are untreatable. A small med lab typically is for medical or first aid skills. A "medical sciences" lab (at least 20 hexagons) can do things like analyze alien poisons or diseases, synthesize compounds (with difficulty) and do other advanced medical tasks like organ transplant or cybernetic surgery. A med lab will also include at least one sensor bed, but only larger labs will have tissue regeneration units. U.W. ships that carry paying passengers must have a med lab and at least one biostasis tube per fifty passengers (round up) or provide up-front notification to potential passengers that medical facilities are unavailable and have the passengers sign a waiver form. If competing on a passenger route with ships that do have medical facilities, ships without typically have fares at a 25% discount.

The minimum medical lab (5 hexagons) consists of a floor-level stasis chamber, on top of which is a sensor bed and small tissue-regen unit, with supply cabinets, ceiling and wall mounted displays and diagnostic instruments, and just enough spare room for the medic to stand and turn around. This lab would cost 40,000 Credits per hexagon for Late Atomic Era equipment, 48,000 Credits for Early Post-Atomic Era devices and 64,000 Credits per hexagon for state-of-the-art Post-Atomic Era facilities.

Entertainment Lab: Not really a laboratory, but a space dedicated to crew entertainment and morale. It could be as simple as a lounge where there is room for people to gather and talk, a set of VR game consoles, a comfy chair and some old fashioned books, or the ship's liquor cabinet. It serves a purpose in keeping passengers happy and letting the crew blow off steam in the normally cramped confines of even the most luxurious starship.

EXAMPLE: At this point, the *Sesterce* has only 12 hexagons of space left. The builders make room for a minimal Early Post-Atomic Era med lab (five hexagons) at a cost of 200,000 Credits. They considered adding ten hexagons of entertainment space to take the edge off the confinement of the quarters, but decided to use that space for the spare parts instead. They can always repurpose the supply closet later if they change their mind.

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Hangar - A hangar includes sealable hangar doors, docking clamps, a pressurizable volume, and a passenger or cargo airlock. A hangar can normally launch or retrieve one ship per starship turn. Hangars cost as a non-military system based on the number of hexagons that they take up. When full, a hangar is assumed to have a mass of .5 tons per hexagon, and .1 ton per hexagon when empty.

The size-1 of the hangar is the maximum size ship it can hold, or twice this number of size-2 ships, four times this number of size-3 ships, etc.

EXAMPLE: A hangar that takes up a size of 8 on a size 11 ship can carry one size 7 ship, two size 6 ships, four size 5 ships, eight size 4 ships, and so on.

Practically speaking, a hangar can carry more heavily armored ships than lightly armored ones, because they are physically smaller, but we're not going to get into the details of that. A hangar that is bought as a military system can launch and retrieve ships at double the normal rate.

▼ **Note** - A carrier normally has a small number of hangars for ease of repairing its carried fighters and for a few specialized recovery ships (to fetch damaged fighters), but the fighters are most often carried on and deployed from docking ports rather than hangars, because it is so much faster.

Entering or exiting a hangar or clamping to a docking port is all but impossible while performing evasive maneuvers. Computers can compensate for fractional gee accelerations between a small ship and a much larger one, but for things like boarding actions, the boarders basically crash land onto the destination ship and blast locking bolts into its hull before using breaching charges to make their own entrance.

Subterfuge - Ships can appear to be different than they *actually* are with a bit of work. Normally any ship that you have a targeting lock on can be reliably classified by sensors. Its power output, maneuvering capability, current reactor output, active weapons, any atmosphere leaks and active sensor types can all be determined with some accuracy. Within a thousand kilometers (1 hexagon), externally carried missiles and the like can be seen by scans even if the systems behind them are powered down. Simple visual inspection will also show any evasion technologies like radar absorbent coatings or stealth hull configurations.

Subterfuge covers the long range aspects of appearing different. Each time you double the cost of a ship's system (up to twice), you can give an enemy sensor operator a +4 difficulty to get a targeting lock for purposes of getting *that* specific information on a ship. That is, it is not any harder to get a targeting lock, but unless the roll is made by 4, the enemy sensor operator does not get to know the details on the system being concealed or is misinformed about them. Furthermore, since much of the time, a lack of information would be obviously suspicious, subterfuge masks the actual signature as something else.

EXAMPLE: A "Q-ship" is a starship that looks like a helpless freighter, but which actually carries heavy weapons and sophisticated sensors. If a pirate is suckered into attacking it, and it has two levels of subterfuge (+8) on its weapons, sensors and engines, the pirate sensor operator is *not* at increased difficulty to spot the Q-ship, but unless they make their sensor roll by 8, they think the Q-ship is running ion drives instead of high-thrust fission engines, has minimal sensors instead of a full military suite, and has only a point defense laser instead of a long range ion cannon. *Someone could be in for quite an unpleasant surprise!*

In some instances, subterfuge can be done in reverse, often at little cost. A ship might dismount some of its reactor shielding to appear like it has more power than it actually does, or scrounge together something that looks like and has the power signature of a few dozen missiles, in hopes of intimidating potential pirates.

Concealment - A ship can use special coatings and designs to make itself harder to spot on sensors. This can only be done effectively on military hulls. Each time you *double* the hull's cost, you give enemy ships +4 difficulty to get a detection or targeting lock. Communication locks assume the recipient wants to talk, and are unaffected.

Concealment can be bought once for Late Atomic Era hulls, and twice for Early or Middle Post-Atomic Era hulls. Vorn crystal hulls come with one level of Concealment (+4 difficulty) at no extra cost, but the Vorn do not buy extra levels.

The effectiveness of concealment or stealth technologies also depends on the technology used and the technology used against it. The difficulty of getting a lock is altered by 2 for each fraction of a tech era difference between the sensors and the concealment. The idea is that later technologies know about earlier stealth measures and how to compensate for them.

EXAMPLE: A ship using Late Atomic Era stealth measures against an Early Post-Atomic Era sensor would only get a 2 point bonus. On the other hand, a ship using Early Post-Atomic Era stealth measures against Late Atomic Era sensors would get a 6 point bonus.

▼ **Note** - This means that Vorn ships are +6 to be spotted by even the best U.W. vessels, +8 to be spotted by Early Post-Atomic Era ships, and +10 to be spotted with Late Atomic Era sensors.

Concealment of another kind is an ECM suite to project false images. This is bought as a normal sensor array. Using it is part of a sensor operator's normal duties, though anyone can push the button to activate it. By creating multiple sensor images that appear identical to the ship, it spreads enemy fire, meaning less shots are fired at the real ship. All the false images are in the same general region of space as the real thing, so it won't be able to fool actual pursuit. The penalty an opposing ship has to hit is the total sensor modifier provided by that ship. Remember to take tech era differences into account.

EXAMPLE: A ship with an ECM "sensor" of -2 to difficulty (a medium Post-Atomic Era model) makes enemy fire aimed using Post-Atomic Era sensors more difficult by 2 points. Early Post-Atomic Era weapon targeting would be at +4 difficulty, and Late Atomic Era fire would be at +6 difficulty.

The normal image presented is not something that would fool the naked eye, but is good enough to mimic the energy signature of a ship viewed at most sensor ranges. If a ship fires at and "hits" a false image, its sensors will be able to tell the deception by the lack of debris or flash of vaporized hull. Similarly, prolonged sensor operation can pick out the differences between the real ship and the false images. As a result, the ECM rating of a ship will drop by 1 after each turn of combat, down to zero.

ECM benefits apply to any ship that uses the target data provided by the ship taking the penalty. If a fleet takes its sensor data from a ship that has a +2 difficulty to hit because of enemy ECM, then all ships in that fleet are at +2 difficulty to hit the ship using the ECM.

ECM pods may be disposable. These are decoy pods the size and cost of a missile that project an energy signature to match the ship that launched it, and can maneuver just like the carrying ship for one turn. On sensors, they look just like the carrying ship, but can be distinguished on a targeting sensor roll with a bonus of the carrying ship's size-4. That is, a tiny ECM drone can mimic a size 4 ship perfectly, but mimics a size 12 battleship very poorly. Any differences in ability can be compensated for by actions of the carrying ship. A ship can only take advantage of one ECM pod at a time.

EXAMPLE: If your size 8 ship drops an ECM drone, it is normally a sensor roll at -4 difficulty to tell the difference. If the size 8 ship drops an ECM drone and then drops its power output to make itself 4 points harder to spot, then it has matched the ECM drone, and an enemy sensor operator will have trouble telling the difference. At least for one turn, until the drone runs out of power.

The main use of ECM pods is on small or already stealthy ships. If they are spotted they can drop decoys, which do not have to follow the same course as the real thing, and may require multiple sensor rolls on the part of an enemy, buying time for escape. Or, a ship can drop decoys and power systems down, hoping that it will be overlooked.

As with stealth architecture, the chance of seeing through ECM depends on the technology difference. Having higher tech ECM than enemy sensors is good for a +2 difficulty for them to spot the difference per fractional tech era, while having ECM of lower tech is a -2 to their difficulty per fractional tech era.

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▼ **Note** - If you had not noticed by now, Late Atomic Era ships are *completely* outclassed by anything more advanced. Against Early Post-Atomic Era vessels, it is like taking on modern jets with WWII fighters. Against Post-Atomic Era ships it is like taking on these jets with WWI biplanes! The only reason Late Atomic Era weapons and combat systems are around at all is they are cheap and easy to work on compared to more advanced systems. Fledgling colonies are like Third World nations. They often do not need nor can afford anything better. The older tech is not that effective, but it is effective enough to be a deterrent against most of the low-level threats they would face.

Disguise - Disguise is hull or system modifications designed to fool short range scanners (*including* the naked eye). Any ship system can be so modified. A major advantage of disguise is that lacking any reason to think otherwise, people see what they expect to see. Even a flimsy disguise can work if there is no suspicion. The ship owner's reputation also factors into this. Disguise can also work internally; a concealed cargo hold for smuggling would be an example.

Disguise simply adds fifty percent to the size in hexagons (and therefore cost) of the system. If a system normally has no cost, consider the cost of the disguise to be based on the hexagons of space used (like a disguised cargo hold). It is normally a Formidable(13) Awareness task to notice a disguised system for what it is, *if* you are obviously examining the right spot of the ship, but any sort of naval architect skill could also be used, and having the same or similar modifications to your own ship may make it easier to spot them.

Few disguises are "standard". If they were, U.W. inspectors would have a list of things to look for. They do have the advantage of having standard ship hulls in their databases. This is good for a -2 to the difficulty of spotting such modifications on any design in that database.

▼ **Note** - Almost all "ship family" ships and most independently owned ships will have a secret compartment or two. These may only be a few hexagons in size, big enough to hide a person, a small, high-value cargo, or maybe as a weapon locker. *You never know when it will come in handy.*

▼ **ADVENTURE SEED** - A ship the adventurers own or are booking passage on was a recent acquisition from the estate of an independent trader. That trader's cargo had already been sold at auction, but not the Antares Cartel contraband he stashed in a small secret hold, a hold the current ship owners are unaware of. The cartel wants their cargo back, as it is either extremely valuable, or could be very damaging from a law enforcement standpoint if it fell into the wrong hands. Options include a 'pirate' attack, a passenger or passengers booking passage and searching for the contraband, or an attempted break-in while the ship is docked. U.W. Marshalls may also have gotten wind of this, but are not on solid enough legal ground to impound and dismantle the ship to look for the cargo. To the cartel, destruction of the ship is an option if the cargo cannot be retrieved by other means...

▼ **THE SESTERCE** - We have something like seven hexagons of space left on the Sesterce. We use this for a five hexagon concealed cargo space that is only accessible from the outside of the hull, and a two hexagon concealed locker for firearms and other small contraband. These modifications cost 35,000 Credits. These concealed spaces are not inherently illegal, nor are the things the adventurers intend to put in them. They just aren't obvious at first glance. In the end, the Sesterce looks like this:

Item	Hex	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	36	1.500MCr
Quarters	300	4	0	11	0MCr
Armor	0	0	64	0	.192MCr
Ion drives	20	1	10	1	.200MCr
Ion drive fuel	10	0	5	0	.010MCr
Rozkhov Dr.	125	3	62.5	4	1.500MCr
Sensor 1	20	1	10	1	.200MCr
Sensor 2	1	-1	.5	0	.010MCr
Bridge	6	0	3	0	.240MCr
Fiss. reactor 1	160	3	80	6	1.600MCr
Fiss. reactor 2	1	-1	.5	0	.010MCr
Point def. laser	5	0	3	0	.200MCr
Sm. long laser	40	2	20	2	1.600MCr
Small pod	40	2	4	2	0MCr
Med. pod 1	125	3	12.5	4	0MCr
Med. pod 2	125	3	12.5	4	0MCr
Med lab	5	0	2.5	0	.200MCr
Spares(1 Hit)	10	1	5	0	.100MCr
Disguised hold	5	0	0	0	.025MCr
Weapon locker	2	-1	0	0	.010MCr
Pod ports(4)	-	-	-	-	.200MCr
External shuttle	-	-	30	-	-
Totals	1,000	-	425	35	7.797MCr

The hit locations will need notes as to which of the small systems are combined, but that is designer preference for the most part. In terms of an official ship description, she might look like this:

Sesterce

Tech Era: Late Atomic

Hull: Pod frame

Size: 5 (1000 hexagon)

Empty/Loaded: 425 tons/2,500 tons

Hits/Damage Limit: 28/-2

Max. thrust: .2g (level 0)

Hull rating: 3.2g (level 8)

Armor: 5d+2 (all facings)

Screens: none

Peak reactor power: 20d+2 (adequate)

Peak pulse power: 0d+0

Best sensor: +0 difficulty

Backup sensor: +3 difficulty

Quarters: 8

Crew per shift: 4

Stores: 10 months

Cost (new): 7.8MCr

Monthly maintenance: 2,800Cr

		First roll					
		1	2	3	4	5	6
Second roll	1	C ₁	C ₁	W ₂	Q	Q	Q
	2	C ₁	C ₁	C ₄	Q	Q*	GS
	3	E	R	R	Q	Q	Q
	4	W ₁	R	R	Q	Q	Q
	5	C ₂	C ₂	C ₃	L	P	P
	6	C ₂	C ₂	C ₃	P	P	P

Adventurer notes - If this ship were bought by adventurers, they would probably want to draw up a floor plan of what the habitable sections look like (you never know when it will come in handy). To do this, we know there are 300 hexagons of volume in passenger space, plus 15 hexagons in various labs, a 4 hexagon bridge and a 2 hexagon secret locker, for a total of 321 hexagons. Since most of this has standing room, we divide by 2 to get 160 hexagons of floor space, noting that we have to split most of this between actual quarters and the halls and other common areas. All this space is probably on one or two levels, on the end of the spin habitat module. The rest of the ship might be accessible, and even have life support, but it will be through crawlways and access tubes that provide few to zero movement options in a critical situation.

▼ **Note** - Now that it's done, we can see there may be a few "adjustments" needed. Do adventurers really need the small pod, or would they be better off with some extra living space, or maybe a booster engine to get them out of tight spaces? A space of 40 hexagons could mount a fission engine, booster and fuel sufficient to push the unladen Sesterce at up to .5g for a day, or 1.1g for an hour. *Is it worth it?*

▼ **STARSHIP ECONOMICS** - The systems on a starship are built to stringent specifications, since they have to handle a lot of stress in an environment of extreme heat, cold, vacuum, and radiation, and continue to work reliably while a long way from home (you can't just pull over to the side of the road and call for a tow truck, and if you are in an unexplored system, that call to the tow truck might take several years before it reaches someone who can hear it). Correspondingly, these systems require frequent adjustment, maintenance, and overhaul, along with regular safety inspections and official certifications. Not counting the crew's salaries, the general supplies, air filters, maintenance, inspection stickers, and so forth will cost the ship's owner the ship's usable hull size-2 in levels of money per month (size+0 for deployed military ships). Usable hull size is anything that requires significant maintenance, which is about everything except spares, cargo, hangars and fuel tankage.

EXAMPLE: The *Sesterce* is a size 5 ship, but really only has about 700 hexagons of space that requires upkeep. This is still about that of a size 5 hull, so the *Sesterce* requires a money level of 3 (2,800 Credits) a month to keep in good condition. If this were a military ship that had size 5 of maintenance-requiring space, it would have a monthly maintenance cost of 5,600 Credits.

EXAMPLE: A good condition size 0 work pod will cost about a money level of -2 (500 Credits) per month to keep it in good running order (which includes inspection stickers, etc.).

A ship with half or more of its hexagons in "worn" systems is +1 to its size for maintenance costs (it takes more money to keep the old girl going...).

EXAMPLE: If the *Sesterce* were an older ship with a bit of wear on it, it would require a money level of 4 per month (4,000 Credits) instead of a money level of 3 (2,800 Credits).

This does not count the salaries of the people doing the maintenance, just the consumables that the ship goes through even while parked at space-dock.

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Every month without proper care and each time this is doubled (two months, four months, etc.), the ship loses 1 Hit. If it ever loses all its Hits due to neglect, it turns into scrap, usable only as a source of raw materials.

EXAMPLE: A work pod with 10 Hits could conceivably go 42 years without maintenance, but you would really not want to be risking your life in for most of that period (it will be in the -1d penalty range after the first sixteen months).

Maintenance is vastly cheaper and easier than repairs, especially on big ships (compare the cost of repairing 1 hit on a size 5 ship like the *Sesterce* (36,000 Credits for a standardized design) to a monthly maintenance of 2,800 Credits to keep from taking the damage in the first place. If on-board spares are used for routine maintenance (like on a long exploration mission), they last ten times as long.

EXAMPLE: A ship which had enough stores to repair 1 Hit of damage could use that to perform ten months of routine maintenance (you can round this to a year).

Losing Hits because of failed maintenance is not an alarm clock waiting to go off. Being a few days or a week late is not going to be a big deal. It is really the long-term commitment to keeping the ship in shape that is most important.

A ship that is completely powered down still requires "maintenance", but at a vastly reduced rate (one-quarter normal). Hits lost in this state really just represent neglect and exposure. A "mothballed" ship has half the "powered down" maintenance level (it would lose 1 Hit after eight months, and would take over twenty years to lose 5 Hits).

Used parts - You seldom have to buy weapons, parts or even ships as new. Items that are used or military surplus are often available at a discount. As the StarForces upgrade their ships, the older vessels and their weapons are dismantled and often sold on the open market. It increases the general defense of the U.W. and helps defray the cost of new and expensive ships.

Ship systems that are obviously used, but in good working order and with all appropriate papers are about half the normal cost. Such weapons and systems are distinguishable from new only by appearance. Only Late Atomic and Early Post-Atomic systems are available at the "used" price.

Quite old, but still working systems are a quarter or less normal cost. The problem with these systems is that they are generally 1 point less capable than their new counterparts in all categories that require power input. A sensor that is +0 new might be +1 when well used. A weapon that is 7d+1 with an accuracy of -4 when new, might be 7d+0 with an Accuracy of -5 when worn. Armor is unaffected. Extremely worn systems would be 2 points less capable, but only be an eighth the normal cost.

Worn or extremely worn systems will also have increased maintenance frequency as described earlier. Worn systems also give the gamemaster one "freebie", a "random" system "malfunction" that temporarily strands the adventurers somewhere for a little while.

Worn or extremely worn systems can be pushed to full, normal capacity at some risk. They get a 3d+0 (worn) or 2d+0 (extremely worn) roll to make an Easy(5) task. If successful, the system may be used *that starship turn* as though it were new. If the roll is failed, that system shuts down, *and* requires the same roll to be restarted. This roll *would* be affected by overall damage penalties a ship has taken.

Once a worn or extremely worn system has been failed due to being pushed, the only way to get it to work reliably at all is to pay the cost for repairing 1 Hit on the ship as a "component repair". That is, you busted something when you pushed the engines to 100% performance, and they'll never work reliably (even at reduced levels) until you replace the balky parts.

The U.W. has certain minimum ship standards, which worn or extremely worn systems may no longer be able to meet, particularly the .1g acceleration requirement under full load. To get around this, ship owners often register their ships in systems whose inspections are less rigorous, where a "priority inspection fee" has inspectors simply look at the *theoretical* numbers for a system in a database rather than require a full-power test of the system. The U.W. disapproves of this, but cannot crack down on it without interfering in the sovereignty of independent worlds.

▼ **DATA TABLES** - The tables on the next few pages list the basic data on starship weapons, power plants, engines, sensors and so on. The tech era listed is the first era it becomes available. Later model weapons and engines using that technology (if available), are usually +2 damage for each fraction of an era forward and consume +2 Strength, or provide +2 Strength and consume +2 Strength (if applicable). Fission technologies are at the top of their curve at Late Atomic Era, and cannot be improved. Weapons at a better tech than normal get the improved Accuracy that goes with that tech (see [page 8.12](#)), but tech-upgraded weapons cost three times as much per fraction of a tech era.

EXAMPLE: A light short range laser from the Late Atomic Era does 6d+0 damage, requires 14d+0 Strength from reactors to run it, has an Accuracy of -8 and costs 200,000 Credits. An Early Post-Atomic Era model does 6d+2 damage, uses 14d+2 Strength, has an Accuracy of -4, and costs 600,000 Credits.

Components can with gamemaster permission be bought in other sizes. Cost is proportional to the increase in size (twice as big costs twice as much). Each doubling of size increases weapon damage by +1d and Strength required by +1d. Each halving reduces damage by 1d and decreases Strength required by 1d.

EXAMPLE: A light short range laser cannon takes up 10 hexagons, uses 14d+0 Strength, does 6d+0 damage and costs 200,000 Credits. A ship with some extra room and power may be able to find a heavier version of this weapon. One doing 7d+0 damage would take 20 hexagons, cost 400,000 Credits and use 15d+0 Strength. If this weapon were in a 60° turret instead of the default 360° turret, it would still cost 400,000 Credits, but it would do 9d+0 damage and use 17d+0 Strength.

▼ **Note!** - Yes, starship weapons (and most other components) are damned expensive. As much as anything else, this is why most civilian ships are minimally armed. If it is a sound business decision to add a million credits to the cost of your ship for a decent weapon, ship owners by all means do so, especially since the StarForces are selling off their stockpiles of Early Post-Atomic Era weapons as their Post-Atomic Era ships come online. Otherwise, ship owners look at how many "piracy insurance" or spare parts payments this money would cover. Ships that run only between major worlds usually have minimum legal sensors, and their biggest weapon is a security officer's sidearm. Compare it to modern ocean-going vessels. When was the last time you saw a passenger liner or cargo ship mounting anti-aircraft guns or anti-ship missiles?

POINT DEFENSE WEAPONS

NAME	TECH ERA	DAMAGE	ACC.	BONUS	STRENGTH USED	HEXAGONS	COST
Hypervelocity pellet gun	Late Atomic	5d+2	20 ¹	4	13d+0	5	100KCr
Point defense laser	Late Atomic	7d+0	20 ¹	2	13d+0	5	50KCr

SHORT RANGE WEAPONS

NAME	TECH ERA	DAMAGE	ACC.	BONUS	STRENGTH USED	HEXAGONS	COST
Light short range laser	Late Atomic	6d+0	-8	0	14d+0	10	200KCr
Medium short range laser	Late Atomic	8d+0	-8	0	16d+0	40	800KCr
Heavy short range laser	Late Atomic	10d+0	-8	0	18d+0	160	3.2MCr
Light plasma cannon	Early Post-Atomic	5d+1 ²	-4	0	14d+2	10	300KCr
Medium plasma cannon	Early Post-Atomic	7d+1 ²	-4	0	16d+2	40	1.2MCr
Heavy plasma cannon	Early Post-Atomic	9d+1 ²	-4	0	18d+2	160	5.0MCr
Superheavy plasma cannon	Early Post-Atomic	11d+1 ²	-4	0	20d+2	640	20MCr
Light sh. range ion cannon	Early Post-Atomic	8d+1 ³	-4	0	14d+2	10	600KCr
Medium sh. range ion cannon	Early Post-Atomic	10d+1 ³	-4	0	16d+2	40	2.5MCr
Heavy sh. range ion cannon	Early Post-Atomic	12d+1 ³	-4	0	18d+2	160	10MCr
Superhvy sh. range ion cannon	Early Post-Atomic	14d+1 ³	-4	0	20d+2	640	40MCr
Light sh. range gravity shear	Late Post-Atomic	6d+2 ^{2,4,5}	-2	0	13d+0	10	n/a
Medium sh. range gravity shear	Late Post-Atomic	8d+2 ^{2,4,5}	-2	0	15d+0	40	n/a
Heavy sh. range gravity shear	Late Post-Atomic	10d+2 ^{2,4,5}	-2	0	17d+0	160	n/a
Superhvy sh. range gravity shear	Late Post-Atomic	12d+2 ^{2,4,5}	-2	0	19d+0	640	n/a

LONG RANGE WEAPONS

NAME	TECH ERA	DAMAGE	ACC.	BONUS	STRENGTH USED	HEXAGONS	COST
Light long range laser	Late Atomic	6d+1	-8	0	16d+0	40	1.6MCr
Medium long range laser	Late Atomic	8d+1	-8	0	18d+0	160	6.4MCr
Heavy long range laser	Late Atomic	10d+1	-8	0	20d+0	640	25MCr
Light l.range ion cannon	Early Post-Atomic	6d+1 ³	-4	0	16d+2	40	5.0MCr
Medium l.range ion cannon	Early Post-Atomic	8d+1 ³	-4	0	18d+2	160	20MCr
Heavy l.range ion cannon	Early Post-Atomic	10d+1 ³	-4	0	20d+2	640	80MCr
Superhvy l.range ion cannon	Early Post-Atomic	12d+1 ³	-4	0	22d+2	2500	320MCr
Light l.range gravity shear	Late Post-Atomic	6d+2 ^{2,4,5}	-2	0	15d+0	40	n/a
Medium l.range gravity shear	Late Post-Atomic	8d+2 ^{2,4,5}	-2	0	17d+0	160	n/a
Heavy l.range gravity shear	Late Post-Atomic	10d+2 ^{2,4,5}	-2	0	19d+0	640	n/a
Superhvy l.range gravity shear	Late Post-Atomic	12d+2 ^{2,4,5}	-2	0	21d+0	2500	n/a

WEAPON MODIFIERS

WEAPON MODIFIERS	TECH ERA	DAMAGE	ACC.	BONUS	STRENGTH USED	HEXAGONS	COST
180° arc	any	+1d	same	same	+1d	same	same
60° arc	any	+2d	same	same	+2d	same	same
Fixed arc	any	+3d	same	same	+3d	same	same
Partial era tech upgrade	n/a	+2	+4	same	+2	same	times 3
Rate of fire upgrade	any	-1d	same	+1	same	same	times 1.5

KINETIC MISSILES

NAME	TECH ERA	ACCEL.	ARMOR	HITS/DL	SENSOR ROLL ⁶	SIZE(HEX)	COST
Kinetic missile(14d+0 damage)	Late Atomic	4.0g(8)	1d+0	10/7	2d+0(+3 diff.)	0(6)	75KCr
Kinetic missile(14d+0 damage)	Early Post-Atomic	4.5g(9)	1d+0	10/7	2d+0(+2 diff.)	0(6)	100KCr
Kinetic missile(15d+0 damage)	Post-Atomic	7.0g(11)	1d+0	10/7	2d+0(+1 diff.)	0(6)	150KCr

¹On the normal (non-starship) range scale. This would be an Accuracy of -10 on the starship range scale.

²Each 1d that penetrates armor reduce the target's damage limit by 1 for that hit.

³Any vessel without magnetic screens has its armor reduced by 1d before comparing to damage.

⁴All vessels have their armor reduced by 1d before comparing to damage.

⁵Any vessel taking a hit from this weapon takes the same damage on the following turn.

⁶The dice it gets and the overall modifier to difficulty based on its size and quality, in the event that the controlling ship cannot pass its sensor data.

POWER SYSTEMS

NAME	TECH ERA	FUEL	REFUELABLE?	STRENGTH	HEXAGONS	COST
Accumulators	Late Atomic	n/a	yes	13d+2	2	20KCr
Solar panels	Late Atomic	light	n/a	4d+2	2	20KCr
Pocket fission	Late Atomic	U ₂₃₅	no	5d+0	1	10KCr
Compact fission	Late Atomic	U ₂₃₅	no	10d+2	5	50KCr
Small fission	Late Atomic	U ₂₃₅	no	12d+2	10	100KCr
Medium fission	Late Atomic	U ₂₃₅	no	16d+2	40	400KCr
Large fission	Late Atomic	U ₂₃₅	no	20d+2	160	1.6MCr
V.large fission	Late Atomic	U ₂₃₅	no	24d+2	640	6.4MCr
Pocket fusion ¹	Early Post-Atomic	H ₂	yes	5d+0	1	12KCr
Compact fusion ¹	Early Post-Atomic	H ₂	yes	10d+2	5	60KCr
Small fusion ¹	Early Post-Atomic	H ₂	yes	12d+2	10	120KCr
Medium fusion ¹	Early Post-Atomic	H ₂	yes	16d+2	40	500KCr
Large fusion ¹	Early Post-Atomic	H ₂	yes	20d+2	160	2.0MCr
V.large fusion ¹	Early Post-Atomic	H ₂	yes	24d+2	640	8.0MCr
Compact antimatter ²	Post-Atomic	H̄	no	12d+1	5	80KCr
Small antimatter ²	Post-Atomic	H̄	no	14d+1	10	160KCr
Medium antimatter ²	Post-Atomic	H̄	no	18d+1	40	640KCr
Large antimatter ²	Post-Atomic	H̄	no	22d+1	160	2.5MCr
V.large antimatter ²	Post-Atomic	H̄	no	26d+1	640	10MCr

¹Add 0d+2 for Post-Atomic Era fusion reactors

*Vorn antimatter reactors have 0d+2 higher Strength

ENGINES

NAME	TECH ERA	FUEL	FUEL/DAY	THRUST	STRENGTH USED	HEXAGONS	COST
Pocket turbothruster	Late Atomic	-	-	10d+2	8d+2	1	10KCr
Compact turbothruster	Late Atomic	-	-	15d+1	13d+1	5	50KCr
Medium turbothruster	Late Atomic	-	-	17d+1	15d+1	10	100KCr
Large turbothruster	Late Atomic	-	-	21d+1	19d+1	40	400KCr
Fuel-burning turbothruster	Late Atomic	hydrocarbons	1.2	+2d	-	-	same
Pocket ion drive	Late Atomic	Xe	.02	7d+0	12d+0	1	10KCr
Small ion drive	Late Atomic	Xe	.08	11d+2	16d+2	5	50KCr
Medium ion drive	Late Atomic	Xe	.15	13d+2	18d+2	10	100KCr
Large ion drive	Late Atomic	Xe	.65	17d+0	22d+2	40	400KCr
V.large ion drive	Late Atomic	Xe	1.3	21d+0	26d+2	160	1.6MCr
Pocket fission drive	Late Atomic	H	.60	15d+0	-	1	10KCr
Small fission drive	Late Atomic	H	3.0	19d+2	-	5	50KCr
Medium fission drive	Late Atomic	H	6.0	21d+2	-	10	100KCr
Large fission drive	Late Atomic	H	24.0	25d+2	-	40	400KCr
V.large fission drive	Late Atomic	H	100.0	29d+2	-	160	1.6MCr
Pocket fusion drive	Early Post-Atom.	H/H	.08	11d+0	-	1	12KCr
Small fusion drive	Early Post-Atom.	H/H	.40	15d+2	-	5	60KCr
Medium fusion drive	Early Post-Atom.	H/H	.75	17d+2	-	10	120KCr
Large fusion drive	Early Post-Atom.	H/H	3.0	21d+2	-	40	500KCr
V.large fusion drive	Early Post-Atom.	H/H	12.0	25d+2	-	160	2.0MCr
Small antimatter drive	Post-Atomic	H/H̄	.40	21d+1	-	5	80KCr
Medium antimatter drive	Post-Atomic	H/H̄	.80	23d+1	-	10	160KCr
Large antimatter drive	Post-Atomic	H/H̄	3.0	27d+1	-	40	640KCr
V.large antimatter drive	Post-Atomic	H/H̄	12.0	31d+1	-	160	2.5MCr
Vorn small gravity drive	Late Post-Atomic	-	-	26d+0	13d+1	5	-
Vorn medium gravity drive	Late Post-Atomic	-	-	28d+0	15d+1	10	-
Vorn large gravity drive	Late Post-Atomic	-	-	32d+0	19d+1	40	-
Vorn v.large gravity drive	Late Post-Atomic	-	-	36d+0	23d+1	160	-
Vorn e.large gravity drive	Late Post-Atomic	-	-	40d+0	27d+1	640	-

SENSORS

NAME	TECH ERA	DIFFICULTY	STRENGTH USED	HEXAGONS	COST
Minimal sensor	Late Atomic	+3	6d+0	1	50KCr
Small sensor	Late Atomic	+1	8d+1	5	250KCr
Medium sensor	Late Atomic	+0	10d+1	20	1.0MCr
Large sensor	Late Atomic	-1	12d+1	80	4.0MCr
V.large sensor	Late Atomic	-2	14d+1	320	16.0MCr
Each part of a tech era		-1	+2	-	+50%
Passive sensor use		+4	-3d	-	-

FUEL

NAME	TECH ERA	STARPORT AVAIL.	SKIMMABLE ¹	COST/HEX
Ion drive(Xe)	Late Atomic	$\alpha/\beta/\gamma$	no	1000Cr
Fission engine(U_{235}/H)	Late Atomic	$\alpha/\beta/\gamma$	partial	50Cr
Fusion engine(H_2/H)	Early Post-Atomic	α/β	yes	200Cr
Antimatter engine(H/H)	Post-Atomic	α	partial	500Cr

ROZKHOV DRIVES

NAME	TECH ERA	ASTROGATION	STRENGTH USED	HEXAGONS	COST/HEX
(minimum ship size of 4)	Late Atomic	+1 difficulty	26d+size	size-1	10KCr
	Early Post-Atomic	+0 difficulty	26d+size	size-2	12KCr
	Post-Atomic	-1 difficulty	26d+size	size-3	16KCr

CARGO PODS

NAME	TECH ERA	EMPTY MASS	ARMOR	SIZE	CAPACITY	COST
Drop pod	Late Atomic	4 tons	1d+0(+5d)	45 hex	22 hex	135KCr
Drop pod	Late Atomic	4 tons	1d+0(+5d)	45 hex	22 hex	135KCr
Drop pod	Late Atomic	4 tons	1d+0(+5d)	45 hex	22 hex	135KCr
Small	Late Atomic	4 tons	1d+0	45 hex	45 hex	68KCr
Small	Early Post-Atomic	4 tons	1d+0	45 hex	45 hex	68KCr
Small	Late Atomic	4 tons	1d+0	45 hex	45 hex	68KCr
Medium	Late Atomic	12.5 tons	1d+0	125 hex	125 hex	190KCr
Medium	Early Post-Atomic	12.5 tons	1d+0	125 hex	125 hex	190KCr
Medium	Late Atomic	12.5 tons	1d+0	125 hex	125 hex	190KCr
Large	Late Atomic	41 tons	1d+1	350 hex	350 hex	545KCr
Large	Early Post-Atomic	39 tons	1d+1	350 hex	350 hex	715KCr
Large	Post-Atomic	38 tons	1d+1	350 hex	350 hex	890KCr
Temp/radiation protected ²	Late Atomic	47 tons	2d+1	350 hex	350 hex	560KCr
Pressurized ²	Late Atomic	59 tons	3d+1	350 hex	350 hex	600KCr
Very large	Late Atomic	120 tons	2d+0	1000 hex	1000 hex	1.60MCr
Very large	Early Post-Atomic	112 tons	2d+0	1000 hex	1000 hex	2.10MCr
Very large	Post-Atomic	108 tons	2d+0	1000 hex	1000 hex	2.50MCr
Temp/radiation protected ²	Late Atomic	140 tons	3d+0	1000 hex	1000 hex	1.65MCr
Pressurized ²	Late Atomic	180 tons	4d+0	1000 hex	1000 hex	1.75MCr

¹Fuel that is partially skimmable means that you can get the reaction mass, but not the fuel that make the reaction mass work, like skimming hydrogen reaction mass for an antimatter engine. If the engine itself is intact, you can replace lost reaction mass, since you still have your anti-hydrogen. If you lose the engine, you lose the anti-hydrogen and the reaction mass by itself won't do you any good.

²At later tech eras, the extra weight for armor drops at the same proportion as for unprotected pods, remembering that the default mass of a pod is a tenth its hexagons.

▼ **SHIP DATABASE** - The following only scratches the surface of the types of ships seen in the U.W., but it is a good start for gamemasters and players. All costs listed are what the ship would have been as a new purchase. Some Early Post-Atomic and virtually all Post-Atomic ships (and systems) will fall into the "new" category (or at best, "surplus"). Some Early Post-Atomic, virtually all Late Atomic ships and surplus military equipment (and systems) will fall into the "worn" category, and many Late Atomic ships and systems will be "extremely worn".

Strengths listed in parentheses after a system will be how much energy that system requires. To make things simple, if a ship can do everything except charge a Rozkhov Drive with its normal power production, it's peak reactor output will be listed as "adequate". If listed as "inadequate" it means that it cannot use all systems at full power at the same time.

With the exception of very small ships like missiles, work pods and lifeboats, all the ships that follow use standard components plugged into standard hulls. A forward/back, inside/out set of advanced hit locations is also provided for each ship, though these can be modified if necessary.

Missile

Tech Era: Late Atomic

Hull: Enclosed

Size: -1 (2 hexagon)

Loaded: 1.2 tons

Hits/Damage Limit: 10/7

Thrust: 4.0g (level 8)

Hull rating: 25g (level 14)

Armor: 1d+2 (all facings)

Screens: none

Peak reactor power: 7d+0 (adequate)

Peak pulse power: 0d+0

Best sensor: +3 difficulty (6d+0 power)

Quarters: n/a

Crew per shift: n/a

Stores: none

Cost (new): .07MCr

Monthly maintenance: 350Cr

		First roll					
		1	2	3	4	5	6
Second roll	1	E	F	F	S	S	S
	2	E	E	F	S	S	S
	3	E	E	E	S	S	S
	4	E	E	F	S	S	S
	5	E	E	F	S	S	S
	6	E	F	F	S	S	S

This is the standard layout for a kinetic missile. Higher tech missiles have better sensors, endurance or acceleration, but have the same basic plan. There are two variants on the normal missile that are available. Both are considered military rather than restricted hardware. The first is the armored missile. This has 1 ton of armor added to its frame, which gives it an armor rating of 5d+2, 6d+1 or 7d+0, depending on its tech era. This will drop the missile's Strength by 1d+0 for purposes of determining its acceleration. Armored missiles are not designed for re-entry, but can often survive it.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	1	-1	.2	-	.012MCr
Fission engine	.5	-2	.25	11	.006MCr
Booster	.1	-	.06	-	.000MCr
Fuel	.4	-2	.20	7	.001MCr
Min. sensor	1	-2	.5	18	.050MCr
Totals	2	-	1.21	36	.069MCr

The second variant has a 100kg fragmentation warhead. This missile is not designed to collide with a target, but to detonate up to several kilometers off and shower the target with a barrage of 7d+0 hypervelocity fragments. The missile still has to be on a collision course for this to work, but it does not have to be as precise. This missile gets -2 difficulty to hit, and if it "hits", it does one 7d+0 attack, plus one extra hit for each two points it made its roll by. Point defense systems set to intercept frag missiles do so at +2 difficulty, as they have to intercept before the missile gets to detonation range. Frag missiles have a Strength of 0d+1 less than regular missiles. Missiles can have both variants. The cost ends up being about the same, the extra cost of armor/warhead offset by the reduced engine size.

Research drones are the same size and cost as missiles and use the same mounting hardware and data protocols. However, instead of a short duration, high thrust fission engine, they have a micro-fusion drive for extended cruising range. They maneuver for up to two weeks at 1g, or passively collect data for several months. Survey drones are often armored for protection against hostile space environments. Survey and exploration ships often use survey drones to speed system mapping, and they can also be used as communication relays so a ship in orbit can maintain communication with all points on a planet (requires three drones for complete coverage).

The last item using a missile chassis is the atmospheric survey drone. This is a small winged vehicle with non-starship range sensors, powered by fuel-burning turbothrusters to give it 1g acceleration and about a day's cruising range at speeds of up to 400kph. These are used for low-level terrain mapping and reconnaissance.

Lifepod

Tech Era: Late Atomic
Hull: Enclosed
Size: 0 (6 hexagon)
Empty/Loaded: .6 tons/1.2 tons
Hits/Damage Limit: 13/5
Thrust: .1g (level -2)
Hull rating: 18g (level 13)
Armor: 1d+0 (all facings)
Screens: none
Peak reactor power: 5d+0 (adequate)
Peak pulse power: 0d+0
Best sensor: none
Quarters: 6 seats
Crew per shift: n/a
Stores: 1 week food & water
Cost (new): .02MCr
Monthly maintenance: 250Cr

Lifepods are a compromise between what is needed and having nothing at all, but the legally required level of compromise was only reached after the *Barnard* disaster in 2198CE. U.W. regulations state that all newly-built ships mount lifepods (or have shuttle space) sufficient for at least 75% of the ship's total passengers and crew.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	6	0	.6	-	.018MCr
Quarters	6	0	0	36	.000MCr
Totals	6	-	.6	36	.018MCr

Lifepods are cramped tincans with six seats, zero cargo space and minimal maneuverability (a total of .1g for one turn from their maneuvering jets). They cannot survive re-entry and have only air recyclers and a small supply of potable water and emergency rations. They are powered by a small, disposable fuel cell that is turned on when the pod is ejected, and which has sufficient fuel to run for about a week if the pod is fully occupied. Lifepods are designed solely to keep people alive until a ship can come and pick them up. They are useless for explorers or in star systems where help would be weeks in coming, but lifepods sufficiently complex to give real maneuverability or atmospheric re-entry would have been too large and expensive to get past the U.W. legislative committees influenced by the Interstellar Trade Federation.

Lifepods are visible on a non-streamlined ship as hull blisters, but are under blow-away panels on streamlined vessels. Directions to the nearest lifepod are clearly marked in corridors, and any access to pods generally sets off security alarms (so it is unlikely that you could stowaway in one).

		First roll					
		1	2	3	4	5	6
Second roll	1	E	C	C	C	L	L
	2	E	C	C	C	G	L
	3	E	P	P	P	G	G
	4	E	P	P	P	G	G
	5	E	C	C	C	G	L
	6	E	C	C	C	L	L

Work pods generally use ion drives with several day's fuel supply. The ion drive gives much finer maneuvering control at low speeds, and the exhaust is less likely to damage the ship or other nearby workpods.

Fires of Heaven^{v1.0}

Workpod

Tech Era: Late Atomic
Hull: Enclosed
Size: 0 (6 hexagon)
Empty/Loaded: 3.1 tons/7.1 tons
Hits/Damage Limit: 13/5
Thrust: .2g (level 0)
Hull rating: 18g (level 13)
Armor: 3d+2 (all facings)
Screens: none
Peak reactor power: 5d+0 (inadequate)
Peak pulse power: 0d+0
Best sensor: none
Quarters: 1 person cockpit
Crew per shift: 1
Stores: none
Cost (new): .09MCr
Monthly maintenance: 500Cr

This is a general purpose short-range vehicle reminiscent of the pods in *2001: A Space Odyssey*. It has a one person cockpit, life support, manipulator arms and a docking port. Large starports may have hundreds of them flying around at any given time, doing repairs or inspections. They can work in somewhat more hazardous conditions than a person in an e-suit, and can carry larger or more specialized repair tools. In addition, many can be teleoperated, so they can be used where radiation might be too hazardous for manned use (though they do lose some flexibility without an on-board operator). Larger ships may carry several for the same set of uses, and they are small enough that they can be left on regular docking ports with little fear of damaging either vessel under most acceleration conditions.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	6	0	.6	-	.018MCr
Bridge	1	-1	.5	6	.040MCr
Fission reactor	1	-1	.5	6	.010MCr
Ion drive	1	-1	.5	6	.010MCr
Manipulators	1	-1	.5	6	.010MCr
Cargo rack	2	-1	0	12	-
Armor	-	-	.5	-	.005MCr
Totals	6	-	3.1	36	.078MCr

Policepod

Tech Era: Early Post-Atomic
Hull: Enclosed
Size: 0 (6 hexagon)
Empty/Loaded: 3.1 tons/3.5 tons
Hits/Damage Limit: 14/5
Thrust: 1.6g (level 6)
Hull rating: 25g (level 14)
Armor: 4d+1 (all facings)
Screens: none
Peak reactor power: 3d+0 (inadequate)
Peak pulse power: 8d+1
Best sensor: +2 difficulty
Quarters: Pilot plus 2 seats
Crew per shift: 1
Stores: none
Cost (new): .18MCr
Monthly maintenance: 500Cr

A police pod is a high-thrust version of the work pod, and would be the equivalent of a "patrol car" for spaceport law enforcement, and is also routinely used by Customs inspectors. It is designed to carry three people, one or two of which are police, and the other seat is designed to hold a restrained miscreant behind a 3d+0 transparent bulkhead (which has separate air vents in case said person needs to be sedated).

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	6	0	.6	-	.024MCr
Bridge	1	-1	.5	6	.048MCr
Quarters (seats)	2	-1	0	12	.000MCr
Fusion eng.	1	-1	.5	6	.012MCr
Fuel, 2 days	.16	-2	.08	1	.000MCr
Accumulators	.5	-2	.25	3	.005MCr
Minimum sens.	1	-1	.5	6	.075MCr
Laser	.3	-2	.15	2	.010MCr
Armor	-	-	.5	-	.006MCr
Totals	6.0	-	3.1	36	.180MCr

Police pods are also lightly armed with a non-starship range autofire laser (7d+1 damage) in a 60° arc forward mount, which in combination with their minimal sensor array, gives them reasonable deterrent capability against targets up to several kilometers off (assume an Accuracy of 20 in normal scale combat).

However, using this firepower is usually a bad thing, since police pods cannot take a lot of punishment if people start shooting back at them...

		First roll					
		1	2	3	4	5	6
Second roll	1	S	S	W	G	G	G
	2	E	S	W	G	G	G
	3	E	E	P	Q	Q	Q
	4	E	F	P	Q	Q	Q
	5	E	S	P	Q	Q	Q
	6	E	S	S	Q	Q	Q

Taxipod

Tech Era: Late Atomic
Hull: Enclosed
Size: 0 (6 hexagon)
Empty/Loaded: 2.4 tons/3.8 tons
Hits/Damage Limit: 14/5
Thrust: 1.6g (level 6)
Hull rating: 25g (level 14)
Armor: 3d+1 (all facings)
Screens: none
Peak reactor power: 3d+0 (adequate)
Peak pulse power: 0d+0
Best sensor: none
Quarters: Pilot plus 3 seats
Crew per shift: 1
Stores: none
Cost (new): .09MCr
Monthly maintenance: 500Cr

Taxipods are similar to police pods, but lack weaponry and sensors, trading these for the ability to carry an extra person and some luggage. Taxipods may also be used as tiny freight haulers, able to carry about four hexagons of anything that will fit through its docking port. Taxipods are seen in the hundreds around major worlds, shuttling people and goods from ships and habitats. Normal rates of hire are about 50 Credits per hour with a minimum half-hour charge, plus whatever gratuity is given to the pilot. Less expensive gypsy cabs are illegal in most areas, but flourish nonetheless.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	6	0	.6	-	.024MCr
Bridge	1	-1	.5	6	.048MCr
Quarters (seats)	3	-1	0	18	.000MCr
Fusion eng.	1	-1	.5	6	.012MCr
Fuel, 2 days	.16	-2	.08	1	.000MCr
Cargo space	.83	-1	.42	5	-
Armor	-	-	.25	-	.003MCr
Totals	6.0	-	2.4	36	.087MCr

		First roll					
		1	2	3	4	5	6
Second roll	1	E	F	Q	Q	G	G
	2	E	C	Q	Q	G	G
	3	E	C	Q	Q	G	G
	4	E	C	Q	Q	Q	Q
	5	E	C	Q	Q	Q	Q
	6	E	C	Q	Q	Q	Q

Taxi pilots are often good sources of information and can (if they like you) steer you to just about any business or service you could be looking for. There is usually some friction between gypsy cabs and established taxi companies.

Deep Space Explorer**Tech Era:** Early Post-Atomic**Hull:** Enclosed**Size:** 5 (1,000 hexagon)**Empty/Loaded:** 534 tons/1,500 tons**Hits/Damage Limit:** 28/-2**Thrust:** .6g (level 3)**Hull rating:** 4.5g (level 9)**Armor:** 6d+1 (all facings)**Screens:** +3d**Peak reactor power:** 16d+2 (adequate)**Peak pulse power:** 13d+2**Rozkhov charge time:** 1 day**Best sensor:** -2 difficulty**Quarters:** 13**Crew per shift:** 3**Stores:** 30 months**Cost (new):** 15.5MCr**Monthly maintenance:** 2,800Cr

This is a typical private or corporate exploration ship, designed for scientific studies and long-duration missions, including those to naturally hazardous areas of space. It has little firepower, and is simply supposed to stay out of trouble or run at any sign of it. With .6g acceleration and passable magnetic screens, it can get in and out of situations many civilian ships cannot, and it can operate alone for several months with its supply of onboard parts.

Since the bulk of its duties are accomplished in space, the ship is not streamlined or designed to withstand re-entry, but it does have landing gear for touchdown on low-gravity airless worlds. In the hands of a skilled pilot, it can manage a safe re-entry with its shields up, but its .4g thrust is unlikely to give a safe landing... Planetary explorations are usually accomplished with a trio of externally docked shuttlecraft (size 3). If any sort of threats are expected, one or two of the shuttles is replaced with an armed model, and all the spare pod mounting ports are loaded with normal missiles (which are otherwise kept in a cargo hold).

This explorer has seven sets of second class accommodations, five of which are set up for double-bunking. This leaves room for a total complement of thirteen. Five are for a full time (albeit skeleton) crew, leaving room for an exploration crew of up to eight. All the quarters have added touches to make their small size more efficient and livable.

On the outbound leg of long trips, the cargo holds may be packed with consumables, which are generally replaced with collected specimens from worlds visited.

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Item	Hex	Size	Tons	Loc.	Cost
Encl. hull	1,000	5	100	-	4.000MCr
Bridge	6	0	3	0	.072MCr
Rozkhov Drive	90	3	45	3	1.500MCr
Fusion drive	40	2	20	2	.500MCr
Fuel, 20 days	60	2	30	2	.012MCr
Fus. reactor 1	40	2	20	2	.500MCr
Fus. reactor 2	40	2	20	2	.500MCr
Accumulators	2	-1	1	0	.020MCr
Sensor 1	80	3	40	3	6.000MCr
Sensor 2	5	0	2.5	0	.375MCr
Labs	60	2	30	2	.600MCr
Armor	-	-	64	-	.256MCr
Spares(3 hits)	30	2	15	1	.360MCr
Quarters(13)	420	4	0	14	.420MCr
Mag. screens	16	1	8	1	.192MCr
Pod ports(8)	-	-	-	-	.400MCr
Cargo 1	56	2	28	2	.000MCr
Cargo 2	56	2	28	2	.000MCr
Missiles(2)	-	-	2	-	.140MCr
Probes(2)	-	-	2	-	.140MCr
Shuttles(3)	-	-	75	-	.000MCr
Totals	1,001	-	533.5	36	15.48MCr

The lab space on an explorer is configured based on the type of mission the explorer generally goes on. At least five hexagons of the lab space is set aside for a medical bay, another five for a manufacturing lab, and because of the length of most missions, ten hexagons is usually set aside for recreational purposes, which usually just enlarges the common areas to keep them from being quite so claustrophobic. This leaves room for two general purpose labs, or one large lab with an overall bonus.

		First roll					
		1	2	3	4	5	6
Second roll	1	S ₁	S ₁	C ₁	Q	Q	Q
	2	P ₁	P ₁	C ₁	Q	Q	Q
	3	E	R	R	Q	L	GS ₂
	4	E	R	F	Q	L	M
	5	P ₂	P ₂	C ₂	Q	Q	Q
	6	S ₁	F	C ₂	Q	Q	Q

Options - Purchasers of such a ship might make room for a fuel refining system to allow refueling from local hydrogen sources. A streamlined shuttle would be used for the fuel skimming, and the refining would be done after the shuttle docked. If 10 hexagons can be spared, the main engine can be outfitted with thrust boosters, which would give the ship an acceleration slightly more than .8g in a pinch.

SF-102 Defender

Tech Era: Late Atomic

Hull: Enclosed

Size: 3 (125 hexagon)

Loaded: 100 tons

Hits/Damage Limit: 23/1

Thrust: 2.3g (level 7)

Hull rating: 6.4g (level 10)

Armor:

Front: 4d+0

Right: 4d+0

Left: 4d+0

Top: 3d+0

Bottom: 3d+0

Rear: 3d+0

Screens: none

Peak reactor power: 12d+2 (inadequate)

Peak pulse power: 17d+2

Best sensor: +0 difficulty

Quarters: Cockpit for pilot and gunner

Crew per shift: 2

Stores: none

Cost (new): 4.2MCr

Monthly maintenance: 2,800Cr

The SF-102 and its variants were the United Worlds' original space fighter, serving a long but largely unremarkable career. Officially designated the Defender, they were often called 'Tin Kites' because of their light armor and small fuel reserves that could strand a novice pilot in deep space; calling a Defender pilot a "kite flyer" could easily start a fight.

The SF-102 is armed with a fixed, forward facing 11d+0 short range laser cannon, a 7d+0 point defense turret and eight kinetic missiles. It can power its main laser for three starship turns before needing to withdraw to recharge, but it can run the point defense weapon off surplus engine power or run the main laser at +2 difficulty to hit due to reduced rate of fire.

The design was licensed and copied by fringe systems long after modern but more expensive and complex ships became available. A fair number are still in good condition as mothballed reserves, and are sold to new colonies at a steep discount; they can get 12 or more serviceable SF-102s for the price of one Shrike, and the U.W. government usually adds several full missile reloads to the package. Old SF-102s are also used as police ships, short-range escorts, tugboats, or are refitted by individuals as collectibles.

An otherwise intact hull with the weapons, engines and electronics stripped out can be had for 500,000Cr. One in less serviceable shape could go for as little as 100,000Cr at a large shipyard. Few surplus SF-102s are equipped in a "standard" way.

While old, the sheer number of hulls and ease of manufacture mean that some are in the hands of pirates, and its credible performance makes it more than a match for the typical freighter or poorly defended research outpost, especially if the original weaponry is replaced with more powerful modern weapons (such as plasma bolt cannons).

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	125	3	12.5	-	.750MCr
Bridge	4	-1	2	1	.160MCr
Fission drive	10	1	5.0	4	.125MCr
Booster	2.5	-	1.3	-	.000MCr
Fission drive	10	1	5	4	.125MCr
Booster	2.5	-	1.3	-	.000MCr
Fuel, 1.5 hours	12	1	6	4	.001MCr
Fission reactor	10	0	5	3	.100MCr
Accumulators	8	0	4	2	.080MCr
Sh. range laser	40	2	20	11	.800MCr
Point def. laser	5	0	2.5	1	.050MCr
Sensor	20	1	10	6	1.000MCr
Armor	-	-	16	-	.048MCr
Pod ports(9)	-	-	-	-	.450MCr
Missiles(8)	-	-	9.6	-	.552MCr
Totals	124	-	100.1	36	4.241MCr

▼ **Note** - The performance of the SF-102 is based on use of its thrust boosters. It has a cruising range of 1.5 days (not hours) at a reduced thrust of 1.1g.

Options - A small concern orbiting Gawaine is marketing a custom "drop-in" fission engine replacement for the SF-102. It replaces both fission engines with an oddly shaped single unit that boosts performance to 3g (1.6g cruising). Through another company, they can also install a 10d+1 plasma cannon in place of the short range laser, along with upgraded accumulators. Since they manage to do all this by using existing surplus components, the price is less than the market rate by a significant amount, at least as long as surplus stocks hold out.

		First roll					
		1	2	3	4	5	6
Second roll	1	F	F	W ₂	P ₁	S	S
	2	E ₁	E ₁	G	P ₁	S	S
	3	E ₁	E ₁	P ₂	P ₁	S	S
	4	E ₂	E ₂	P ₂	W ₁	W ₁	W ₁
	5	E ₂	E ₂	W ₁	W ₁	W ₁	W ₁
	6	F	F	W ₁	W ₁	W ₁	W ₁

Tramp Freighter**Tech Era:** Late Atomic**Hull:** Enclosed**Size:** 7 (8,000 hexagon)**Empty/Loaded:** 3,228 tons/40,000 tons**Hits/Damage Limit:** 34/-5**Thrust:** .8g (level 3)**Hull rating:** 4.5g (level 6)**Armor:** 8d+1 (all facings)**Screens:** none**Peak reactor power:** 17d+2 (adequate)**Peak pulse power:** 0d+0**Rozkhov charge time:** 17 hours**Best sensor:** +0 difficulty**Quarters:** 14**Crew per shift:** 6**Stores:** 10 months**Cost (new):** 49.4MCr**Monthly maintenance:** 4KCr

This is a typical pre-pod era bulk freighter, designed for optimization of cargo space and revenue, and later modified to a pitiful semblance of self-defense and passenger carrying ability, either by a nervous owner or because of war regulations. The hopelessly obsolete original Rozkhov Drive was been ripped out in the interest of increasing cargo space, replaced with an Early Post-Atomic Era model. While its old fission engines are woefully inefficient, they can push the freighter's bulk up to .3g when carrying a full load of heavy metals, and to .8g when unladen. Typically, thrust used is .1g or .2g to stretch the thrust endurance to a few weeks.

Typically, hulls like this were retired from regular service several decades ago, and those still in operation usually run with a fair amount of barely serviceable parts, slowly carrying low-priority cargoes between backwater destinations that larger shipping firms find unprofitable. Still, passage is cheap and the owners ask few questions. A small ship family might be in possession of an old freighter like this, possibly converting one of the cargo holds into an expansion of living space.

While it does not have much endurance, the pair of large cargo shuttles can be equipped with skimmers for reaction mass, though this does not address depletion of fissionables. In addition to the external cargo shuttles, the ship has a small hangar that normally contains several work pods.

This ship in worn but serviceable condition would cost about 13MCr, but have a monthly maintenance of 5.6KCr and have performance a little bit worse.

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Item	Hex	Size	Tons	Loc.	Cost
Encl. hull	8,000	7	800	-	24.00MCr
Bridge	45	2	22.5	0	.45MCr
Fission drv. 1	160	3	80	1	1.600MCr
Fission drv. 2	160	3	80	1	1.600MCr
Fuel, 5 days	1000	5	500	4	.05MCr
Fission reac.1	40	2	20	0	.400MCr
Fission reac.2	40	2	20	0	.400MCr
Rozkhov Dr.	1,000	5	500	5	12.00MCr
Armor	-	-	1,500	-	4.500MCr
Plasma cann.	40	2	20	0	1.200MCr
Point def. las.	5	0	2.5	0	.05MCr
Sensor 1	20	1	10	0	1.000MCr
Sensor 2	1	-1	.5	0	.05MCr
Quarters(14)	770	5	0	4	.000MCr
Medlab	10	0	5	0	.100MCr
Hangar	125	3	12.5	1	1.250MCr
Spares(1 hit)	80	2	40	0	.800MCr
Cargo hold 1	900	5	-	4	.000MCr
Cargo hold 2	900	5	-	4	.000MCr
Cargo hold 3	900	5	-	4	.000MCr
Cargo hold 4	900	5	-	4	.000MCr
Cargo hold 5	900	5	-	4	.000MCr
Shuttles(2)	-	-	200	-	.000MCr
Totals	7,996	-	3,228	36	49.45MCr

		First roll					
		1	2	3	4	5	6
Second roll	1	F	C ₁	C ₁	C ₂	C ₂	QS ₂
	2	F	C ₁	C ₁	C ₂	C ₂	QP ₁
	3	E ₁	R	R	RP ₂	C ₅	GS ₁
	4	E ₂	R	R	C ₅	C ₅	C ₅
	5	F	C ₃	C ₃	C ₄	C ₄	QW ₁
	6	F	C ₃	C ₃	C ₄	C ₄ H	QW ₂

Options - Hulls last more or less forever if well maintained. More than one tramp has ended its days as an orbiting warehouse, supply depot or research outpost, stripped of everything except one old fission drive, one reactor and some fuel, everything else sold off or ripped out to refit it for its final role.

EABA

Polaris-class Starliner

Tech Era: Early Post-Atomic

Hull: Enclosed

Size: 9 (64,000 hexagon)

Empty/Loaded: 14,741 tons/85,000 tons

Hits/Damage Limit: 42/-8

Thrust: .2g (level 0)

Hull rating: 1.1g (level 5)

Armor: 11d+0 (all facings)

Screens: none

Peak reactor power: 21d+2 (adequate)

Peak pulse power: 0d+0

Rozkhov charge time: 10 hours

Best sensor: -2 difficulty

Quarters: 1,000

Crew per shift: 24

Stores: 10 months

Cost (new): 501MCr

Monthly maintenance: 11KCr

Until the advent of artificial gravity generators, the Polaris-class starliner was the queen of the starlanes. Sleeker and newer ships have stolen most of her glory, and Polaris liners have been relegated to less profitable routes or leased out as colonization transports. With a light load, these starliners can manage a thrust of .2g, but if carrying a full load of high-density cargo, they can only manage .1g. However, their good fuel reserves allow them to get where they are going in a reasonable amount of time. Polaris-class vessels are *not* cheap to operate. Fuel, maintenance and salaries cost over 20,000 Credits per day, so these ships are run on tight schedules for maximum passenger turnaround.

Those ships that have not been refitted for maximum passenger capacity are well appointed, with the usual mix of first-, second-, and third-class cabins, dining halls, entertainment facilities, a large hangar (so that wealthy passengers can bring personal space craft), and some cargo capacity. Normal capacity (in addition to the crew) is about 80 first-class passengers, 200 second-class, and 600-800 third-class. First- and second-class passengers enjoy private cabins. Third class is mostly multiple-occupancy staterooms with common, cafeteria-style food dispensers, semi-private showers, and just enough computer access to run entertainment programs. The entire third-class section has limited or no access to other passenger sections. Crew quarters, control stations, and ship's systems are technically barred to all passengers, although first-class passengers can often get a "captain's tour".

A Polaris-class liner's lifepods carry about 400 people. If rescue is imminent, privately-owned gigs in the hangar might be able to save a few more lives; in no scenario could all 1,000 passengers and crew escape a disaster in space.

Item	Hex	Size	Tons	Loc.	Cost
Encl. hull	64,000	9	6,400	-	256.0MCr
Bridge	350	4	175	0	4.200MCr
Aux. bridge	125	3	62.5	0	1.500MCr
Fusion drv. 1	160	3	80	0	2.000MCr
Fusion drv. 2	160	3	80	0	2.000MCr
Fusion drv. 3	160	3	80	0	2.000MCr
Fusion drv. 4	160	3	80	0	2.000MCr
Fuel, 20 days	960	5	480	0	.192MCr
Fusion reac.1	160	3	80	0	2.000MCr
Fusion reac.2	160	3	80	0	2.000MCr
Fusion reac.3	160	3	80	0	2.000MCr
Fusion reac.4	160	3	80	0	2.000MCr
Rozkhov Dr.	8,000	7	4,000	4	96.00MCr
Armor	-	-	1,500	-	6.00MCr
LR ion cann.	160	3	80	0	20.00MCr
Plasma cann.	40	2	20	0	1.200MCr
Point def. las.1	5	0	2.5	0	.050MCr
Point def. las.2	5	0	2.5	0	.050MCr
Missiles(20)	80	3	48	0	1.400MCr
Sensor 1	80	3	40	0	6.000MCr
Sensor 2	5	0	2.5	0	.375MCr
Qtrs.(1000)	40,000	8	0	22	40.00MCr
Medlab	20	1	10	0	1.000MCr
Mfr. lab	40	2	20	0	.480MCr
Ent. lab	1,000	5	500	1	12.00MCr
Hangar 1	1,000	5	100	1	12.00MCr
Hangar 2	1,000	5	100	1	12.00MCr
Spares(1 hit)	640	4	320	0	7.680MCr
Lifepods(64)	384	3	38.4	0	1.152MCr
Cargo	8,000	7	-	4	.000MCr
Secure car.	500	4	-	0	.000MCr
Shuttles(2)	-	-	200	-	.000MCr
Totals	63,674	-	14,741	33	495.3MCr

During the Interstellar War, Polaris-class vessels were pressed into service as troop transports, with some defensive modifications made. For the most part, these modifications have been kept, with hardware and software upgrades paid for by the U.W. government, as well as a small subsidy for lost cargo or passenger volume.

		First roll					
		1	2	3	4	5	6
Second roll	1	C	G ₂ S ₂ W ₂	Q	Q	Q	Q
	2	C	Q	Q	Q	Q	Q
	3	EF	R	R	Q	L	H ₁
	4	P	R	R	Q	G ₁ S ₁ W ₁	H ₂
	5	C	Q	Q	Q	Q	Q
	6	C	Q	Q	Q	Q	Q

Small Pod Freighter

Tech Era: Post-Atomic

Hull: Pod

Size: 5 (1,000 hexagon)

Empty/Loaded: 364 tons/2,500 tons

Hits/Damage Limit: 27/-2

Thrust: .2g (level 0)

Hull rating: 6.4g (level 10)

Armor: 5d+0 (all facings)

Screens: none

Peak reactor power: 20d+0 (inadequate)

Peak pulse power: 0d+0

Rozkhov charge time: 4.2 hours

Best sensor: +1 difficulty

Quarters: 4

Crew per shift: 2

Stores: 10 months

Cost (new): 7.4MCr

Monthly maintenance: 2.0KCr

This is a recently developed improvement on the traditional pod ship design, popular with businesses from corporate transport to small companies to individual entrepreneurs. It is made from proven modern technologies, has good performance, relatively low operating costs, and a great deal of flexibility. It could carry tractors on one run, passengers on the next, or sensors and labs for a research team the day after that.

Available non-cargo pods include a "Q-ship" pod (sensors, ECM, accumulators, missiles and a pair of ion cannons), a corporate transport pod suite (four linked first-class quarters plus a luggage/amenities pod, all with armor), a getaway pod (a boosted antimatter drive, sufficient for nearly 3g acceleration for a day), a research station pod suite (four pods that detach and re-link to form a small orbital research outpost plus a size 3 shuttle), and a "carrier" pod (docking, fuel and quarters for a fighter crew). Obviously, some pods are less commercially available than others. Rumor has it the StarForces are using the ship design as a testbed for a pod-based warship, rumors which are neither confirmed or denied by StarForces officials. Upsize versions designed for the larger cargo pods are in the works, but these are expected to use upgraded fusion reactors rather than the newer antimatter models.

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Item	Hex	Size	Tons	Loc.	Cost
Pod hull	1,000	5	100	-	2.500MCr
Bridge	16	1	8	1	.256MCr
Sensor	5	0	2.5	0	.500MCr
AM react. 1	40	2	20	2	.640MCr
AM react. 2	40	2	20	2	.640MCr
AM react. 3	40	2	20	2	.640MCr
Ion drive	40	2	20	2	.400MCr
Fuel, 30 days	19.5	1	9.8	1	.020MCr
Rozkhov Dr.	45	2	22.5	1	.720MCr
Armor	-	-	16	-	.080MCr
SR ion cann.	10	1	5	0	.600MCr
Quarters(4)	79	2	0	3	.120MCr
Medlab	5	0	2.5	0	.300MCr
Spares(1 hit)	10	1	5	0	.160MCr
Pod 1	125	3	12.5	4	.000MCr
Pod 2	125	3	12.5	4	.000MCr
Pod 3	125	3	12.5	4	.000MCr
Pod 4	125	3	12.5	4	.000MCr
Pod 5	125	3	12.5	4	.000MCr
Cargo shuttle	-	3	50	-	.000MCr
Totals	974.5	-	363.8	34	7.356MCr

Options -A little space is deliberately left over to allow customization in case adventurers get a hold of such a ship. There is also a slightly less capable version of this ship that came out when the first fusion drives became available. It used fusion drives instead of ion drives, and had spin quarters rather than gravity plating, but uses the same design concepts.

		First roll					
		1	2	3	4	5	6
Second roll	1	C ₁	C ₁	C ₁	C ₂	C ₂	C ₂
	2	P ₁	P ₁	C ₁	C ₃	C ₃	C ₂
	3	E	F	P ₃	-	C ₃	C ₃
	4	E	R	P ₃	L	Q	Q
	5	P ₂	P ₂	C ₄	C ₅	GWS	Q
	6	C ₄	C ₄	C ₄	C ₅	C ₅	C ₅

EABA

Small Cargo Shuttle

Tech Era: Early Post-Atomic

Hull: Lifting body

Size: 2 (45 hexagon)

Empty/Loaded: 14 tons/64 tons

Hits/Damage Limit: 18/3

Thrust: 2.0g (level 6)

Hull rating: 12.5g (level 12)

Armor:

Front: 4d+1(+2d)

Right: 3d+1

Left: 3d+1

Top: 3d+1

Bottom: 4d+1(+2d)

Rear: 3d+1

Screens: none

Peak reactor power: 7d+2 (adequate)

Peak pulse power: 12d+1

Best sensor: +2 difficulty

Quarters: 4 seats

Crew per shift: 1

Stores: none

Cost (new): .468MCr

Monthly maintenance: 1.0KCr

This is the smallest reusable re-entry vehicle in common use. Most ships not capable of re-entry will have one or two of these as a means to get from orbit to surface, or as a way to get from more distant parking orbits to a crowded starport. It's about the size of an early 21st century motorhome, with an ovoid body protected by heat-resistant tiles on the nose and underbelly, with small wings and a front canard for atmospheric stability. Thrust listed is using boosters, which is normally only necessary for liftoff and landing, otherwise the shuttle has a .8g thrust. Convert listed endurance from days to hours when thrust boosters are used. The shuttle can safely land on a 1g planet while carrying its maximum load, but can normally only carry passengers and a ton or two of cargo back into orbit. The shuttle carries a small accumulator bank instead of a reactor. This allows use of systems when the engine is shut off, and also provides the power needed to jump-start the fusion engine.

They are normally configured to haul the maximum amount of cargo, but acceleration couches can be mounted in the pressurized cargo hold to carry extra passengers for short hops. Some enterprising individuals on either side of the law have re-configured the cargo space to carry offensive or defensive weaponry (a light plasma cannon, point-defense laser or missiles), making the shuttle into a mini-fighter.

Some people prefer the older fission-powered models for their higher thrust, but these are usually frowned on for atmospheric use at the current time. However, they are still in fairly common use in the outlying areas of the U.W.

Item	Hex	Size	Tons	Loc.	Cost
Lifting body	45	2	4.5	-	.180MCr
Stub wings	15	1	-	12	.000MCr
Bridge	2	-1	1	2	.080MCr
Seats(3)	3	0	0	2	.000MCr
Sensor	1	-1	.5	1	.075MCr
Fusion drive	5	0	2.5	5	.060MCr
Booster	1.2	-	.6	-	.015MCr
Fuel, 3 days	1.2	-1	.6	1	.000MCr
Armor	-	-	4	-	.048MCr
Accumulators	1	-1	.5	1	.010MCr
Cargo	15	1	-	12	.000MCr
Totals	44.5	-	14.2	36	.468MCr

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	C	C	S
	2	A	A	A	C	C	Q
	3	E	E	F	C	C	G
	4	E	E	E	C	C	G
	5	A	A	A	C	C	Q
	6	A	A	A	C	C	P

Options - Fairly numerous. This hull with a boosted fission engine would have a boosted thrust of 3.2g (but only 4 turns of thrust), or a normal thrust of 1.6g (for 10 hours). It could liftoff from a 1g gravity well while carrying its maximum load. Another option is to use Post-Atomic Era fusion engine (instead of Early Post-Atomic Era models), which would boost overall acceleration to 2.3g and allow carrying a few more tons into orbit from the ground.

▼ **Note** - Ratings for cargo shuttles and other vehicles capable of ground-to-orbit assume there is no atmosphere. Lifting body hulls can get more mass into orbit by spending an extra turn and using a long runway takeoff.

Large Cargo Shuttle

Tech Era: Post-Atomic
Hull: Lifting body
Size: 4 (180 hexagon)
Empty/Loaded: 63 tons/500 tons
Hits/Damage Limit: 22/1
Thrust: 3.0g (level 7)
Hull rating: 9.0g (level 11)
Armor:
 Front: 4d+1
 Right: 2d+1
 Left: 2d+1
 Top: 2d+1
 Bottom: 4d+1
 Rear: 2d+1
Screens: +2d
Peak reactor power: 12d+1 (adequate)
Peak pulse power: 13d+0
Best sensor: +2 difficulty
Quarters: 6 seats
Crew per shift: 1
Stores: none
Cost (new): 1.93MCr
Monthly maintenance: 2.0KCr

An up-to-date version of the common cargo shuttle, which is seen in many configurations (cargo, passengers, ambulance, etc.). It is between a size 3 and size 4 hull, built to exactly carry (internally) one small cargo pod. It can get just about anything that will fit safely to the ground in a 1g environment, and can lift about 60 tons into orbit. With an external fuel pod, light engine use and a habitat pod in the hold, it is quite capable of lengthy interplanetary jaunts at a non-boosted thrust of about 1.5g.

Item	Hex	Size	Tons	Loc.	Cost
Lifting body	180	4	18	-	.900MCr
Stub wings	60	3	-	12	.000MCr
Bridge	2	-1	1	1	.080MCr
Seats(5)	5	0	0	1	.000MCr
Sensor	1	-1	.5	0	.075MCr
Fusion drive	40	3	20	10	.500MCr
Booster	10	-	5	-	.100MCr
Fuel, 3 days	9	1	4.5	2	.001MCr
Armor	-	-	10	-	.160MCr
Screens	6	0	3	1	.096MCr
Fusion reactor	1	-1	.5	0	.012MCr
Accumulators	1	-1	.5	0	.010MCr
Cargo	45	1	-	9	.000MCr
Totals	180	-	63.0	36	1.930MCr

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	A	A	A
	2	E	E	F	C	C	GS
	3	E	E	E	C	C	Q
	4	E	E	E	C	C	M
	5	E	E	F	C	C	C
	6	A	A	A	A	A	A

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Near-space Interceptor

Tech Era: Early Post-Atomic
Hull: Lifting body
Size: 2 (45 hexagon)
Loaded: 23 tons
Hits/Damage Limit: 18/3
Thrust: 3.2g (level 8)
Hull rating: 12.5g (level 12)
Armor:
 Front: 2d+1(+4d)
 Right: 2d+1
 Left: 2d+1
 Top: 2d+1
 Bottom: 2d+1(+4d)
 Rear: 2d+1
Screens: none
Peak reactor power: 12d+2 (adequate)
Peak pulse power: 15d+0
Best sensor: -2 difficulty
Quarters: 2 seat cockpit
Crew per shift: 2
Stores: none
Cost (new): 1.2MCr
Monthly maintenance: 2.0KCr

Near-space interceptors come in a variety of designs and technologies, of which this is a fairly representative sample. Interceptors are designed for ground launch and landing, a last line of planetary defense or rapid reaction force. They can reach suborbit in a few minutes, fire weapons at short starship ranges, and then engage forces in the atmosphere or on the ground. They are less effective in combat than either dedicated atmospheric fighters or space-based fighters, and so are often found among the defenses of colonial worlds that cannot afford to maintain a full-time space presence, but still have (or feel they need) an orbital interdiction capability.

Near-space interceptors usually have an 8d+1 plasma cannon in a forward fixed mount, or five internally carried missiles.

The fuel supply of only three turns assumes the interceptor is using its full thrust of 3.2g. If not using boosted thrust, it has an endurance of 8 hours at slightly more than 1.5g. Normal deployment is to carry one external fuel pod with 1 turn of boost-rate fuel, sufficient to get into orbit and then drop the pod to avoid any penalties to combat agility. The other pod port may carry a streamlined sensor drone or ECM pod, which is deployed as soon as possible after reaching orbit.

Item	Hex	Size	Tons	Loc.	Cost
Lifting body	45	2	4.5	-	.360MCr
Stub wings	15	1	-	12	.000MCr
Bridge	3	-1	1.5	3	.144MCr
Sensor	1	-1	.5	0	.075MCr
Fission drive 1	5	0	2.5	5	.050MCr
Booster	1	-	.5	-	.013MCr
Fission drive 2	5	0	2.5	5	.050MCr
Booster	1	-	.5	-	.013MCr
Fuel, 3 turns	2			2	.001MCr
Armor	-	-	4	-	.048MCr
Accumulators	2	-1	1	1	.020MCr
Plasma cann.	10	0	5	8	.300MCr
Pod ports(2)	-	-	-	-	.100MCr
Totals	45	-	22.5	36	1.173MCr

Normal crew of an interceptor is a pilot and a gunner, either of which can do targeting and navigation tasks as required. At the current time, any new colony will be given several of these and enough infrastructure to keep them maintained, free of charge by the UW Colonial Ministry, if the colony has trained combat pilots to man them and techs to keep them in good order. As a result, retired pilots or techs may be approached with offers of land or other enticements to join a colony-founding expedition. If honorably discharged veterans cannot be found, those with questionable backgrounds surely can, and while the UW doesn't approve, it doesn't officially object either.

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	A	A	P
	2	A	E ₁	E ₁	G	G	GS
	3	E ₁	E ₁	E ₁	F	W	W
	4	E ₂	E ₂	E ₂	F	W	W
	5	A	E ₂	E ₂	W	W	W
	6	A	A	A	A	A	W

Atmospheric Interceptor

Tech Era: Early Post-Atomic

Hull: Winged

Size: 2 (45 hexagon)

Loaded: 14.5 tons

Hits/Damage Limit: 18/3

Thrust: 2.3g (level 7)

Hull rating: 12.5g (level 12)

Armor: 2d+1 (all facings)

Screens: none

Peak reactor power: 9d+1 (inadequate)

Peak pulse power: 13d+0

Best sensor: -2 difficulty

Quarters: 1 seat cockpit

Crew per shift: 1

Stores: none

Cost (new): .80MCr

Monthly maintenance: 2.0KCr

Atmospheric interceptors are built for combat at non-starship ranges. They can only engage starships in an atmosphere in the same hexagon, and only then if their acceleration exceeds the ship they are targeting (a hexagon is 1,000km, so you have to be able to out-accelerate your foe to guarantee getting close enough to shoot). They are normally equipped with a short range 12d+0 autofire laser and four short range fragmentation (7d+0) missiles.

Item	Hex	Size	Tons	Loc.	Cost
Winged hull	45	2	4.5	-	.360MCr
Wings	30	2	-	24	.000MCr
Bridge	2	-1	1	2	.096MCr
Sensor	1	-1	.5	0	.075MCr
Fuel turbothr.	5	0	2.5	5	.050MCr
Booster	1	-	.5	-	.013MCr
Armor	-	-	1	-	.012MCr
Accumulators	1	-1	1	1	.010MCr
Laser	5	0	2.5	4	.100MCr
Pod ports(2)	-	-	-	-	.100MCr
Missiles(4)	0	-	1	-	.070MCr
Totals	45	-	14.5	36	.786MCr

The listed thrust of 2.3g is only available when using boosted thrust, and only for one turn. Normal combat endurance is 2.5 hours at 1.1g (which can be extended to 5 hours at .5g because of the full wings). Atmospheric interceptors usually carry an external fuel pod to improve their endurance, and can strike or defend targets in hexagons adjacent to the one they were deployed from.

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	A	A	A
	2	A	A	A	A	A	A
	3	E	E	E	P	G	GS
	4	E	E	W	W	W	W
	5	A	A	A	A	A	A
	6	A	A	A	A	A	A

Pegasus-class Dropship

Tech Era: Early Post-Atomic

Hull: Lifting body

Size: 6 (2,800 hexagon)

Empty/Loaded: 1,137 tons/2,000 tons

Hits/Damage Limit: 31/-3

Max. thrust: 2.3g (level 7)

Hull rating: 3.2g (level 8)

Armor:

Front: 8d+0(+2d)

Right: 7d+0

Left: 7d+0

Top: 7d+0

Bottom: 8d+0(+2d)

Rear: 7d+0

Screens: none

Peak reactor power: 14d+1 (inadequate)

Peak pulse power: 19d+0

Rozkhov charge time: 48 hours

Best sensor: -1 difficulty

Quarters: 60

Crew per shift: 6

Stores: none

Cost (new): 37.4MCr

Monthly maintenance: 8.0KCr

The Pegasus-class is the standard StarForces Marine armored transport. It will carry up to four squads and one ground vehicle, plus as many crew-served weapons as will fit, and can keep them in supplies and maintained nearly indefinitely. With regenerative life support, fuel refineries, a medical lab, spare parts, and a manufacturing lab, it can repair or replace about anything that gets broken, including its complement of marines. A landing force will typically include one ship like this out of five, the remaining four being unarmed cargo landers of similar size. The normal duty crew are also marines, who take on other roles after landing.

The hull is stress-rated to 3.2g, but the fission engines can only generate up to 2.3g with thrust boosters. Normally, the full thrust is only used for takeoff and landing maneuvers because of the extremely high fuel use and relatively small fuel reserves (1.5 hours at full thrust). Normal thrust is closer to 1.5g, and even that is used sparingly. A Pegasus can liftoff from a 1.2g gravity under full load, though they are some of the largest and most ungainly re-entry capable vessels in U.W. space.

Pegasus-class ships can operate on their own in an emergency, but they are really meant to be part of a larger operation. For instance, most of the Rozkhov Drive charging process would be done using the larger power plants of a docked support ship. A Pegasus almost always carries external fuel pods, which are refueled by other support ships as needed.

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Item	Hex	Size	Tons	Loc.	Cost
Lifting body	2800	6	280	-	22.40MCr
Stub wings	933	5	-	12	.000MCr
Bridge	45	2	22.5	1	2.160MCr
Sensor 1	20	1	10	0	1.500MCr
Fission drive 1	160	3	80	3	1.600MCr
Booster	40	-	10	-	.400MCr
Fission drive 2	160	3	80	3	1.600MCr
Booster	40	-	10	-	.400MCr
Fuel, 1.5 days	300	4	150	4	.015MCr
Rozkhov Dr.	350	4	175	4	1.400MCr
Cargo	125	3	-	2	.000MCr
Quarters(60)	480	4	0	6	.000MCr
Armor	-	-	250	-	3.000MCr
Fus. reactor 1	10	0	5	0	.120MCr
Fus. reactor 2	10	0	5	0	.120MCr
Fus. reactor 3	10	0	5	0	.120MCr
Accumulators	8	0	4	0	.080MCr
Plasma cann.	40	1	20	1	1.200MCr
Point def. laser	5	0	2.5	0	.150MCr
Fuel skimmers	16	1	8	0	.192MCr
Med lab	20	1	10	0	.480MCr
Mfr. lab	20	1	10	0	.240MCr
Pod ports(4)	-	-	-	-	.200MCr
Totals	2,792	-	1,137	36	37.38MCr

Pegasus-class vessels do not have spin-gravity quarters. They are not designed for long-duration flight, and crews are expected to spend no more than two weeks in space at a time. This is probably a good thing. These ships are extremely cramped and the five squads of Marines are generally in a mood to kill something after a week or more in the "belly of the beast". The pod ports are equipped as a mission requires. Usually one is extra fuel, another is a streamlined pod carrying mission-specific supplies, and two carry near-space interceptors, which detach and make a separate re-entry to provide air support for the relatively defenseless Pegasus.

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	A	A	QL
	2	E1	F	F	Q	Q	Q
	3	E1	E1	R	RP ₃	Q*	GS
	4	E2	E2	R	R	QL	A
	5	E2	F	F	A	C	P1W1
	6	A	A	A	A	C	P2W2

Options -Current upgrade plans are to replace the fission drive with an advanced antimatter unit, thrust boosters, and several days worth of fuel, upgrade the fuel purifiers and convert the main fuel tank to either a boat bay for a Phoenix-class fighter, or artificial gravity quarters for more marines.

Customs Cutter

Tech Era: Early Post-Atomic

Hull: Lifting body

Size: 4 (350 hexagon)

Loaded: 120 tons

Hits/Damage Limit: 24/0

Max. thrust: 2.0g (level 6)

Hull rating: 6.4g (level 10)

Armor:

Front: 3d+1(+4d)

Right: 2d+2

Left: 2d+2

Top: 2d+2

Bottom: 3d+1(+4d)

Rear: 2d+2

Screens: none

Peak reactor power: 17d+2 (adequate)

Peak pulse power: 17d+0

Best sensor: -1 difficulty

Quarters: 5

Crew per shift: 2

Stores: none

Cost (new): 8.3MCr

Monthly maintenance: 4.0KCr

Customs cutters are fairly fast, lightly armed and armored ships designed to patrol spacelanes, discourage piracy, perform rescue and recovery, spot contraband, and perform safety inspections on ships. Cutters are not jump-capable, but they are designed for short-duration patrols and if necessary, atmospheric pursuits. As the customs service is never a high priority on legislative agendas, most cutters are fairly old, even for fusion-powered ships, and are unlikely to be upgraded unless a specific ongoing threat demands a more effective ship type. A typical crew is four, operating in staggered shifts of one or two, with overlapping duties and a typical patrol duration of a week or two. In addition to knowing how to run ship's systems, each crewperson is typically a specialist of some type (e.g., space medic, sensor operator, pilot, or gunner), and also trained in boarding operations, protocol, and hand weapons. One set of "quarters" does double duty as a brig that can also be used as a contraband locker. It is designed for one, but two can be shoe-horned in, although the life support system will not be happy with it more than a few days.

Normal armament is a 60° arc 9d+1 plasma cannon, a 360° point defense laser and four missiles kept under armor so they can survive re-entry if needed. Cutters have very little armor but pack a good punch for their size and are generally given a decent amount of respect.

Most cutters look like 20th-century submarines, but with odd bulges and bristling sensor antennae. Their short patrol durations mean they don't require spin gravity, allowing for a more compact design than on larger military ships or passenger-carrying vessels. Their cruising acceleration is about 1g, though they can boost to 2g for several hours if needed. For their pod ports, one is normally used for a fuel pod to extend patrol durations, and the other is a "rescue pod", a power source and life support system that can be mated to a damaged ship. Cutters do not carry extended life-support stores and are not designed for patrols of longer than a few weeks. As listed, they have a patrol range of no more than 1AU from their base. With an extra fuel pod, this can be extended to 4 AU.

Item	Hex	Size	Tons	Loc.	Cost
Lifting body	350	4	35	-	2.800MCr
Stub wings	117	3	-	12	.000MCr
Bridge	5	0	2.5	0	.240MCr
Sensor	20	1	10	2	1.500MCr
Fusion drive	40	2	20	5	.500MCr
Booster	10	1	5	-	.125MCr
Fuel, 6 days	18	1	9	2	.004MCr
Quarters(5)	50	2	0	5	.000MCr
Armor	-	-	16	-	.192MCr
Fus. reactor 1	10	0	5	1	.120MCr
Fus. reactor 2	10	0	5	1	.120MCr
Accumulators	4	0	2	0	.040MCr
Plasma cann.	40	1	20	4	1.200MCr
Point def. laser	5	0	2.5	1	.150MCr
Missile bay(4)	16	1	5	2	.768MCr
Med lab	5	1	10	1	.480MCr
Pod ports(2)	-	-	-	-	.100MCr
Totals	350	-	113	36	8.338MCr

Options - A common modification on the frontier is to restructure the internal missile bays, replacing one with a larger number of externally carried missiles (up to eight), and the other with extra fuel tankage. This gives a more menacing appearance that is not appreciated in some systems, but more than welcome in others. Having missiles mounted externally means that it either has to use streamlined missiles, or jettison them before re-entry.

		First roll					
		1	2	3	4	5	6
Second roll	1	A	A	A	A	W ₁	W ₁
	2	E	F	A	W ₂	L	A
	3	E	E	Q	Q	GS	S
	4	E	P ₁	Q	P ₁	Q*	Q
	5	E	F	A	W ₃	W ₃	A
	6	A	A	A	A	W ₃	W ₃

System Defense Boat**Tech Era:** Late Atomic**Hull:** Frame**Size:** 5 (1,000 hexagon)**Loaded:** 700 tons**Hits/Damage Limit:** 29/-2**Max. thrust:** 3.0g (level 7)**Hull rating:** 3.2g (level 8)**Armor:** 7d+0 (all facings)**Screens:** none**Peak reactor power:** 21d+2 (adequate)**Peak pulse power:** 17d+2**Best sensor:** -1 difficulty**Quarters:** 10**Crew per shift:** 4**Stores:** 10 months**Cost (new):** 10.2MCr**Monthly maintenance:** 5.6KCr

The System Defense Boat is often one of the first ship types an independent world will construct after building its first shipyard. Late Atomic Era tech is easy and cheap, and the lack of a Rozkhov Drive frees up space that less advanced components usually require. SDBs are a planet's primary defense at first, possibly supplemented by small numbers of SF-102s. As shipyard facilities and the economic situation improve, the SDBs are relegated to less important tasks, upgraded with better equipment, sold or stripped for parts, but seldom scrapped entirely.

SDB's are not designed for long interplanetary patrols. Their mission is to defend the orbital space around a planet, no further than that planet's moons. They will often spend long, boring patrols sitting in parking orbits to provide sensor coverage in areas the planet's ground or low orbit facilities do not reach.

SDB's also lumber themselves and a small space station (refueling and recreation facilities) out to the region of space most incoming jumps will arrive at, to provide some protection against pirates or other threats. This is not an exact science, but incoming travellers will only be arriving from a few directions, and will precipitate out of jump space when hitting the Rozkhov radius of the system, so a well placed SDB station is usually no more than a few hours from most incoming ships.

SDB's are reasonably functional, having a 3.0g boost acceleration for up to 4 hours, or a 1.6g cruise acceleration for up to 4 days. This good endurance for such an old design is at the cost of a fuel tank that is forty percent of the SDB's volume, large enough that when partially empty, crews can use it as a swimming pool (strictly against regulations, but done nonetheless).

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Unlike virtually all other military vessels, SDB's are built on a frame hull. This is cheaper, easier to repair, and easier to dismantle or reuse the parts from. While many of an SDB's components will be locally built, systems will almost always use Early Post-Atomic Era weapons and sensors, often supplied at a discount through StarForces surplus offerings. Normal weaponry is a pair of 360° arc 7d+1 plasma cannon, a 360° arc 7d+0 point defense laser, a brace of 8 kinetic missiles and a set of reloads. An SDB also usually carries a pair of work pods and for long missions will often have some of the pod ports occupied by fuel or extra spares.

Item	Hex	Size	Tons	Loc.	Cost
Frame hull	1,000	5	100	36	1.500MCr
Bridge	16	1	8	1	.640MCr
Sensor 1	5	1	2.5	0	.375MCr
Sensor 2	5	1	2.5	0	.375MCr
Fission drive	160	3	80	7	1.600MCr
Booster	40	-	20	-	.400MCr
Fuel, 4 days	400	4	200	14	.020MCr
Quarters(10)	200	3	0	7	.000MCr
Med. lab	5	0	2.5	0	.200MCr
Cargo	25	1	-	1	.000MCr
Spares(1 hit)	10	0	5	0	.100MCr
Fission reactor	40	1	10	1	.400MCr
Accumulators	8	0	4	0	.160MCr
Plasma cann.	40	2	20	2	1.200MCr
Plasma cann.	40	2	20	2	1.200MCr
Point def. laser	5	0	2.5	0	.050MCr
Armor	-	-	160	-	1.600MCr
Pod ports(8)	-	-	-	-	.400MCr
Missiles(8)	-	-	9.6	-	-MCr
Totals	999	-	656.6	36	10.22MCr

SDB's have plenty of surplus power when the engines are running at full capacity. However, without the main engine, accumulators can only power systems at full power for a few minutes, and after that, the main reactor can only run one of the plasma cannon at full power.

		First roll					
		1	2	3	4	5	6
Second roll	1	F	F	F	W ₁ S ₁	Q	Q
	2	E	P	F	F	Q	Q
	3	E	E	F	F	W ₂	W ₂
	4	E	E	F	F	W ₃	W ₃
	5	E	E	F	F	C	Q
	6	F	F	F	GS ₂	QL	Q

City-class Destroyer

Tech Era: Post-Atomic

Hull: Enclosed

Size: 7 (8,000 hexagon)

Loaded: 5,300 tons

Hits/Damage Limit: 34/-5

Max. thrust: 2.3g (level 7)

Hull rating: 3.2g (level 8)

Armor: 10d+0 (all facings)

Screens: +3d

Peak reactor power: 27d+1 (adequate)

Peak pulse power: 27d+0

Rozkhov charge time: 48 minutes

Best sensor: -4 difficulty

Quarters: 50

Crew per shift: 12

Stores: 10 months

Cost (new): 784.0MCr

Monthly maintenance: 11KCr

Just before the start of the Interstellar War, City-class destroyers began to enter service, replacing the aging Nation-class. Production of Cities was ramped up when it was discovered just how badly Vorn ships overmatched Nation-class vessels, and when technological advances in power and artificial gravity became available, City production was halted while the design was altered to take advantage of new systems. The final design is the mainstay of the StarForces Navy, and sees heavy service on the frontiers and fringe worlds of the United Worlds even after the war. It gives up some maneuverability and defense for endurance and flexibility. It is the largest re-entry capable ship class in the United Worlds Navy, and the addition of an efficient ion drive and advanced life support systems gives it more or less indefinite patrol times.

Its heavy ion cannon packs a lot of power, and multiple hits from this weapon can cripple virtually any vessel. The unofficial motto of City crews is "Reach out and touch someone..." Vorn fleets in particular discounted the City's smaller size when it first appeared in battle lines, but quickly changed tactics to spare a few shots to punch through the City's low defenses (against gravity shears).

These destroyers have a fixed, forward-facing 12d+0 long range ion cannon with the ability to take three shots per turn at no penalty, two 360° arc 9d+0 plasma cannon with the ability to take two shots per turn at no penalty, two 360° arc 7d+0 hypervelocity guns with the ability to take four shots per turn at no penalty, and thirty-two kinetic missiles in armored launchers, plus reloads in the cargo hold (plus a set of antimatter warheads whose use can only be authorized by StarForces high command). City-class destroyers also have two large hangars, each with a squadron of Shrikes, and enough storage and quarters for their crews and maintenance techs.

City-class destroyers have a boost acceleration of 2.3g (20 hours), a cruise acceleration of 1g and an ion drive at .1g for maneuvering/course corrections. Although adequate for most tasks now that the Vorn have "retreated", Cities will eventually be replaced by Hero-class destroyers (in development).

Item	Hex	Size	Tons	Loc.	Cost
Encl. hull	8,000	7	800	36	80.00MCr
Bridge	125	3	62.5	1	8.000MCr
Sensor 1	80	2	40	0	8.000MCr
Aux. bridge	45	2	22.5	0	2.880MCr
Sensor 2	80	2	40	0	8.000MCr
AM drive 1	160	3	80	1	2.500MCr
Booster	40	-	20	-	.625MCr
AM drive 2	160	3	80	1	2.500MCr
Booster	40	-	20	-	.625MCr
AM drive 3	160	3	80	1	2.500MCr
Booster	40	-	20	-	.625MCr
AM drive 4	160	3	80	1	2.500MCr
Booster	40	-	20	-	.625MCr
Fuel, 20 days	480	4	240	2	.240MCr
Ion drive	40	2	20	0	.400MCr
Fuel, 61 days	40	2	20	0	.040MCr
AM react. 1	640	4	320	3	10.00MCr
AM react. 2	640	4	320	3	10.00MCr
Accumul.	128	3	64	1	2.560MCr
Rozkhov Dr.	350	4	175	2	5.600MCr
Armor	-	-	1,000	-	16.00MCr
Mag. screens	125	3	62.5	1	2.000MCr
Quarters(50)	700	5	0	3	.000MCr
Med. lab	10	1	5	0	.640MCr
Spares (1 hit)	80	2	40	0	1.280MCr
Cargo 1	200	3	-	1	.000MCr
Cargo 2	200	3	-	1	.000MCr
Hangar 1*	125	3	62.5	1	.800MCr
Hangar 2*	1,000	5	500	5	6.400MCr
Hangar 3*	1,000	5	500	5	6.400MCr
Ion cannon	640	4	320	3	540.0MCr
Hyperv. gun 1	5	0	2.5	0	.900MCr
Hyperv. gun 2	5	0	2.5	0	.900MCr
Plas. cann. 1	160	3	80	0	22.50MCr
Plas. cann. 2	160	3	80	0	22.50MCr
Miss. bay(32)	128	3	39	0	8.192MCr
Totals	7,986	-	5,218	36	783.9MCr

*loaded

		First roll					
		1	2	3	4	5	6
Second roll	1	F	P ₁	C	H ₁	H ₁	H ₁
	2	E ₁	P ₁	Q	H ₁	H ₁	W ₁ W ₂
	3	E ₂	P ₁	Q	G ₁ S ₁	QL	G ₂ H ₂
	4	E ₃	P ₂	P ₃	W ₃	W ₃	W ₃
	5	E ₄	P ₂	B	H ₃	H ₃	W ₄ W ₅
	6	F	P ₂	C	H ₃ S ₂	H ₃	H ₃

Shrike**Tech Era:** Post Atomic**Hull:** Enclosed**Size:** 3 (125 hexagon)**Loaded:** 101 tons**Hits/Damage Limit:** 23/1**Thrust:** 5.0g (level 9)**Hull rating:** 12.5g (level 12)**Armor:**

Front: 6d+0

Right: 4d+0

Left: 4d+0

Top: 4d+0

Bottom: 6d+0

Rear: 4d+0

Screens: none**Peak reactor power:** 19d+1 (adequate)**Peak pulse power:** 0d+0**Best sensor:** -2 difficulty**Quarters:** Cockpit for pilot and gunner**Crew per shift:** 2**Stores:** none**Cost (new):** 9.6MCr**Monthly maintenance:** 2,800Cr

The Shrike is the latest U.W. fighter design, almost purpose-built to take on Vorn fighters, and pretty good against everything else. It is a no-compromise bare-knuckle brawler, designed to take whatever can be dished out and give back as good as it gets. It mounts a rapid-fire plasma cannon in a 60° forward mount (9d+0, 2 attacks per turn), a 7d+2 point defense laser, and carries eight of the latest antimatter-powered kinetic missiles.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	125	3	12.5	36	1.250MCr
Bridge	4	-1	2	1	.256MCr
Sensor	20	1	10	6	2.000MCr
AM drive	40	2	20	14	.640MCr
Booster	10	-	5	-	.160MCr
Fuel, 2 days	6	0	3	2	.003MCr
Plasma cann.	40	2	20	12	3.600MCr
Point def. laser	5	0	2.5	1	.450MCr
Armor	-	-	16	-	.256MCr
Pod ports(9)	-	-	-	-	.450MCr
Missiles(8)	-	-	9.6	-	.552MCr
Totals	125	-	100.6	36	9.617MCr

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Under cruising thrust, a Shrike can maintain an acceleration of 2.3g for two days. Under boosted thrust, it can pull 5g's for about two hours. With a small external fuel pod, it can make a 150 million kilometer Earth-Mars run in about four days, which is about the limit of the endurance for the crew of two in their cramped cockpit.

Shrikes are not built for atmospheric re-entry, but taking a cue from the Vorn, are built tough enough to take it if they have to. The only weakness of the Shrike is that everything revolves around the antimatter engine that takes up a third of the ship. This engine is the Shrike's *only* source of power, and if this quits, the Shrike is completely dead in the water. Some have suggested removing the point-defense laser (which is useless against most Vorn ships) and replacing it with something more useful, but the StarForces have thus far resisted attempts to remove the Shrike's anti-missile capability.

		First roll					
		1	2	3	4	5	6
Second roll	1	E	E	S	W ₂	S	S
	2	E	E	S	G	S	S
	3	E	E	E	W ₁	W ₁	W ₁
	4	E	E	E	W ₁	W ₁	W ₁
	5	E	E	F	W ₁	W ₁	W ₁
	6	E	E	F	W ₁	W ₁	W ₁

Options - None to date, as they have seen little combat against their designed foe. Pirates and hostile Jodoni demenses give Shrikes a wide berth, as Shrike pilots don't get combat experience by firing warning shots. With an eight missile load, Shrikes may carry ECM drones, sensor drones or fragmentation missiles in addition to the normal kinetic kind. There has been some talk of trimming the fuel supply to retrofit magnetic shielding, but like the point-defense laser modification, this one is being resisted for the moment.

EABA

Lucifer-class Fighter

Tech Era: Late Post-Atomic

Hull: Enclosed

Size: 3 (125 hexagon)

Loaded: 93 tons

Hits/Damage Limit: 23/1

Thrust: 4.5g (level 9)

Hull rating: 18g (level 13)

Armor:

Front: 7d+0

Right: 5d+0

Left: 5d+0

Top: 5d+0

Bottom: 6d+2

Rear: 3d+0

Screens: none

Peak reactor power: 16d+0 (inadequate)

Peak pulse power: 21d+2

Best sensor: -2 difficulty

Quarters: Cockpit for pilot and gunner

Crew per shift: 2

Stores: none

Cost (new): n/a

Monthly maintenance: n/a

The Vorn heavy fighter (dubbed Lucifer class by the StarForces) is extremely powerful and well armed, and only the luckiest of U.W. fighter pilots has survived a one-on-one dogfight with this vessel. Destroyers fear them, cruisers worry about them, and even battlecruisers don't ignore them.

From crashed examples, U.W. researchers have determined that the Vorn use huge accumulator banks much as the StarForces use thrust boosters. The large bank in a Lucifer can run all systems at full power for a little more than fifteen minutes. After this, the ship's thrust drops dramatically, to 3g if the Lucifer does not use its gravity shear and 2.3g if it intends to use the weapon.

Standard Vorn tactics with this ship are to hit hard and hit fast, using the ship's holographic projectors to confuse foes, and natural agility to dodge fire rather than engaging in high-g evasive maneuvers that would throw off the gunner's aim. The ship is not streamlined, but that doesn't stop Vorn pilots from following prey into an atmosphere; the fighter is strong enough to take it. The crystal hull structure the Vorn use is naturally tough, hardened against all the special weapon effects used by the United Worlds fleet. The most unfortunate technical fact about this ship is that it isn't jump capable, which means that if one is encountered, there's a mothership somewhere in the vicinity as well.

Item	Hex	Size	Tons	Loc.	Cost
Enclosed hull	125	3	12.5	36	-MCR
Bridge	4	-1	2	1	-MCR
Sensor	5	1	2.5	1	-MCR
Gravity drive	40	2	20	12	-MCR
AM reactor 1	10	1	5	3	-MCR
AM reactor 2	10	1	5	3	-MCR
Accumulators	16		8	4	-MCR
Gravity shear	40	2	20	12	-MCR
Armor	-	-	16	-	-MCR
Pod ports(3)	-	-	-	-	-MCR
Mines(2)	-	-	2	-	-MCR
Totals	125	-	100.6	36	-MCR

StarForces pilots are trained to take these performance limitations into account, along with the ability of Vorn ships to dump all their vectors and stop simply by turning off their gravity drive. However, near the close of the Interstellar War, Lucifers were observed to have a greater combat endurance, and apparently adopted the use of disposable accumulator pods to extend combat endurance by several minutes.

Vorn have never been known to use missiles, but as a space-faring species they are well aware of the destructive potential of ultra high-velocity projectiles, and the Interstellar War gave them valuable experience at spoofing StarForces missiles. Each Lucifer-class fighter also carries a pair of inert crystal hull lumps near the exhaust manifold for the antimatter reactors. They will often make a "strafing run" on enemy ships, getting into visual range before dropping these unguided projectiles into the path of enemy ships, targeting it like a missile attack, but using the gunner's skill. Once clear of the Vorn's gravity drive, these inert mines quickly slow to a stop and explode, showering the immediate vicinity with a cloud of crystal hull shards. Any ship (or cluster of missiles) that doesn't dodge this (much like evading a missile, but based on the Vorn gunner's skill), takes a 7d+0 autofire hit (+1 hit for each 2 points the mine makes its to hit roll by).

		First roll					
		1	2	3	4	5	6
Second roll	1	P ₁	P ₁	P ₁	W	G	S
	2	E	E	E	W	W	W
	3	E	E	E	W	W	W
	4	E	E	E	W	W	W
	5	E	E	E	P ₃	W	W
	6	P ₂	P ₂	P ₂	P ₃	P ₃	P ₃

The only known weakness of the Lucifer is that it has a "soft ass". This makes it easier to damage after it has done a strafing run with its 8d+1 forward arc gravity shear, which is often little consolation to the ship being shaken apart by internal gravity stresses.

Mammon-class Freighter

Tech Era: Late Post-Atomic

Hull: Enclosed

Size: 8 (23,000 hexagon)

Empty/Loaded: 8,290 tons/50,000 tons

Hits/Damage Limit: 36/-6

Thrust: 3.0g (level 7)

Hull rating: 12.5g (level 12)

Armor: 12d+1 (all facings)

Screens: none

Peak reactor power: 29d+1 (adequate)

Peak pulse power: 29d+2

Rozkhov charge time: 36 minutes

Best sensor: -3 difficulty

Quarters: 20

Crew per shift: 8

Stores: 10 months

Cost (new): n/a

Monthly maintenance: n/a

Even the Vorn must transport goods through space, and on occasion Vorn Mammon-class freighters have been caught by United Worlds patrols, and from the wreckage of those encounters came most of the U.W. technical knowledge of the Vorn. This includes the information that the fixed cargo holds are easily repurposed to surprise United Worlds ships by disgorging up to several squadrons of Vorn Lucifer fighters as a self-defense measure. As no dedicated Vorn carriers have been encountered to date, Vorn may consider fighters to be just an "add-on" weapon, much like many U.W. ships can add missile racks as needed.

Many Vorn freighters show evidence of being pushed to beyond their structural limits, and despite a lack of streamlining even show signs of re-entry damage. Analysts deduce from this that normal Vorn commerce is to and from orbital depots, but that on occasion these ships are used to deliver directly to the surface of high-gravity worlds. Estimates of the design indicate it can deliver over 50,000 tons to and lift 12,000 tons of cargo out of a 1g gravity well. As a troop carrier, it can land an entire battalion and enough supplies to keep it operational for a year. Used as a tug, it can tow or push up to 32 million tons at .1g, and long range (classified) reconnaissance pictures show these freighters or ships much like them moving asteroids around as the Vorn collect resources necessary to keep their spacefaring civilization running.

On the rare occasion where civilian ships encounter Vorn freighters, U.W. policy requires they be left alone. This is not for fear of provoking the Vorn, but is mainly so the civilians will survive the encounter and report the Vorn presence to the U.W. If left alone, Vorn freighters generally ignore human ships (for now). If provoked, they will usually attack.

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Item	Hex	Size	Tons	Loc.	Cost
Encl. hull	23,000	8	2300	36	.MCR
Bridge	350	4	175	1	.MCR
Sensor 1	20	1	10	0	MCR
Sensor 2	20	1	10	0	MCR
Gravity dr. 1	640	4	320	1	.MCR
Gravity dr. 2	640	4	320	1	.MCR
Gravity dr. 3	640	4	320	1	.MCR
Gravity dr. 4	640	4	320	1	.MCR
AM reactor 1	640	4	320	1	MCR
AM reactor 2	640	4	320	1	MCR
AM reactor 3	640	4	320	1	MCR
AM reactor 4	640	4	320	1	MCR
AM reactor 5	640	4	320	1	MCR
Accumul.	256		128	0	-MCR
Rozkhov Dr.	1000	5	500	2	-MCR
Gravity shear	160	3	80	0	-MCR
Gravity shear	160	3	80	0	-MCR
Armor	-	-	2000	-	-MCR
Quarters(20)	800	4	0	1	-MCR
Cargo 1	4500	6	-	7	-MCR
Cargo 2	4500	6	-	7	-MCR
Cargo 3	2500	5	-	4	-MCR
Cargo 4	2500	5	-	4	-MCR
Hangar	100	3	10	0	-MCR
Spares(1 hit)	230	3	115	1	-MCR
Pod ports(3)	-	-	-	-	-MCR
Mines(2)	-	-	2	-	-MCR
Totals	22,856	-	8,290	36	-MCR

That the Vorn have the resources to make cargo ships that are better armed and equipped than some United Worlds warships has been a continual concern for those planning for the next conflict with this hostile race.

		First roll					
		1	2	3	4	5	6
Second roll	1	C ₁	C ₁				
	2	E ₁	P ₁	C ₁	C ₂	C ₂	C ₂
	3	E ₂	P ₂	R	C ₂	P ₅ W ₁	GS ₁
	4	E ₃	P ₃	R	C ₃	LQW ₂	P ₆ S ₂
	5	E ₄	P ₄	C ₄	C ₃	C ₃	C ₃
	6	C ₄	C ₄				



OUT THERE

The unlicensed bounty hunters caught up to us at the Tawhirimatea Starport. We found out later they'd been hired by Vogt from Asgard. Apparently he held grudges a long time...

The bounty hunters' cyberware must have addled their brains, because they opened up on us in the main promenade.

I'm looking at a store window display, thinking about picking up a new e-suit, when a laser burst melts through the plexi.

My ears pop. A few seconds later, the decompression alarm goes off. "Oh boy," I think. "We're in for some fun now."

- Lauro Rizal, free trader, 2237CE

▼ **FIRING IT UP - Fires of Heaven** attempts to strike a balance between interstellar empires so vast that no one person could visit every planet in a lifetime, which can become unmanageable as players find themselves confronted with endless options and no direction, and a setting so limited that its adventure opportunities are exhausted in short order. But even if the world mix is "just right", some gamemaster decisions can be just as important to game viability.

Many campaigns founder on possibilities; *if the adventurers can be anything and begin play anywhere, how is the gamemaster expected to craft a single adventure to bring them all together in one place united in a single purpose?* One solution to this problem is to restrict the initial location.

If, before adventurer creation starts, the gamemaster either informs the players of the campaign's starting locale or offers them a short list of possibilities, they can then leave it up to the players to devise adventurers who can logically be found in such places; i.e. if the gamemaster sets the first adventure on a struggling frontier colony, the players will know not to create Lunar diplomats, Nutoan starship engineers, or StarForces interceptor pilots, *unless they can come up with justifications for their choices within the campaign framework* (something that creative and insistent players may still do).

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The most obvious of limited environments, the confines of a single StarForces Navy ship, isn't recommended for a starting campaign because it goes too far in the direction of restricting player choice (essentially nothing but StarForces personnel), and because it then *continues* to limit adventurer freedom for as long as they remain within the StarForces environment; they won't be allowed to pursue independent goals if those involve leaving the ship, the majority of their adventures will be assigned to them from above (with no option of turning down missions), and the heart of every exploit, whatever the trappings, will be combat.

This isn't to say that isolated adventurers can't take place in this environment. Many times, StarForces vessels act as couriers or escorts for important civilians, ships may have attached media representatives, and some shipboard services like cooking may even be contracted to the private sector, giving the limited opportunity for non-StarForces adventurers to act and interact on a StarForces vessel.

Another balance must be struck between the various adventure options open to the gamemaster in **Fires of Heaven**, from the exploration of newly-discovered worlds to the profit-making potential of interstellar commerce, political intrigue behind the scenes of a United Worlds Assembly session to investigations into corporate cybercrime, analysis of disturbing spatial anomalies and puzzling Progenitor artifacts to scouting missions into Vorn-held space. The gamemaster must make the game exciting for all the players, and must provide opportunities for each adventurer to spend time in the spotlight. For example, fixing the starship's engines may not seem thrilling compared to shooting laser cannons at space pirates - unless the ship is about to fall into the sun! A good gamemaster could even make fixing lunch seem like an exciting proposition...

But while **Fires of Heaven** is designed to be a realistic setting in which violence is far from the only solution to most problems, the gamemaster has to ensure that there are sufficient opportunities for action interspersed amongst the other roleplaying activities. And while action can mean zero-gravity sporting contests, hovercar chase scenes, and struggling against the elements on a planet that was never intended for the enjoyment of humans, in even the least combat-oriented of campaign the reality of cutthroat pirates, world-conquering aliens, and colony-threatening monsters must be admitted. *And players want to be the ones shooting at them...*

▼ **COMBAT** - Thrilling combats are a vital part of many science fiction adventures. Grappling in zero-g on a starship hull, shooting it out with laser pistols in an alien landscape, or squaring off against a cyborg martial artist in the bowels of a space station are all classic genre moments. The following rules cover some minutia that many gamemasters will simply prefer to gloss over. Use or ignore them as you wish.

Perception - Before a person can fight, they have to identify a target. Awareness rolls can be particularly important in the **Fires of Heaven** setting, where combatants may wind up pursuing someone through a chlorine fog, shouting at each other on a thin-atmosphere world, or trying to target a sniper by the flashes of his particle beam rifle.

The perception system in **EABA** covers many situations likely to be encountered in space or on other worlds. For example, bonuses for extremely high contrast can easily be applied to a lighted object, such as an e-suit helmet light in the darkness of space. Likewise, the sight Awareness modifiers for nighttime conditions also apply to worlds orbiting dim stars or an outer planet far from its sun. But some new Awareness modifiers are in order.

Atmospheric effects can play hob with sight and hearing perception ranges. Sound travels poorly in thin atmospheres, which is a +2 difficulty for hearing in atmospheres of 0.5 Earth atmosphere pressure or less. Dense atmospheres, on the other hand, carry sound extremely well, for a -2 to difficulty on worlds with 2.0 Earth pressure or greater.

Some atmospheres contain chlorine or other cloudy gases that reduce visibility. Difficulty for sight Awareness in these conditions is +2, much as they would be in a hazy fog on Earth. On the other hand, the clarity of vacuum is generally good for a -2 to difficulty of sight Awareness, provided it isn't countered by the scratchy visor of your second-hand E-suit...

Different weapons have their own unique visual and audible signatures, making some types easier or harder to detect or track back to their source. A person with a skill in a particular weapon type will be able to identify it ("Hey! Someone's shooting a laser at us!"). A person with a specialization in a particular weapon type may be able to identify the model of weapon within that type if they make their Awareness roll by 2 or more ("That sounded like an Ares M34...who still uses those?").

In general, the default modifier for hearing or seeing a weapon or side effects of the weapon (like ricochets) is a bonus equal to a third of its damage level (1 per 1 d). So, a 2d+1 pistol starts off as a -2 to spot, either the sound, muzzle flash, or the debris kicked up as the bullet hits something. Similarly, most noise-producing or visually striking items will have default sound and sight modifiers based on their size and power, like a vehicle engine's Strength.

Item	Sight	Hearing
Firearm	+6	+0
silenced	-	+4
Particle Beam*	+4	+4
Stunner*	+2	+3
Blaster*	+2	+3
Laser*	+4	+1
Railgun	+6	+1
Explosives	+0	-2
Ground vehicle	-	+0
Air vehicle	-	-2
Rocket liftoff	-4	-6
Decompression signs	+0	-2

Weapons with an asterisk can automatically be tracked back to their origin if they are detected. Other items can be localized within an arc that can be narrowed to the source on a followup Awareness roll. Lasers can only be spotted visually if there is something in the environment that will absorb or diffract the beam, like dust, mist or compounds absorbed by that laser's wavelength.

EXAMPLE: If a fusion drive has a thrust of 12d+0, it means it has a default hearing Awareness modifier of -12, with -4 more for seeing it and -6 for hearing it. Anyone looking in the right direction only has to make an Average(7) sight Awareness roll to spot the liftoff at a range of 1 kilometer (normally a difficulty of 23), and anyone within 2 kilometers only has to make an Average(7) hearing Awareness roll to hear the liftoff (normally a difficulty of 25). Someone on the lookout for it could spot it from even further away (**EABA**, page 7.7).

EXAMPLE: A sloppy sniper with a 5d+0 laser rifle shoots at an adventurer on a crowded street, and misses. The adventurer wasn't looking for the shot, but the steaming hole that opened up in the back of the person in front of them is a good clue. This gives a rough idea of direction. The adventurer makes a hearing Awareness roll based on range, modified by street noise and a -4 modifier for the weapon (-5 for being a 5d weapon, +1 for being a laser). If they make the roll, the crack of discharging superconductors and sizzle of ionized air lets them know about where the shot came from. They can try to make another roll to actually spot the sniper, or maybe do the *smart* thing and find some cover...

▼ **DAMAGE** - Many of the optional damage effects presented in **EABA** are appropriate in the fairly realistic **Fires of Heaven** setting.

Hit Location - Hit location tables are used in **Fires of Heaven** to produce a realistic feel in combat. The Hit locations for humans can also be used for the generally humanoid alien races, such as the D'eira, Nutoa, and male Jodoni, but specialized charts are required for other races and for robots. The "aim" column represents the extra difficulty to aim for that location, but this does not take into account the size of the item. For instance, aiming at the treads of a huge robot would use its overall size as a modifier, then the modifier for that smaller part of the robot.

Human hit locations

3d roll	Location	Aim	Effect
3-6	Head	+6	+1d damage, max. 7d+0
7-8	Arms	+4	-1d damage, max. 3d+0
9-12	Body	+2	normal, max. 5d+0
13-18	Legs	+4	-1d damage, max. 3d+0

Etherean hit locations

3d roll	Location	Aim	Effect
3-6	Head	+6	+1d damage, max. 7d+0
7	Wings	+5	-1d damage, max. 1d+0
8	Arms	+5	-1d damage, max. 3d+0
9-12	Body	+2	normal, max. 5d+0
13-18	Tail	+4	-1d damage, max. 1d+0

Vorn hit locations

3d roll	Location	Aim	Effect
3-6	Head	+6	+1d damage, max. 5d+0
7-8	Arms	+4	-1d damage, max. 2d+0
9-12	Body	+2	normal, max. 3d+0
13-15	Legs	+3	-1d damage, max. 2d+0
16-18	Tail	+6	-1d damage, max. 1d+0

Robot hit locations

3d roll	Location	Aim	Effect
3-5	CPU	+7	+1d damage, max. 3d+0
6	Tools	+5	-1d damage, max. 1d+0
7-8	Arms	+4	-1d damage, max. 1d+0
9-12	Body	+2	-1d damage, max. 2d+0
13-15	Motive	+3	-1d damage, max. 2d+0
16-18	Accessory	+6	-1d damage, max. 1d+0

▼ **Note** - The computer brain of many robots is not located in their heads; in fact, many robots have no heads!

▼ **Note** - Aiming for "arms" or "legs", "wings", etc. on this table usually means a *particular arm or leg*. If it is reasonable to aim for multiples of this item, the difficulty is 2 points easier. Most of the time you could aim for "legs", but it would require special circumstances to aim at "arms" rather than one arm or the other.

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Wound effects - The advanced topics for stunning, knockouts, bleeding and so on are useful in enforcing the realistic effects of being injured by an attack; adventurers should not simply shrug off being blasted by a laser, for example, unless the gamemaster desires a cinematic campaign. These rules have the potential to slow play during combat, however.

The use of crippling injury rules (**EABA**, page 5.8) is recommended for **Fires of Heaven** campaigns to promote awareness of the risks of engaging in combat. To compensate for this, the existence of advanced medical care (**EABA**, page 5.8), cybernetic equipment, and other benefits makes these types of serious injuries less of a problem than in less technologically advanced genres, where disabling wounds could easily end an adventurer's career.

Recovery - The advanced medical techniques of the 23rd century have greatly speeded recovery from injuries. An adventurer under Post-Atomic Era medical care gets a +3d bonus to their Health for making recovery rolls on lethal hits, noting that adjusted Health is never more than double the adventurer's uninjured Health.

After being modified for injury penalties and quality of care, the adventurer gets back one lethal hit per full die of Health per day, or per four days for crippling injuries.

EXAMPLE: After getting winged by laser fire, an adventurer checks into a hospital for some regen therapy. They have a normal Health roll of 2d+2, with a 2d+2 bonus for the quality of care (remember that bonuses are limited to double their *uninjured* Health). This gives them a Health roll of 4d+4, which becomes 5d+1. However, they also took 10 hits, which is a -2d penalty, leaving them with a roll of 2d+1. This means they will recover 2 hits per day they stay in the hospital. If these 10 hits had come from one crippling injury, they would recover 2 hits per four days. You could do their recovery of hits incrementally, their recovery rate improving as their adjusted Health roll does.

Outpatient care (seeing a medical professional once a day and not engaging in strenuous activity) is a lot cheaper than full hospitalization, but is 1d less effective. Simply getting some emergency room care and going on your way is usually 2d less effective. Remember that a physician can substitute their skill roll for the patient's Health roll in extreme conditions (**EABA**, page 4.9).

▼ **HIGH AND LOW GRAVITY** - Gravity affects the way an adventurer moves and defends, and changes the rate at which they exert themselves. Most of the effects of gravity on a person raised in a 1g environment but subjected to a different gravity are summarized below.

Gravity	Agility	Eff. Strength	Falling
0	special/-3	special	-
0.1	-2	+10	+7
0.2	-2	+7	+5
0.3	-2	+5	+3
0.4	-2	+4	+3
0.5	-1	+3	+2
0.6	-1	+2	+2
0.7	+0	+1	+1
0.8	+0	+1	+1
0.9	+0	+0	+0
1.0	+0	+0	+0
1.1	+0	+0	+0
1.2	+0	-1	-1
1.3	+0	-1	-1
1.4	+0	-2	-1
1.5	-1	-2	-1
1.6	-1	-2	-1
1.7	-1	-2	-1
1.8	-1	-3	-2
1.9	-1	-3	-2
2.0	-1	-3	-2
2.5	-2	-4	-2
3.0	-3	-5	-3
4.0	-3	-6	-4
6.0	-4	-8	-5
8.0	-5	-9	-6

A drop in Agility can affect the adventurer's default Agility roll and their Dodge. Adventurers native to a world with an altered gravity are not affected by that world's Agility penalties. They do take penalties when they are *outside* that level of gravity, using the table to figure the level of penalty.

EXAMPLE: An adventurer native to a 1.5g world takes no Agility penalties on a 1.5g world. However, they do take a -1 penalty to Agility on a 1g world.

Strength is not *actually* increased or decreased in these environments. Rather, gravity adjusts the adventurer's effective Strength for purposes of lifting capacity and encumbrance penalties. Adventurers with an **Experience** (EABA, page 2.13) relating to a high or low gravity environment can offset up to -3 of Agility penalties for a gravity other than the one they were raised in. Weightlessness, or zero gravity, is handled in a separate section (page 9.7).

Standing - For simplicity, an unencumbered adventurer of at least effective Strength 0d+0 may stand up in virtually any gravity. The adventurer may be exerting themselves and thus taking non-lethal hits just from the effort of staying upright, however.

Leaping - Gravity affects jumping distance by adjusting the distance by the Strength penalty or bonus. Gravity doesn't affect movement other than leaping, except that extra encumbrance from heavy gravity can cause movement penalties with less actual weight.

EXAMPLE: An adventurer makes a running jump in a .6g environment. Since there is a +2 effective Strength here, the distance level they can jump is increased by +2. Similarly, if they were in a 1.4g environment (-2 to effective Strength), their jumping distance would be *reduced* by 2 levels.

Lifting and Throwing - For lifting, you simply use the adventurer's gravity-altered Strength to determine if they can lift an item, and if so, what encumbrance penalties they take. For throwing an item, you would compare the gravity-adjusted Strength to the weight of the item and get a distance level, as for normal throwing distance (EABA, page 5.6). Remember that when throwing something, any Agility penalties from gravity will apply to rolls made to try and hit anything.

EXAMPLE: Archaeologist Stanislav Moravec tries to lift a boulder on the planet Anubis, which has a gravity of 0.5g. In 1g, the boulder would weigh 150kg (too heavy for Moravec to lift with his Strength of 8) but on Anubis his lifting capacity is based on a Strength 3 points higher. With an effective Strength of 11, Moravec lifts the boulder.

Later, Moravec picks up a 25kg rock and prepares to throw it. He has an effective Strength of 11 the light gravity of Anubis. Looking at the **EABA Universal Scale** (EABA, page 3.4), a Strength of 11 can throw a weight of 3 (25kg) a distance of 8, or 6 meters, and if he took an extra action to really heave it, he could get it up to 8 meters. In a normal 1g environment, the furthest he could possibly throw it would be 3 meters.

Falling - Sooner or later, someone is going to take a spill on a world with non-standard gravity. The rules for falling damage (**EABA**, page 5.5) increase falling damage by 1d for each 3 distance levels, starting at 1d+0 half-lethal damage for falling 1 meter. Altered gravity simply adjusts the distance levels you count before increasing damage by 1d. High gravities that would reduce the interval to zero or less levels simply reduce the interval to 1 distance level per extra 1d damage, plus 0d+1 for each point over a -2 on the interval.

EXAMPLE: Falling in a 4g environment (a -4 to the interval) means you take an extra 1d+2 for each distance level fallen (1d for the distance level, another +2 for the leftover points from the interval).

EXAMPLE: Jehan Sajjad falls off a cliff while exploring Thor, which has a gravity of 1.6g. She lands on a ledge after falling 8 meters. *This is going to hurt.* On Earth, a 1g world, Sajjad would take 3d+0 half-lethal damage (1d for 1 meter, another +1d after 3 distance levels (3 meters) and another +1d after 3 more distance levels (8 meters). On Thor, however, the damage interval is reduced to 2 distance levels. Sajjad takes 4d+0 damage when she hits the ledge.

If Sajjad missed the ledge and fell a total of 16 meters to another outcropping, on Earth, she would still have only taken 3d+0 damage, since the next damage interval is at 23 meters. On Thor, this distance is another 2 distance levels, so she would take 5d+0 damage.

If Sajjad had been lucky enough to take her fall on Ryujin, which has a gravity of 0.6g, she would only take extra damage each 5 distance levels, so an 8 meter fall would only be 2d+0 damage, and a 16 meter fall would only be 3d+0 damage.

Various combinations of gravity and atmosphere density can adjust the terminal velocity of a fall, and thus the maximum possible falling damage. In vaccum, there is no terminal velocity, and thus no upper limit on falling damage, while on Jupiter, the increasing density of the atmosphere means that while you might be crushed to death from the pressure, you don't have to worry about slamming into the rocky core, as your terminal velocity will eventually drop to a snail's pace.

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Damage from Acceleration - Acceleration is the act of changing speed or direction of travel, which can produce several gravities of thrust. When a starship accelerates suddenly, the adventurers inside may suffer damage from these g-forces. This is separate from the damage they might take from being bounced around the inside of a ship like a pinball, and represents things like the stress of overworking your heart. The fatiguing effect of simply being in a rapidly changing acceleration field will do 1 non-lethal hit per point of Strength penalty. This damage is usually only taken once per starship turn, for the maximum level of g-stress taken.

EXAMPLE: An adventurer has to cling to a bulkhead while the ship he is on does 2g emergency maneuvers. A 2g gravity field is a -3 penalty on Strength, so he takes 3 non-lethal hits.

Adventurers who are prone in a bed or on a normal couch or padded surface, can ignore the first 2 non-lethal hits. Adventurers wearing g-suits, designed to reduce the effect of g-forces on the body, can ignore the first 3 non-lethal hits per starship turn. Adventurers in dedicated acceleration couches can ignore the first 3 non-lethal hits per starship turn, and those in a fluid bath (sometimes called an acceleration tank), can ignore the first 9 non-lethal hits per starship turn, though a fluid bath cannot be used in combination with any modifier except heavy gravity Experience. Adventurers in suspended animation take no damage from starship acceleration or constant heavy gravity.

EXAMPLE: An adventurer in a g-suit and in an acceleration couch can ignore the first 6 points of damage from acceleration stress. They suffer no ill effect until they exceed 4g's of maneuvering.

Items or modifiers that reduce acceleration damage will stop half that amount of crash landing or falling damage.

A ship with an artificial gravity generator can reduce the effects of constant acceleration (but not combat maneuvering) by generating a gravity field in the opposite direction.

High-g exoskeletons boost the Strength of an adventurer for the purpose of carrying and lifting, and also count as g-suits for resistance to high-g damage. These are common on well-heeled expeditions to heavy-gravity worlds. Note that most acceleration couches will not mesh with the bulky frame of powerful high-g exoskeletons.

Random Acceleration Damage - If a starship is under several g's of thrust, unsecured passengers and crew members can be hurled about bulkheads during course changes. Each 1g of acceleration used causes double the gravity penalty to Agility rolls and in-ship use of Agility skills and the normal gravity penalty for firing starship weapons, and actions that are normally automatic may require Agility rolls to be successful. Adventurers can take steps to improve their stability, such as taking extra time, clinging to handholds while they move, etc. Ship acceleration can cause an adventurer to "fall" in unexpected directions on a failed Agility roll when they try to move, with damage based on the distance and the apparent gravity caused by the ship's acceleration.

EXAMPLE: Doc Martin is trying to get to the bridge to get urgent medical care to an injured sensor tech...while the ship is making emergency 2g evasive maneuvers. A 2g gravity well is normally a -1 to Agility rolls, so it is a -2 penalty to Agility for trying to move around (he has to worry about the floor suddenly becoming the ceiling. The gamemaster has him make an Easy(5) Agility roll to make it from Medbay down the corridor to the main lift. Doc fails the roll, and the gamemaster has him take a several meter tumble as though he were on a 2g planet. *Ouch.*

Spin Gravity - Starships and space habitats constructed before the advent of artificial gravity technology often rely on centrifugal force to simulate gravity. While spinning or rotating simulates gravity well, centrifugal forces create odd effects that may disorient the unaccustomed in some ways. Adventurers in spin gravity automatically take a -1 penalty to Agility rolls and Agility skills. An Experience with spin gravity eliminates these penalties.

▼ **ZERO GRAVITY** - Zero gravity is also referred to as weightlessness and freefall. Zero gravity rules should also be used in situations of less than 0.1g.

Movement - Without special equipment, leaping and crawling are the only available movement modes. Operating in freefall can be quite tricky, and actually fairly hazardous if not done properly.

Crawling is really just a form of climbing, moving along a ladder or using other handholds. Climbing skill is not required except for difficult maneuvers, and provided the surface is designed for zero-g movement, it is simply a Very Easy(3) task, and you can spend extra time to increase your chances if there is a problem. The base movement rate is your walking distance as a minor action, or running distance as a major action. Clambering around in zero-g without using both hands and both feet will increase the difficulty, and will usually require a skill or Attribute roll to avoid coming loose, overshooting your destination or otherwise embarrassing yourself.

Leaping is another way to get around in zero-g. Once an object or person starts moving in freefall, it continues to move until it runs into something or an opposing force is applied; e.g., via a thruster pack. An adventurer can propel themselves their running distance as a leap, and will coast at this speed until they hit something. While carried objects have no weight in zero-g, they still have inertia and count normally for any modifications to running speed (if you are trying to leap while carrying a friend under each arm, your leap will be slower than if you were unencumbered).

An Agility roll or appropriate zero-g movement skill is used to correctly aim yourself, using distance level as a difficulty, and any amount missed by as the distance level you are off target. Remember to take into account modifiers for spin gravity, any relative motion between where you leap from and where you are going, etc.

EXAMPLE: Kiana Bensen was on EVA when a piece of space debris sheared through the antenna strut she was working on. She and her ship are now drifting in different directions. She has a maneuver pack, but chooses to leap the distance, shoving off the strut and aiming for an airlock 20 meters away. With relative motion added in, she needs to match a difficulty of 12 with her 3d+2 zero-g movement roll, which is reduced to 2d+2 because of encumbrance. She "aims" for a few seconds to drop the difficulty to 10 and rolls, getting an 8. A miss distance of 2 is less than a meter, so after several seconds of freefall, she plants her feet right next to the airlock, and prepares to head back inside.

An adventurer drifting in free-fall continues at the same velocity and direction until another force changes or stops their motion. This could be landing on a surface, grabbing another flyer, or using a thruster pack; in an emergency, an adventurer might try throwing something or firing a recoiling weapon to slow their velocity or alter their direction. Adventurers in uncontrolled zero-g flight sometimes spin, randomly changing facing each Phase. An Average(7) Agility or zero-g movement roll can be used to stabilize a spinning spacer.

It is normally a Very Easy(3) task to land correctly after a zero-g leap. This assumes there is something to grab onto at the other end, or the adventurer has magnetic footgear or some other means to stop from bouncing. A surface with no handholds would be harder, having stickyboots would make it easier, and so on. The difficulty is also modified if the adventurer's leaping speed is high enough (3 meters or more) to make a difference. Failing the roll means the adventurer hits and bounces, drifting away from their landing point at a meter per turn. An uncontrolled free-fall landing is counted as a fall from a height of the free-fall speed.

Zero-g movement gear - With the proper gear, semi-normal movement in zero gravity is possible. A character with magnetic or sticky shoes can walk on appropriate surfaces, a thruster pack will permit controlled flight, and someone wearing large wings can glide or even flap around in a pressurized environment.

Magnetic or sticky boots require that one foot be kept on the ground at all times, which makes it impractical to move any faster than a walk. Early thruster packs require use of one hand on a joystick, but modern models have a variety of interfaces, such as bite-operated, toe-operated (sensors in your spaceboots), voice-operated and models that operate on body language cues. By thrusting "down" at least a meter per second, these can allow an adventurer to run normally along a surface, though this is wasteful of the thruster pack's reaction mass.

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Combat modifiers - Zero-g or free-fall will have a few specialized combat effects. Thrown objects or other projectiles have more or less unlimited range. *They just keep going.* If there is an atmosphere, they will eventually slow down and stop, but in vacuum, they will keep going at full speed until they hit *something*, whether that is a dozen meters or a dozen kilometers off.

An adventurer in free-fall cannot dodge as well. Whether restricted by the need to hang onto something, avoid pulling your magnetic boots loose or because you have nothing to push against, Agility for dodge purposes is reduced by 1d.

For every action, there is an equal or opposite reaction. If making any sort of melee attack, a maneuvering, movement or landing roll will have to be made to avoid throwing yourself off balance, with a penalty of the base Strength used in the attack (do not count any bonus from Advanced skills). This applies whether you are the one delivering the attack, or the one being attacked. Failing the roll breaks you loose from the surface you are on, or puts you into an uncontrolled free-fall spin. If you are able to use your own Strength to counter the force, it can offset the penalty on your roll. This would be something like using a handhold while throwing a punch. This is effective, but it is also a prime target for someone else's attack, since a fixed target like a hand on a railing doesn't get to dodge very well.

Also, many types of modern weapons have recoil, which can be a problem in free-fall or when trying to stick to a surface in zero-g. In general, a movement or maneuvering roll is required after using a recoiling weapon like a conventional weapon or railgun, with an increase in difficulty of the full dice of weapon damage, with a further +1 difficulty for burst fire, and +3 difficulty for autofire. Blasters and particle beam weapons would halve this penalty, and stunners and lasers have no recoil. In an emergency, a recoiling weapon can be used as a sort of thruster. Every five points of increased difficulty would be a 1 meter thrust, and this can be accumulated over several turns if needed.

EXAMPLE: A 3d+0 pistol could be fired twice to get a total of +6 modifier, for a 1 meter thrust. If fired five times, the cumulative modifier would be +15, for 3 meters of thrust.

EABA

▼ **LIVING IN A DANGEROUS GALAXY** - Hazardous conditions abound in space and on other planets. Poisonous or even acidic atmospheres, airless vacuum, bitter cold, blast-furnace heat - the list of ways to die seems endless. Naturally, adventurers will likely end up facing many of these dangers at some point in their careers. Rules for the effects of temperature and air pressure extremes are found in the main **EABA** rules.

Alien races are also sensitive to extreme temperatures, but possess different comfort ranges and degrees of tolerance depending on conditions on their native world.

EXAMPLE: Curo, a Nutoa, has a base temperature range of 15°C to 45°C and suffers extreme temperature effects in 5°C increments. His shuttle crashes in a remote region of Gawaine, a cool world orbiting Omicron Eridani A. The temperature is 5°C, two steps below the base range for Nutoa. Unless he can find some protective clothing or another way to stay warm, Curo suffers the fatiguing effects of heavy exertion (1 non-lethal hit per 4 minutes). Curo will be dead in an hour or two unless he finds a way to stay warm...

Temperature Ranges

Race	Base Temperature	Step
Humans	10°C to 30°C	5°C
D'eira	-5°C to 20°C	5°C
Ethereans	0°C to 40°C	10°C
Jodoni	5°C to 45°C	10°C
Nutoa	15°C to 45°C	5°C
Vorn	5°C to 35°C	5°C

In *theory*, races suitable for adventurers have a narrow common comfort range of 15°C to 20°C, which is where most multi-species environments will be set. In *practice*, the gamemaster will usually gloss this over and not worry about it.

Radiation - From cosmic rays and solar flares to damaged fission power plants there are many ways to suffer dangerous radiation exposure. The average radiation exposure *per year* for a person on Earth is 0.1 rem; humans can absorb up to 25 rems without immediate ill effect, while 100 rems may cause radiation sickness, and more than 800 rems causes death. As a side note, adventurers in biostasis only take an eighth the normal dose from radiation exposure, and do not suffer any radiation episodes until they are revived. However, in their weakened post-revival state, any such episode can easily be fatal.

Normal background radiation has little effect on an adventurer, but exposure to intense radiation has a cumulative effect. The easiest way to do it is to take the *lifetime* cumulative exposure and count it as a "lifting capacity" on the **EABA Universal Chart**. Each time you reach an increment of 3 positive levels, the adventurer has a "radiation episode" that does 1d+0 lethal, *crippling* hits. In addition, their Health is *permanently* reduced by 1.

EXAMPLE: Silla N'kora hits 25 rems cumulative exposure. She has an attack of queasiness and gets a nosebleed that just won't quit (she takes 1d+0 lethal hits). In addition, Silla's Health is permanently dropped by 1.

A person with radiation sickness suffers a weakened immune system, hair loss, and a drop in blood cell counts. Long-term effects of radiation exposure include cataracts, sterility, genetic damage, and cancer. Modern regeneration tanks can halve a person's lifetime exposure levels (1 hour in a regen tank and 200 Credits per rem reversed, half this cost if using your own tank). Cloned organs and body parts damage by radiation can halve the lifetime exposure as well, and the two can be combined. If either therapy changes the levels of damage taken, the effects can be reversed.

EXAMPLE: Silla took most of her radiation dose while doing emergency repairs on a ship's reactors. Her employer springs for some regen therapy at the next class A starport they hit. This takes 12.5 hours and costs 1250 Credits. This drops her lifetime dose to no less than 12.5 rems, which is below the first 1d threshold. She gets her lost point of Health back. The remaining 12.5 rems *cannot* be further reduced by subsequent regen therapy.

There are also the gamemaster-contrived radiation events from jump drive malfunctions, new and unexplained astronomical phenomenon, exposure to Progenitor artifacts and so on. This is not conventional radiation (of course!), and so its effects will be somewhat different. Mood changes, bizarre biological effects, or maybe just an excuse for one of the adventurers to unlock their psi potential. It's a standard prop in a science-fiction universe. *Just don't overdo it.*

Variant Atmospheric Conditions - Atmospheric conditions vary greatly on the federation worlds. Even if the atmosphere is breathable by humans, it may be too thin to sustain life indefinitely or too dense to breathe comfortably. Atmospheric pressure on other worlds is listed in comparison to Earth's sea level pressure. Numbers listed in the **Atlas** chapter represent sea level, or base, conditions on the planet; actual atmospheric pressure will vary depending on altitude, rising in deep canyons and dropping on high mountain peaks just as it does on Earth. Humans can breathe easily on worlds with 0.8 to 1.2 atmospheres. Thinner atmospheres require a respirator for long-term survival, while denser ones can cause pressure equalization problems.

Adventurers in sudden pressure drops (like explosive decompression) or increases suffer 1d+0 half-lethal damage for each full atmosphere of pressure change (round nearest). For instance, an adventurer who goes from an atmospheric pressure of 1 atmosphere to a pressure of 3 atmospheres suffers 2d+0 half-lethal hits. Damage is reduced by 0d+1 for every 2 time levels over a second that the change takes place, reducing or eliminating the effects for those who take time to acclimate.

EXAMPLE: You could safely acclimate from 1 atmosphere to 3 atmospheres by taking 12 extra time levels (one minute) to do it.

Safely *decompressing* (to a breathable pressure, we presume) takes 12 time levels longer than safely going to a higher pressure.

Aliens and Variant Atmospheres - Alien races are likewise affected by atmospheric pressures different from the norm for their species. These effects are similar to those experienced by humans. Most of the time, someone outside their comfortable pressure range can simply wear a supplemental oxygen mask (if pressure is too low), or a pressure-boosting mask to augment normal breathing muscles (if the pressure is too high). Human starships and habitats are usually kept at about .9 atmospheres, with a slightly enhanced oxygen level, which is tolerable to everyone except the Jodoni.

D'eira are accustomed to a thin atmosphere, breathing easily from 0.4 to 0.8 Earth-normal. Nutoa are accustomed to a thicker atmosphere, breathing easily in atmospheric pressures from 1.1 to 1.5 Earth-normal. Jodoni breathe without assistance at air pressures from 0.3 to 0.7 Earth-normal, and Vorn at 0.6 to 1.4 Earth-normal. Ethereans breathe water, but when out of water are capable of coping with variant atmospheric pressures via psychokinetic control of their bodies at a cellular level.

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Corrosive Atmospheres - Atmospheres on some worlds are not only deadly for humans to breathe, they contain corrosive chemicals such as sulfur compounds, ammonia, chlorine, and fluorine. Armored e-suits, sealed vehicles, and other precautions are necessary for survival on worlds with such atmospheres.

Not only will an adventurer exposed to a corrosive atmosphere suffer acute poisoning, they may suffer burns on any exposed skin. Depending on the exact makeup of the atmosphere, they take from 0d+1 to 1d+0 lethal hits in a time increment based on how corrosive the atmosphere is. One that is on a marginally habitable world might only do 0d+1 lethal hits per day. One that is violently corrosive might do 1d+0 per second!

Long-term exposure to a corrosive atmosphere will damage even equipment designed for use on such hostile worlds. The corrosives in the air will *eventually* eat through the armor, wrecking the internal circuitry, contaminating life support systems, and creating other problems. Most gear designed for corrosive or poisonous atmosphere use is pressurized to slightly higher than atmospheric pressure. This not only keeps the corrosives on the outside, it also provides a way to detect if there is a leak anywhere (the internal pressure drops).

Poisonous Atmospheres - Atmospheres on many worlds are poisonous to humans. Carbon monoxide, chlorine, and ammonia are just a few of the many possibilities for atmospheres deadly to humans, some of which are also highly corrosive. Even if a spacer has sufficient oxygen to breathe, if it is mixed with large enough quantities of these gases, they can still die.

Airmasks or e-suits are required on worlds with poisonous atmospheres. An unprotected adventurer can hold their breath, which counts as extreme exertion (lose 1 non-lethal hit each 15 seconds). They will take no damage from the atmosphere, but must quickly find a source of good air!

Breathing a poisonous atmosphere causes a person to take from 0d+1 non-lethal to 1d+0 lethal damage, again with a time increment based on the nature of the atmosphere. Unlike the corrosive atmospheres, an adventurer in a merely poisonous atmosphere can get by with an oxygen mask, or sometimes even just a mask with the right kind of filter cartridge.

Some atmospheres, while not immediately poisonous, contain trace elements that eventually concentrate in the body and gradually poison non-native lifeforms. Hephaistos, a metal-rich world, provides one example. Human colonists are at risk for long-term heavy metal poisoning unless they undergo preventative medical treatment on a regular basis.

Gradual effects of contaminated atmospheres on adventurers are treated similar to radiation exposure. Each particular toxin will have its own effect. Some may affect Health, as radiation does. Others might be neurotoxins that cause brain degeneration (Awareness) or behavior disorders (Will). Regen therapy or organ replacement can completely purge the toxins from the body, however, damage to the brain may be permanent. Regen therapy might restore damaged neural tissue, but if the lost tissue was where most of your language skills were, then those skills are gone. To reflect this, if long-term toxicity at any time reduces the dice available for an Awareness or Will-based skill roll, a random skill on the affected Attribute is reduced by 1d. If it was a +0d skill to begin with, it is *completely lost*.

▼ **SPACE SICKNESS** - Many humans venturing into space suffer spacesickness as they adjust to weightlessness. In most cases, the queasy feeling passes within a few hours but some people never adjust. Spacesickness generally hits the first time a person experiences weightlessness and may recur on later trips if the person has been out of zero-g for awhile. A lucky few humans are immune to spacesickness. An unlucky few never get over it.

The Vorn, who spend most of their lives in space, are never spacesick (or those who are are quickly weeded out). Ethereans alleviate any effects of spacesickness through psychokinetic body control on a cellular level. The D'eira, Jodoni, and Nutoa are as susceptible to spacesickness as humans.

Jump Effects - The reality-bending effect of the Rozhkov Drive has a severe but typically short-lived effect on human physiology. Nearly all interstellar travelers suffer from disorientation and fatigue immediately after a jump, but this "jump shock" normally passes within moments. One in ten humans experience the more debilitating "jump sickness", suffering fatigue and mental confusion 24 hours or more after a trip via the Rozhkov Drive.

About one in five Nutoa suffer jump sickness, and roughly one in twelve Jodoni. D'eira are rarely affected, with just one in fifty suffering lasting ill effects from interstellar jumps. Neither Vorn nor Ethereans ever undergo jump sickness, and they have only mild jump shock experiences.

Jump shock typically does 1d+0 non-lethal hits, which are recovered normally. Jump sickness is more severe. A person who suffers from jump sickness takes a -1d penalty to all Awareness and Awareness-based skill rolls for a full day after a jump.

Starships also suffer a form of jump sickness. All electronic devices of any use on a starship, from digital watches to targeting computers, must be re-booted after a jump. All use of skills that requires advanced electronics will be at +4 difficulty on the starship turn after a ship completes a jump.

▼ **EXPERIENCE** - The adventurers in a **Fires of Heaven** campaign are inevitably going to gain experience points. When they do the gamemaster will have to delineate exactly how and when these points can be spent for various sorts of adjustments and improvements to the adventurer.

Attributes - This is the most obvious category. It is also the most expensive, and in the long run, the most useful, since an increase in an Attribute will affect the roll for all skills based on it. Just remember that increasing an Attribute costs five times the point difference between the current level and the new level.

EXAMPLE: Increasing a adventurer's Strength of 7 to a Strength of 8 costs 15 points.

Increasing Attributes can come from simple hard work (like Strength), but more often includes some sort of training program, or in the case of Fate, exposure to something like the Ethereal spores. A player who wants to increase an Attribute on their adventurer should let the gamemaster know well ahead of time. This lets the gamemaster work the process into the overall plot.

EXAMPLE: If a player says they are starting to collect points to increase their adventurer's Strength, then maybe they can meet someone or have an encounter while working out at a gym.

Skills - Another place to spend points to increase a hero's personal power is on skills. Unlike a broader space opera setting (where the single skill "Space vehicles" would tell an adventurer everything they need to know to run a starship), **Fires of Heaven** skills are more specialized, requiring a broad range if one wants to cover every element of starship operations, for example.

Along with obvious choices (e.g., combat abilities), players should be encouraged to select and improve skills that reflect the breadth of the setting: Science skills, Area Knowledges of different worlds visited, alien languages, cultural familiarities for alien cultures, etc. Often overlooked are mechanical and technological skills: with the amount of high-tech machinery in the **Fires of Heaven** setting, engineers are a viable adventurer type, and every adventurer is likely to find a use for some repair skill.

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Skills are something you learn by doing. Simply adventuring and using an existing skill is enough justification to spend points to improve it. Using a skill for the first time in a pressure situation (by using your unskilled Attribute roll) may be enough for the gamemaster to allow the player to put 1S into the skill as a specialized skill.

EXAMPLE: Jherri Takrit and friends had to steal an armored car and flee through the crowded streets of Magnor Prime after a military coup by the corrupt planetary officials they were trying to expose. Jherri had never fired a heavy weapon before, but she got lots of hands-on experience that day. The player puts 1S into the appropriate weapon skill, giving her a +0d roll for that *particular* heavy weapon. If the player chooses, Jherri can spend more points in *later* adventures to improve this to an overall +0d skill, now that she has actually had some real-world experience with it.

Of course, many skills can be learned by self-study or organized classes. If a player goes this route, the rate at which the adventurer can accumulate points should be no more than double the guidelines for training, even if the adventurer is not spending money on the training.

EXAMPLE: If the adventurer is only spending a bit of their spare time trying to pick up a new language, it is *not* reasonable for them to gain a +1d fluency (a cost of 10S) in a single month, even if the player has accumulated 10S in experience for that adventurer.

Powers - If an adventurer has a psi power, some applications for experience points are obvious: a psion can always improve their powers or raise new ones from latency, or a non-psi adventurer can find themselves infected by the psi-bringing Ethereal spore. Adventurers can also spend money to get or improve cybernetic enhancements. A gamemaster should take care to prevent the campaign from mutating into a super-psi or over-powered cyberpunk romp (unless that's the direction they specifically *want* the campaign to go).

Traits - The last way to improve an adventurer is to reduce their limitations or increase advantages. Some ways of doing this (e.g., altering the modifiers on a psion's powers) can have the consequences as purchasing new abilities, and should be watched just as carefully. Others can open up adventuring opportunities, such as an adventurer leaving the StarForces (buying off their service-related Traits) and finding themselves free to choose their own course without input from a chain of command.

While many Traits can be acquired or offset by spending points, some of them can "just happen". Aging would be an obvious example of this. The gamemaster can also introduce new Friends or Enemies, the actions of the adventurers might confer a change in Wealth or Status, an injury might cause a Weakness, or a drug or radiation effect might affect the adventurer's Personality. For Traits that are adventure side effects, adventurers neither gain nor spend points for these things to happen, though they may be able to spend points to modify them with gamemaster permission.

EXAMPLE: Adventurers are awarded the Order of Culain for services to the government of Tara, and the gamemaster says this is one very limited level of Status when dealing with the Tara government. One of the adventurers is from Tara, and the player thinks a bit more influence could be useful. The player wants to spend some experience to make their award two levels of Status, and the gamemaster agrees. During the award ceremony, that adventurer's status as a "native son" is proudly mentioned and gets a lot of media coverage, so that the adventurer has a bit more "name recognition" than the rest of the group. That adventurer now has a little more pull if they choose to use the Status conferred by the award.

Perks - Along with giving the adventurers points that can be spent in any way or the equivalent in Traits, there are also awards that the gamemaster gives toward a specific purpose. As the players are likely to spend their points on adventurer abilities, the gamemaster shouldn't make their own contribution to ability inflation. Instead, the gamemaster can concentrate on perks and things that can further the overall plot and the ability of the adventurers to get things done.

As a setting that focuses as much on personal interactions as laser firefights, people, places and things are there for the gamemaster and adventurers to use. Acquiring some military (but legal) hardware, a grateful shipping magnate giving some free travel passes (or even occasional use of a ship!), or simply knowing who to talk to on a certain planet when they need to "get things done", all these are highly valuable, but not something that you buy with points.

Money - The cash price of gear, bribes, and services is quite important. And some purchases aren't single-time affairs; firearms need ammunition, armor needs replenishment, license and docking fees must be paid regularly, and just about anything that can be bought can be upgraded.

An adventurer who has or can find steady employment can use their skill roll to generate income based on their proficiency, but far more often, adventurers are going to be "contract workers", getting paid by the day or by the service for a particular job. When the job is done, you're out of work and have to look for a new opportunity. Even independent starship operators are like this, going where the cargo is, and taking it where it is needed. The gamemaster and players should hash things out at the start of the campaign to make sure that everyone knows how income is likely to be generated. Having the adventurers work for or be part of some organization may impose some restrictions on the adventurers, but it also provides a safety net in terms of income. A StarForces Marine may not always be in combat, but they are always collecting a paycheck.

Vehicles - Just as every hero in a fantasy setting needs a horse, some gamemasters think they *must* give the adventurers a spaceship in order for them to function in a star-spanning science fiction setting. In a campaign centered around exploration or trade this might be true, but a gamemaster may want to consider reasons to restrict adventurer travel for other campaign types.

The **Fires of Heaven** setting isn't just about chasing smugglers through an asteroid belt, it's about a probe into the smuggler's activities on Shen Nung that leads to a tip directing the investigators to the correct asteroid to begin the chase. Each of the worlds of the United Worlds federation is just that: a world, a full-fledged setting suitable for adventures of its own. A multi-faceted campaign can continue for game-years without leaving the surface of a single world.

And if the adventurers have to wait a few weeks or a month for the next commercial flight before they can leave a planet, it gives the gamemaster an opportunity to confront the adventurers with the consequences of the actions they took while on the world. Of course, even if the adventurers do have a ship and think they can flit about, leaving chaos in their wake, it must be remembered that the United Worlds is a young confederation with only a few dozen human-inhabited worlds, and that information can travel as fast as starships; eventually their actions are bound to catch up with them.

But once the adventurers do get themselves into space, their ship becomes an easy place to sink experience. While they don't have to directly pay experience directly for the ship, buying it and keeping it supplied implies a certain credit balance. And with a starship comes a profusion of new abilities needed to operate it, or hired crew to provide these services. *A starship is a hole in space into which one pours money...*

▼ **Note** - Because of the high damage of modern weapons and the relative fragility of vehicles, for **Fires of Heaven** we suggest that weapons never do more Hits to a vehicle than their full dice of damage that penetrate Armor. So, a 5d+2 rifle hitting a vehicle with 1d+0 armor would do no more than 5 Hits or the vehicle's Damage Limit, whichever is lower.

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It is not in the stars to hold our destiny but in ourselves.

- William Shakespeare

▼ **AFTERWORD** - No one can say for certain what tomorrow holds. **Fires of Heaven** strives to present a reasonable, believable vision of the future, but it's not the only vision, and almost certainly not a *true* vision of what lies ahead for humankind. The real future of humanity will be more amazing, more unbelievable, and more wondrous than anyone alive today can imagine. We write our own futures, individually and collectively. Our choices build the universe our children will inherit. *It is up to us to make it a good one.*

Author's Notes - I began writing **Fires of Heaven** in February 1998 and completed the final draft in February 2000, with editing continuing through February 2001.

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This project could never have been completed without the assistance of many people who gave generously of their time and knowledge to help ensure its playability and technical accuracy. Thanks to Mark Arsenault, Rick Beymer, Anthony J. Bryant, Kate Casa, Amy Crittenden, Doug Garrett, Bob Greenwade, Bruce Harlick, Rex Hodge, Sara Hodge, Spike Y. Jones, Steve Kenson, Michelle Knight, Greg Lloyd, Steven S. Long, James Maliszewski, Matthew Mactyre, Shelley Chrystal Mactyre, Dave Mattingly, Michael Nunn, Steve Peterson, Greg Porter, and Tomas Skucas.

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"The Interstellar War was a choice between Insanity or Resignation. Either continue fighting with absolutely no chance of winning, or lay down and die."

- Edward Pernie, AP soldier/reporter during the Interstellar War

▼ **ANGELS ABOVE - Fires of Heaven** does not include a full set of adventures or detailed long-term plots. If the numerous adventure seeds, hints and 300 pages of background material have not given you some inspiration about where to start and where to go, another few pages aren't going to make a lot of difference.

But, we do recognize reality. Most player groups generate a diverse set of adventurers to cover as many situations as possible, and one of the more difficult tasks a gamemaster often faces is, "How do I plausibly get a group of adventurers who wouldn't normally be in the same room with each other to start risking their lives and fortunes as a team?" While we have made suggestions about having the gamemaster and players coordinate about where and how a campaign starts, there is no "roleplaying law" that adventurers have to start out in the same location and best of buddies; some of the best-loved teams in fiction and many roleplaying groups begin at the wrong end of several barrels. This short scenario gives plausible methods of dragging just about any **Fires of Heaven** adventurer into this story with a minimum of gamemaster manipulation.

Another question you will face is, "*The scenario ended. Now what?*" While it is likely your players will inadvertently suggest adventure seeds, the section "The Real Vorn Conspiracy" provides notes that you can expand into a continuing campaign. If the heroes succeed in stopping the inmates and you're not sure what to do next, 'drop a clue' and tell your players, "This seems like a good stopping point. Why don't we pick it up from here next time?"

A final note for new gamemasters: As stated in the Introduction, this setting book is the *foundation* for a science fiction roleplaying campaign. The appeal and 'magic' of roleplaying games is that you and your players will take this universe and shape it into a unique, vibrant, living story filled with characters and tales from your own imaginations.

The Angel of Mercy - This adventure takes place aboard the *Angel of Mercy* Medical Station. As noted on [page 2.12](#), the *UWS Angel of Mercy* hospital ship was the first non-construction ship to arrive at Eden via the jumpgate. The ship was not designed for planetary landing, and after the *Angel of Mercy* completed her medical mission, remaining orbital elements of the *UWS Argo* and *UWS Odyssey* were attached and the *Angel of Mercy* Medical Station was born. Most sections remained operational with very little modification, but a few were mothballed and have remained untouched for centuries.

For purposes of this adventure, all references to *Angel of Mercy* are to the *entire* station unless specifically noted.

The station consists of seven sections: Central Command, Power Supply, the United Worlds Center for Criminal Psychosocial Studies (or UWCCPS), Trauma, Short Term & Outpatient, Standard Term, and Long Term. The United Worlds Center for Criminal Psychosocial Studies is located near the center of the *Angel of Mercy* and is considered the most secure section of the station next to Central Control. The only section where guards carry lethal armaments other than the UWCCPS and Central Control is the Trauma Section (since every case requires immediate and extreme treatment and there might not be time for a thorough weapons search).

In order pay off some of the debt accumulated during the Interstellar War, the government of Eden sold the *Angel of Mercy* to Unicorp five years ago. Medical costs immediately doubled, and rumors are that Unicorp has almost recouped the purchase price. In reality, Unicorp has only recouped half of the purchase price after expenses. Eden significantly subsidized treatment costs when the station was in their possession and ran a much tighter operation than government critics would ever admit.

The Scenario in a Nutshell: A group of inmates breaks out of the UWCCPS and seizes control of the station. The inmates are led by three veterans of the Interstellar war who believe the United Worlds government has been infiltrated by Vorn spies. There may or may not be a grain of truth to this. (see [Non-Player Extras](#) for details about the leaders and [The Real Vorn Conspiracy](#) if you want to have a cloak-and-dagger component to your game.)

The escaped inmates slaughter their way to the command deck in Central Control. They activate all of the emergency bulkheads in the station before transmitting their manifesto to Eden Beanstalk. The escapees hope to fire up the ship's ancient engines and guide the ship to the nearby jumpgate, which they think leads to the secret Vorn home world. The prisoners believe they can deliver a "killing blow" to the enemy by ramming the planet with the Angel of Mercy. If this sounds totally implausible, remember that they are mental patients. Unfortunately the hull sections added onto the original spaceship were never designed to handle such acceleration forces, and some will detach from the ship with probable loss of life.

Timeline: This is the timeline of events that would unfold if the adventurers were *not* involved with the mission. With the adventurers, many of these same events will unfold, and they will have to work with these events, around these events, or in some cases, prevent these events.

- 2 wks Bob creates his "Victory Plan" and enlists a large number other inmates to help. Part of the plan is involves small 'incidents' to get UWCCPS personnel to trigger more local alarms than usual and implement a "Boy Who Cried Wolf" reaction from the regular station security personnel.
- 0:00:00 "Victory Plan" begins.
- 0:15:00 Escapees secure all of UWCCPS (ie. they kill all the station personnel currently on duty) without triggering a full station alarm. The Angel of Mercy command and security crew doesn't pay much attention to the local security alarms in UWCCPS.
- 0:28:00 Station alarm is triggered as escapees are finally spotted on a security camera in the corridor leading to the "bridge." The Angel's command center is in the exact middle of the ship.
- 0:30:00 Station Commander begins to issue a distress call when he realizes the inmates appear to have some way of "hacking" the security blast door controls. Escapees break into the bridge a moment later. The inmates quickly kill all station personnel on the bridge.
- 0:30:25 Bob appears on holocast with his manifesto. Escapees manage to 'lock down' the different sections of the ship using secure bulkhead doors.

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- 0:35:00 The first attempt to start the Angel of Mercy's engines fails. The engine's power cores produce energy surges through the station's power system that disable most internal and external sensors along with a scattering of other systems.
- 0:50:00 Several StarForce Marine shuttles debark from Eden Beanstalk on an intercept course. One is a brand new assault & board model with stealth capabilities, specifically designed for assaulting large spacecraft/stations.
- 1:15:00 Bob and other escapees manage to get external radar back online along with a few internal sensors. He freaks out when they detect the approaching shuttles (other than the stealth model.)
- 1:17:00 Bob convinces the other escapees that those trapped in one of the sections (gamemaster's choice) are actually all Vorn agents sent to disrupt his plan. While the approaching shuttlecraft appear to be of human manufacture, Bob knows that they are secretly filled with crack Vorn shock troops sent to assist the Vorn agents stuck in the station section. The escapees manage to override safety protocols and space the entire station section.
- 2:45:00 Assault shuttles enter the range of the Angel of Mercy's defensive grid. How many shuttles survive this encounter is up to the GM, and if any of the non-stealth shuttle survive, assume their weapons manage to destroy the Angel of Mercy's exterior defense grid. The stealth shuttle manages to get through undetected.
- 2:46:00 Surviving assault shuttles latch onto the Angel of Mercy and begin infiltration of the UWCCPS. "Security Teams" of armed inmates set up by Bob manage to put up a spirited, if mostly futile, fight.
- 2:55:00 Assault Marines make their way out of the UWCCPS into the command area. They manage to isolate the other sections of the ship away from the command center, thus preventing the inmates from directly affecting the remaining patients and staff (other than those in the power center.)

- 3:00:00 Assault Marines are at the door to the command center, preparing to enter. Escapees manage to start up the ancient engines and the station begins to debark from orbit. One attached section is instantly ripped off and the other attached sections appear headed to that same fate. Marines are given the order "Shut down the engines immediately. There is no time to take prisoners."
- 3:01:00 Assault Marines burst into the command bridge and kill all inmates on the bridge. An additional attached section and parts of the complementary core section separate from the Angel of Mercy.
- 3:02:00 Assault Marines take over the control center. The power core/engine the entire engine section (including the station's normal power generator) is jettisoned. The station is now on backup power.
- 3:05:00 The last of the compromised sections is sealed off. Casualty totals are: 100 crew, 100-150 patients, and all 150 of the UWCCPS inmates.
- 3:15:00 The StarForces cruiser Protector intercepts the jettisoned engine core and begins to pull the still-dangerous material out into deep space. The section is deemed too dangerous to salvage and destroyed a week later.
- 3:18:00 The StarForces gunboat OnTarget and the frigate Aegis latch onto the broken-away sections and manage to rescue seventy patients and crew who survived in bulkhead sections that retained integrity.
- 3:45:00 Three StarForces cruisers intercept the Angel of Mercy. Survivors who are mobile are transferred off the ship and cruiser power is hooked into the Angel of Mercy's system to keep life support operational. The station is now in a slightly higher orbit, but otherwise now out of danger. Two of the cruisers will remain attached to the Angel of Mercy until a new power system arrives.
- +3 mo. The new power and station-keeping system is installed and activated. Unicorp lays off 85,000 personnel to defray the costs of this 'incident.'

Non-Player Extras of Note: Inmates

Robert (Bob) Merced: Bob was a chaplain & medic during the Interstellar War. He was the sole survivor of not one, but two encounters with the Vorn. Upon arriving home, Bob appeared free of heavy post-traumatic stress, only demonstrating signs of a few minor conditions for which there had been effective treatments for more than a century. His therapist thought things were going rather well.

The first person to disappear was the UW Veteran's Bureau tax auditor. Two days later, Bob's therapist wasn't answering his emergency number. The police put him on a short list of five suspects, but the top two suspects were patients of that therapist and had recently been listed as having "Multiple Extreme Post-Traumatic Issues."

The detectives realized their error the third day when Bob lost all semblance of sanity and gunned down an unfortunate cable repair man in broad daylight. The repair man rang the wrong doorbell. It took a SWAT team, tear gas, tranq darts, and two anti-personnel nets to subdue Bob.

Bob claimed the war wasn't over; the Vorn had changed tactics to a "war of infiltration and espionage" against the United Worlds military/ industrial complex. Veterans would be the best able to recognize signs of their activities, so they were being summarily re-programmed or eliminated. To Bob's warped perceptions, anyone who posed any sort of difficulty or wanted to delve too much into his life was a Vorn agent (such as the mistaken repair man who simply asked to go into Bob's apartment).

The judge in the trial sentenced him to a three life sentences, with initial incarceration at the UWCCPS for treatment until such time as he would not be an immediate threat to himself and others.

Fredrick Mumumar: Fred is a veteran of the Interstellar Wars and the former commander of the Eden Beanstalk Station. He attempted suicide eight years ago after a long string of terrible personal tragedies. While his old security codes are useless, he will be able to accurately predict the course of action taken by local StarForces personnel, and he is the one who knew how to quickly take over complete control of the station. Fred helped formulate the current contingency protocols regarding emergencies aboard the Angel of Mercy. Most of the time he is paralyzed from action by self-doubt and general depression, but he is very open to suggestions and will immediately commit to just about anything for someone he feels to be a "real friend" (of course, Fred thinks of Bob as "my best buddy").

Louis Asherton: Louie is the youngest of Bob's core followers. He looks healthy and psychologically stable most of the time, if a bit meek and self-condescending. In fact, Louie is actually a hyper-aggressive person who sublimates all aggression into a secondary sub-personality ("Mr. Mean"). When the personality of "Louie" is in control, he wouldn't harm an insect. At different intervals, however, "Mr. Mean" takes over: Lois Asherton secretly killed fifty people in cold blood before detectives could crack the serial murder case. The breakout is a particularly stressful situation for Louie.

Non-Player Extras of Note: Station Crew

Samantha Prasha, Assistant Engineer: One of the first things the escapees do after taking over Central Control is lock all of the personnel cabins in the section. Samantha (Sam) will be stuck in her room pounding on her door until the adventurers or StarForces marines rescue her; the marines will have Sam don her emergency space suit and guide them to Central Control (each crew quarter in the Command Center locks airtight and is equipped with an e-suit). While Sam can provide a lot of technical and navigation support, she has zero combat training and will freeze or flee combat.

Dr. Ernie Kryzyci, Trauma Surgeon: Ernie was on break from his rounds at the Trauma Center when bad things started to happen. While he will not kill the inmates, he is more than willing to use a tranquilizer. Ernie will tag along with the adventurers if asked; bring Ernie into the game if none of the adventurers has adequate medical skills.

Special Note: Depending on "the truth", Ernie may or may not be an unwitting Vorn informant. If he is an agent, Ernie will load up a tranquilizer with a cocktail of drugs that will induce almost total and permanent amnesia in addition to knocking out the target for up to 24 hours.

Joshua Ringi, Security Guard: Being a security guard in the Trauma section has its moments. While not a battle-hardened veteran, Joshua has been in enough scraps, including some involving potentially-lethal weapons, to be a capable combatant. He is not a thrill-seeker, but he recognizes that the current situation will probably require direct action in order to resolve it.

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Non-Player Extras of Note: StarForces

Corporal Egor Nuevon, StarForces Marine: Egor is the second in command of the assault squad in the "stealth" shuttle and will take point as often as possible. Most of his friends consider it a minor miracle that Egor survived long enough to enlist in the Marines. A speed-freak and thrill-seeker of the highest order, Egor enlisted with a longer medical history of broken bones and blood transfusions than most of the veterans on their way out of the service. Egor's non-combat marine job is test pilot/gunner for new star fighters and weapons systems undergoing final field trials at Eden.

Major Samuel Bunkrett, Star Forces Marine: Sam leads the assault squad and is normally in charge of Weapons Approval at Eden Beanstalk. Samuel is a native of Eden and secretly a supporter of greater planetary self-security and sovereignty. He is not an advocate of a violent breakaway; Sam is a student of human history and understands that internal strife between "states" and a larger federal government are disturbingly common. Major Bunkrett is extremely good at "thinking on his toes," which is why Commander Lee assigned him to the mission.

Special Note: Depending on "the truth", Major Bunkrett may or may not be an unwitting Vorn agent. If he is, then he will attempt to force the situation to justify killing all of the inmates.

Vice-Admiral Quan Lee, StarForces Navy, Head of Eden Beanstalk: The StarForces alternate military command of Eden Beanstalk between the Marines and Navy. Vice-Admiral Quan Lee is a twenty-five year veteran of the service and was first in his class. Admiral Lee is a tough but friendly commander who keeps his staff at a high level of proficiency without resorting to overbearing management. While he has considerable ship-to-ship combat experience and training in marine tactics, Admiral Lee has never been in an actual hand-to-hand combat situation.

▼ **Note** - All of these extras are in the competence range of starting adventurers. The gamemaster can simply choose from the adventurer templates to get their stats. In fact, adventurers who fit these roles could actually take the places of these extras!

EABA

Weapon Availability - Security Personnel in all sections but Central Command and the Trauma Unit are armed only with tranquilizer guns and stun sticks. All of the lethal weapons in Central Command will be in the hands of the escapees at the start of this scenario. There are a total of a half a dozen laser pistols in the Trauma Center; the four security guards on duty will stay in their section (unless you want to play Joshua as a friendly NPC combatant) and not hand over their own weapons, but the adventurers should eventually be able to convince the guards to give them the remainder, particularly once it becomes apparent that the station is now under the control of mental inmates trying to restart the engines. How much personal armament the player characters have on-hand is entirely up to how you want to run the scenario.

Angel of Mercy Orbital Hospital - The original Angel of Mercy interstellar hospital ship comprises the core of the overall station. Sections added over the course of the years make up the remainder. Built before artificial gravity became available, the original hull was designed for spin gravity, and most of the additional sections are also spin gravity. Some medical work is still done in the zero gravity core of the station, as it makes it easier for patients in regen tanks or with severe cardiac problems, but most of the core has been refitted with .5g gravity plating which can be turned on or off as needed. If or when main power is lost, this will turn off. Bob will probably spin down the hospital to zero-g before trying to light the engines, but he might spin it back up to make boarding more difficult once he detects the incoming shuttles.

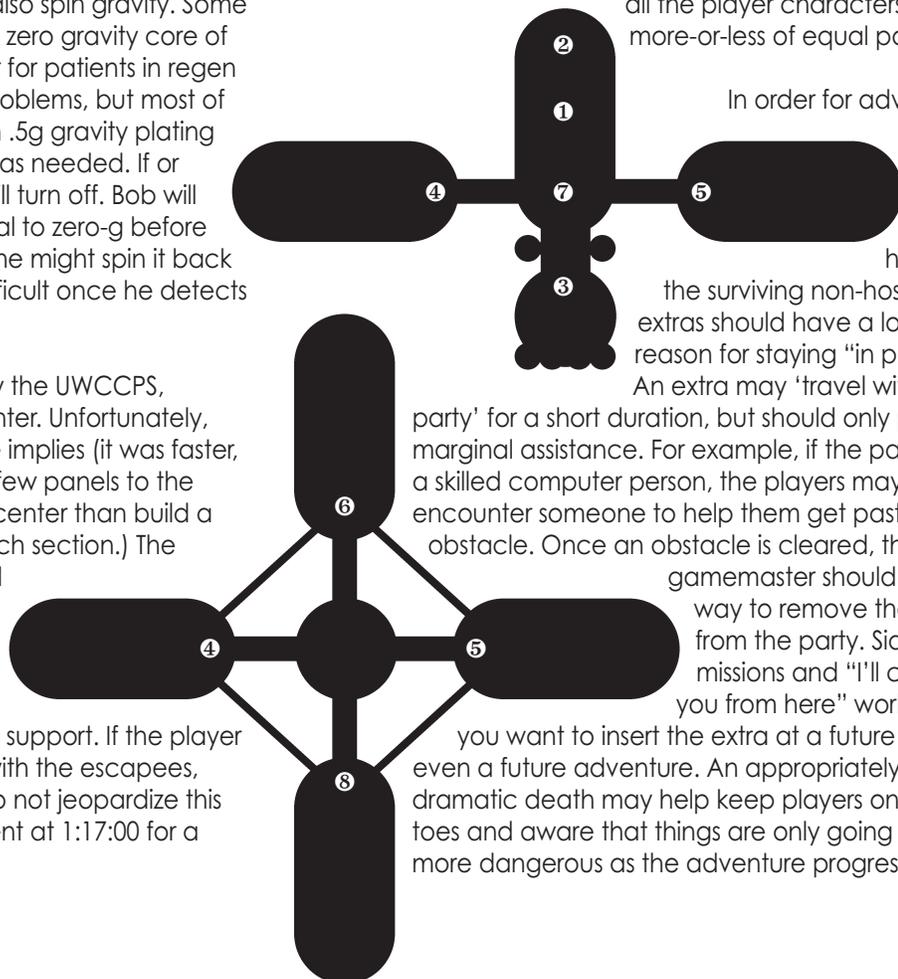
The escapees only occupy the UWCCPS, command, and the power center. Unfortunately, command is just what its name implies (it was faster, easier, and cheaper to add a few panels to the UWS Angel of Mercy's control center than build a separate control center for each section.) The sections have all been "locked down." The escapees initially believe that the patients and staff of those sections are in reality *their* "assault troops" and do not try to sabotage life support. If the player characters establish contact with the escapees, they need to be very careful to not jeopardize this illusion (check the Timeline event at 1:17:00 for a worst case scenario.)

All of the therapists at the UWCCPS are killed at the beginning of this scenario. Computerized notes and records are physically destroyed. If the party is having a particularly difficult time dealing with the escapees, let them uncover some shreds of the remaining hardcopy notes (printed or handwritten.) Players who took any psychology, negotiation or leadership skill might provide a useful benefit. On the other hand, they need to be very careful about how they use it. After all, the psychotherapists on the station were the first to be killed...

Even one correctly played hacker adventurer has the ability to become very powerful in this environment (almost everything is computer controlled, outside is deadly vacuum). On the other hand, this very scenario is unlikely simply because it is possible. To prevent this sort of computerized disaster, airlocks typically have mechanical locks that prevent both doors from being open at the same time. When a ship needs to be depressurized, the crew have to manually disengage these locks.

There are a lot a innocent extras who can provide very effective pawns for the baddies to control hacker player characters as the crazed inmates try and open various compartments to vacuum. The gist is to make sure that all the player characters are more-or-less of equal power.

In order for adventurers to play the part of the heroes, the surviving non-hostile extras should have a logical reason for staying "in place." An extra may 'travel with the party' for a short duration, but should only provide marginal assistance. For example, if the party lacks a skilled computer person, the players may encounter someone to help them get past an obstacle. Once an obstacle is cleared, the gamemaster should find a way to remove the extra from the party. Side missions and "I'll cover you from here" work well if you want to insert the extra at a future time or even a future adventure. An appropriately dramatic death may help keep players on their toes and aware that things are only going to get more dangerous as the adventure progresses.



The Angel of Mercy Orbital Hospital has several sections, not all of which are directly connected to each other. Most are adjacent to the Trauma center, and others connect by structural crawlways that are normally both physically and electronically locked. The spin-gravity outer sections are connected to the center by an air-tight hub that allows the main hull to remain stationary, allowing for easier docking at the blisters below the trauma center. Each spin section has a docking port on its tip, and the front of the main hull also has a docking port so that dangerous mental patients can be debarked directly into the CCPS. The main hull has a diameter of about 25 meters and each of the numerous decks has a useful area of about 400 square meters. Access between decks is by a central elevator, and a surrounding spiral stair. Original ladder access tubes are still in place, but locked and alarmed.

1. Command Center(25 Staff): Located at the core of the station, the Command Center oversees the non-medical operations of the station. Access corridors and tubes directly connect the Command Center with most of the other station sections.

Each critical staff member has his/her own office/cabin at the perimeter of this section, with its own life support for an emergency situation. Several crew members will be trapped in their rooms during the scenario; the crew members trapped in their room would have been able to take control of the station if the inmates had not taken over the bridge as quickly as they did utilizing Fredrick Mumumar's intimate knowledge of station systems.

2. Center for Criminal Psychosocial Studies(150 patients/50 staff): Located directly above the Command Center, this section was refitted with considerable security to contain all but the most dangerous mentally insane criminals. Every room patients normally occupy have airtight seals and knockout gas dispensers (the first area the escapees secure is the CCPS security room.) Unfortunately, the designers of the CCPS did not anticipate that a former commander of the Eden Beanstalk would one day end up an inmate.

Psions screen everyone slated for time at the CCPS to weed out those who attempt to avoid time in a regular prison from those who really are insane. Each screener is limited in the number of scans they can do over their career to minimize the effect of peering into dangerously unbalanced minds and is regularly screened by other psions who themselves never screen actual convicts.

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3. Power center (including Engines)(6 Staff):

Located aft of the Command center, this section is normally a pretty quiet place. The underutilized fission systems are highly reliable and only require normal maintenance and refueling. Other than slight numerical variations, the past ninety-five days of the engineering log are identical. Staff here includes the legal minimum number of reactor-qualified engineers and a handful of trainees trying to get certified.

Station engineers in this area manage to stop the first attempt to restart the engines. Bob sends a "team" of escapees into this section to "secure the area from the evil Vorn operatives!" Several of the engineers manage to escape capture/murder and continue to delay the engine restart.

The power center is filled with potentially deadly techno-babble and would make an interesting "fall-back of last resort" for the leaders of the escapees. There should simply be too much firepower on the player's side to lead to inevitable victory, however, dice can do odd things (the escapees may luck out and "punch through" the assault.) There is always the chance that the adventurers might drive/trick the escapees from the bridge before the squad if they aren't playing StarForces personnel.

The important thing to remember is that the main engines have not been brought up to full power for decades, if not centuries. They are warmed up to a few percent of their rating when stationkeeping maneuvers need to be done, but this is not even enough to disassociate the reaction mass into hydrogen and oxygen. The main engines still work. *Theoretically*. But whether or not they catastrophically fail if brought up to full power is not a matter of if, but of when.

4. Long Term and Antigeria Treatments(50-60 patients/30 staff): Not surprisingly, this newest and rather posh section of the Angel of Mercy caters exclusively to wealthy patients. In addition to normal hospital procedures, this module offers a Desaix-licensed subset of antigeria treatments, and an excellent hospice for those with money and incurable conditions. While this section has an independent life support system (one would never dare suggest that the ultra-wealthy breathe the same air as everyone else), it does rely on central station power.

5. Short Term/Elective Surgery(150-200 patients/30 staff): Short Term Treatment and Elective Surgery is the most crowded area of the station and where most surgeries take place. Angel of Mercy is the place where anyone in orbit who needs medical care goes to. A trip down a beanstalk takes time, and trips from orbit to the ground are not the sort of thing you want to do if you are injured. In addition, a microgravity environment has certain advantages and many spacers simply prefer to stay in space.

While every common medical procedure is performed here, they naturally specialize in those operations that most benefit from a microgravity environment. Approximately two-thirds of surgeries are out-patient, while the rest require between 12 and 24 hours of on-site recuperation. This section will be evacuated after the trauma and long term sections.

6. Medium Term Treatment (75-100 patients/40 staff): When people refer to the Angel of Mercy as a "space hospital," most envision this area. Some treatments and injuries still require weeks or even months of recovery time. While orbital ambulances can ferry most patients once they stabilize, that is not always an option. The section only has two operating rooms: most surgeries are performed in Short Term and patients moved to Medium Term.

7. Trauma ward(20-50 patients/50 staff): Located below the Command Center, the Trauma Ward was originally a mirror of the CCPS and was formerly the Medium Term Treatment section. During the Interstellar War, the Angel of Mercy's trauma capabilities were greatly expanded and this entire area was converted to handle the most extreme injuries treatable by current medical technology.

Core life support and emergency power systems are in the level beneath this one, but ahead of the connector to the power center. In the original ship, this would have been the "radiation bunker" in the event of severe solar activity, interposing the engine and reactor mass between the crew and any radiation sources. These emergency bunks have been removed and are now used for non-critical medical supplies (gloves, gowns, etc.).

8. Staff quarters: If you have a job on an orbital facility, you usually do not commute there. There are fairly spacious quarters in this module, with size proportional to pay grade. It also includes exercise facilities, day care and other amenities.

Adventurer rationales - These are some possible ways to involve your group of adventurers in this scenario. The adventurer's level of initial armament and location will most likely determine their first course of action(s). An alternate title to this subsection might be "101 Ways to Use Grenades as Plot Devices."

Currently-Active StarForces Soldier (Pilot or Marine): A Full Emergency alarm arrives at Eden StarForce HQ. The holoscreen goes blank for a few seconds, then the image of the Angel of Mercy's commander is replaced by a man wearing very bloody psychological patient garb. "We have removed the Vorn infiltrators from this ship. Assault on the Vorn homeworld will begin the instant we resurrect the engines of this once proud and mighty warship!"

Professional Assistance, Charged By the Hour: The Angel of Mercy is owned and operated by Unicorp. Unicorp does not like people taking things of theirs and wants it back. Your employer, Mr. Smith, was contacted by "Unicorp officials" approximately 10 minutes after the prisoners took over the ship. Your team just wrapped up a simple task at Eden Beanstalk Station and is the closest squad in the area. Smith has arranged for you to accompany a few StarForces marines on a very fast assault shuttle that departs in 15 minutes.

I Have the Discharge Papers in My Hand: Your last job was a success, but things didn't go as smoothly as planned. It finally doesn't hurt to move, and the doctors assure you that the scars will completely disappear within a month as long as you use the ointment every day. Or...you and your buddies in basic training thought the live grenade training started *next* week. The other guys have already returned to training and assure you the drill sergeant has a most evil gleam in his eye when your name is mentioned.

The Veteran: When philosophers invoke the concept of "immovable objects" in their arguments, they are really referring to bureaucracies. You were filling out the fifth and final page of form X3-543A (Request for a 100 count bottle of asprolin) when you heard screams over the ship intercom system. You *hope* the screams are coming from the legal department.

Just Visiting: Your buddy, Gerald McClumski, has a few more days of regeneration to go after having accidentally dropped that live grenade. Unfortunately, Gerald isn't that mobile yet and won't be able to help you. You're optimistic you might actually get through this without ending up like Gerald. If you want to make it more difficult for the players, the escapees depressurized the entry area where security was holding your weapons.

Rip Van Popsicle: You signed up as one of the colonists on board the *UWS Odyssey*. You were never revived because of a malfunction in your pod, causing tissue damage that was irreversible at the time. Recent medical advances have allowed the Angel of Mercy to repair this damage. When the escapees were starting their rampage, you were just being detanked, waking to find yourself someplace *far* different than you expected. It is possible the entire group of adventurers could be in this condition. Having nothing tying them to any one particular world, and having only each other as friends or contacts, they have a natural reason to stay together. Plus, their accumulated pay, assets, pensions or other settlements might be sufficient for a passable quality starship as a "gimme" from the gamemaster. Particularly if they do well in this scenario and save some grateful and very wealthy person in the antigeria module...

The Real Vorn Conspiracy - While the escapees are not "playing with a full deck", there is a glimmer of truth to their rantings about Vorn spies.

The Vorn abruptly ceased major operations against the United Worlds because the UW failed to provide either new technology nor enough of a challenge for "evolutionary culling". This does not mean the Vorn have gone away. They continue to test the UW with the hope that mankind and its allies will one day provide a worthy opponent. This monitoring includes overt skirmishes as well as more traditional methods of espionage. The Vorn obviously cannot be *actual* spies, nor can they directly be spy handlers because of the language and culture barriers. But, Vorn are well-versed in intrigue. The females just usually employ it among each other.

During the Interstellar War, the Vorn captured a number of prisoners. Most were quickly disposed of, either being used to test the physical limits of human (and other) biology, or after using this knowledge of limits to acquire tactical or strategic information. However, some were kept alive to observe alien social interactions.

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After the war, these individuals were coerced to contact one or more hidden squatter colonies in the guise of a hitherto unknown alien race, one which desired to remain hidden... because of the Vorn. In exchange for tidbits of other alien tech the Vorn had picked up over the centuries, these squatter colonies acted as go-betweens to the organized crime syndicates that invariably end up as the major suppliers for squatter colonies. With layers of intermediaries and a supply of U.W. credits, the Vorn could then hire people to do things for them. Slow and inefficient, but it does give them the ability to peer deeper into the U.W. than anyone expects.

The basic scenario as written assumes that no *actual* Vorn operatives get involved in the events that transpire. If you want active Vorn spies in this module, then here are a few starting points that would be easy to expand and "flesh out":

There are two Vorn spies in this module. Dr. Ernie Kryzyci works at the Angel of Mercy station and reports on medical technology and potential psychic developments. Maj. Samuel Bunkrett keeps track of StarForces Marine weapons development at Eden Beanstalk. Neither is aware of the existence of the other and both do not know the true identity of their 'employer.' Ernie believes he works for United Worlds intelligence, and Major Bunkrett has been led to believe that he is supporting an Eden self-defense movement called "HomeBase."

The spies have a mutual handler, Z. Z does not know of the aliens, but suspects their existence. He, like his employer, has no idea they actually work for the Vorn. Z's primary mission is to monitor planetary and in-system communications using alien tech to filter through the huge amount of data, and pass certain bits higher up the chain. Z panics when the inmates announce their manifesto, as some of the information in it includes data, worlds or coordinates that Z is supposed to be looking for, and if probed, might uncover some of the activity Z's employers are involved in. Without checking to see if the threat was in any way credible, he separately contacts Ernie & Bunkrett, telling each of them that one of the inmates "has somehow stumbled across info that, if allowed out, would expose your activities and several members of the organization". This story will actually appear to 'hold water' because Z luckily chose Fredrick Mumumar as the patsy. His previous position as the commander of Eden Beanstalk Station means he had a higher security clearance than either Ernie or Major Bunkrett.

▼ **EDITOR'S RECOMMENDATION** - The editor would like to recommend the general-interest gaming APA **Alarums & Excursions** to all readers of this product. Many interesting people (including the editor and author of **Fires of Heaven**) write regularly in this amateur 'zine, and more readers (and writers) are always welcome. For more information about **A&E**, go to <http://theStarport.com/xeno/aande.html>.

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Outland

Star Trek series

Star Wars series

Total Recall

2001: A Space Odyssey

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Babylon 5

Space: Above and Beyond

Star Trek

Star Trek: The Next Generation

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Firefly

Farscape

Other - In addition to all of these, there are countless blogs, web pages and references dealing with science fiction, real science, theoretical science, gadgets, gizmos, aliens, online campaigns and an ever-increasing number of topics that could and should be of interest to a **Fires of Heaven** gamemaster or player. Odds are that you already follow one or more of them. In addition, **Fires of Heaven** is about the people of this universe. The tech is just trappings and the alien worlds are just locations. The real-world human concerns that you see on the news are seeds for adventures and conflict in the 23rd century just as much as they are now. While the **Fires of Heaven** universe has muted some of humanity's worst excesses, the shadows of racism and nationalism still exist as xenophobia and planetary independence movements. There are still terrorists, and conflicts of belief, natural disasters that bring out the best and worst in people, and power that continually tries and too-often succeeds in corrupting those who think to master it. If you run short on ideas, just pick up the newspaper...



GEAR



Suspect was found in possession of a concealed Ares F2 laser pistol. When asked for documentation showing legitimate ownership, suspect said: "Registration? I ain't got no registration. I won it in a card game." Inquiries about previous owner were equally uninformative. Quote: "The previous owner? He won a blaster shot to the vitals."

*- Police transcript, Centauri Metals
Outpost 3, 2237CE*

▼ **INTRODUCTION - Fires of Heaven** is a space opera setting, and space opera is cluttered with gadgets. Not just adventure-driving übergadgets like some mythical gizmo from long-dead alien civilizations, or the slightly more accessible Vorn tidbits scattered about, but the technology that is the nuts and bolts of daily life, whether that life is the mundane one of the ordinary person, or the fast-paced, dangerous life that adventurers seem to lead. **Fires of Heaven** is space opera, and that means to some extent, the tech is designed to give a feel for the gameworld. Much of the tech is not as advanced as it might be, some of it may be more advanced. It is supposed to be a dangerous world, but also a survivable one. There are lots of special effects and gimmicks and tricks that mean different gadgets, weapons or armors will each have their strengths and weaknesses in certain situations. Remember that any given manufacturer of an item probably makes dozens of variants. *This gear list barely scratches the surface of what is available.*

▼ **WEAPONS AND ARMOR** - Most 23rd century weapons are only a bit more deadly than their 20th-century counterparts. Rather than boosting the already-high lethality of armaments, scientific advances have produced lighter, more compact weapons with larger magazines, higher rates of fire, and enhanced reliability. Not only do weapons need to work in the normal combat environment of bearable hot, cold, wet, dry and dusty, they now need to work in the vacuum and temperature extremes of outer space. Likewise, advances in metallurgy and other material sciences have made armors lighter and less expensive than 20th-century protective gear - providing comparable defenses against attacks but in more convenient packages.

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This does not mean there are not heinously powerful handheld weapons out there. There are enough genuine and spurious reasons for people to want überpistols or superheavy rifles, and firms are more than happy to meet the specialized desires of bounty hunters, ultra-big game hunters and assorted weapon fetishists. But for the most part, the average person will use the average weapon, for reasons of cost and reliability, if nothing else.

Availability of Equipment - The U.W. and its member worlds regulate sales of certain gear (especially weapons), primarily for public safety reasons. Four broad classifications define the availability of equipment through legal (and illegal) channels.

Open⁰ means there are no U.W. limits on ownership of the item, although there may be planetary or local restrictions placed on it. For instance, a particular item or weapon might be "open", but prohibited on a certain world because it conflicts with a local industry making the same type of item. Government buildings prohibit almost all weapons, and may have restrictions on recording or communication equipment. Private buildings or vessels can set arbitrary guidelines on what is and isn't allowed, and only possession of the item as part of a U.W. government job can override this.

EXAMPLE: Stunners might be an open item, but a commercial suborbital shuttle can still ban them from coming aboard except in checked luggage. A U.W. marshal could still carry one on board, however.

While ownership of open items is not limited, public carrying of the item may be counted as restricted. For instance, you might be able to buy a stunner at a department store, and use it as a home defense weapon, but carrying it around with you on the street may be a minor legal infraction unless you have a permit to do so.

Restricted¹ equipment is legal, but requires a permit to purchase and possess. Permits are usually fairly easy to obtain, however, as long as the applicant has a valid reason for needing the equipment in question and has no criminal record that would involve the item (violent crimes for weapons, hacking convictions for advanced computers, and so on). Some items are restricted because the federation government wishes to control their use, while in other cases safety permits are required for potentially dangerous gear.

Permits issued by the U.W. are good throughout the federation, and generally cost about half a percent of the assessed value of the item. Permits will be good for anywhere from one to five years, depending on the item.

Restricted permits are also often required for use of an open item in certain circumstances. An aircar might require a special permit to use a particular traffic lane, or a bounty hunter might need a permit to carry an otherwise open-class weapon (since it is more likely to be used, a background check is done, etc.).

All Progenitor artifacts are restricted items, and sale or transfer of them requires appropriate forms and registration numbers for the artifact in question. Similarly, all sites with Progenitor ruins are restricted areas and may only be visited once proper permits have been procured.

Military² equipment is used by the StarForces and planetary defense forces. It cannot be sold to civilians. However, if it comes into your possession legally, it counts as a restricted item. People have built old starfighters out of several scrapped units, for instance. If the U.W. sold the old ones for scrap after cutting them in half or using them for target practice, it wasn't illegal for you to buy and reassemble the pieces. However, the restricted permits will be based on the new price of the equipment or weapon.

Illegal³ equipment has been outlawed entirely. Civilians are simply not allowed to own or possess the item under any circumstances. Nerve gas, bioweapons, atomic weapons, mutagenic agents, mindwipers, and so on. Even being associated indirectly with such equipment can possibly get you busted on a conspiracy or accessory charge, and it would be a permanent red flag in your official record that would pop up anytime the government makes a background check on you.

All Vorn technology is illegal. Anyone who finds any is expected to leave it in place and notify the nearest StarForces vessel (a reasonable finder's fee is paid). The only exception in the law is if the item is in immediate danger of being destroyed, in which case possession is allowed just long enough to turn it over to the nearest StarForces vessel or U.W. Marshall's office.

▼ **MELEE WEAPONS** - Many hand weapons are still used in the United Worlds, ranging from knives and modern versions of other venerable combat favorites to more recent innovations, such as the stun rod.

Knives - A standard in hand-to-hand combats, modern knives are lighter and stronger than their forebears but have changed little in design. Advanced alloys permit creation of blades capable of holding a razor-sharp edge for years, though using them to cut advanced materials will dull them as readily as less advanced materials would dull an archaic knife.

Combat Knife - A polysteel blade designed specifically for hand-to-hand fighting, the combat knife comes in many styles. Military, commercial, and cultural variations (such as the Japanese *tanto*), are available. Aside from slight concealability or mass differences, they are all about the same in use.

Survival Knife - A blade with a hollow hilt that holds wilderness survival gear, the survival knife comes in both military-issue and commercial versions. The hilt typically contains fishhooks, line, a few water purification tablets, a small compass, a wire saw, and firestarting equipment. It is good for a -1 to the difficulty of most Scrounging rolls related to wilderness survival, but it is a bit larger and less concealable than a combat knife.

Nanowire Weapons - Products of 23rd-century metallurgy, a monofilament consists of a several, long ceramic nanotubes wound into a cable a fraction of the diameter of a human hair. Very thin, very strong, very sharp, and near invisible, nanowires have obvious applications in hand armaments. Most armors are inappropriate against attacks from a nanowire weapons (reduce armor by 1d). Since nanowires by themselves are very small, they can readily get past sensors and most physical searches, and improvised weapons can be made using the nanowire at some later time. Police and military hand-held body scanners can pick up concealed nanowires, but most building and spaceport walk-through scanners will not.

Nanowire Garrote - Favored by some assassins, a nanowire garrote consists of a length of nanowire strung between two grips. While its use mimics that of a traditional garrote, a nanowire garrote kills not by strangulation but by cutting major neck arteries and the windpipe. Used with sufficient force, a monowire garrote can decapitate victims.

Nanowire Knife - A nanowire knife consists of a nanowire cable suspended in a handled metal bow like a hacksaw blade. Most nanowire knives are intended as household or outdoor tools. Since a nanowire blade has no point, it can only be used for slashing or cutting, not stabbing, and cannot be thrown effectively. Still, despite being nick-named "cheese-slicers", nanowire knives can be deadly if pressed into combat use. An illegal configuration is known as the "cheese-slicer", and is three or four nanowires arranged around a central support, so that any slicing motion will bring one or more of the nanowires into contact with the target of the attack.

Nanowire Whip - Holodramas notwithstanding, nanowires do not make good whips, even with weighted tips. While insanely sharp, they do not have much mass and usually leave shallow cuts unless the wire is under tension.

Stun Rods - Stun rods deliver an electric jolt tuned to the nervous system of most lifeforms, capable of dazing foes or even knocking them unconscious. Targets suffer no long-term injury, however. The rods are built on the same principle as electrostatic stunners and, like stunners, are less effective against metal or metal-lined armors (increase armor by 1d), but tend to ignore thin or fabric-based armors (decrease their armor by 1d).

Stun rods are standard issue for police forces on many worlds, and are also favored by animal control personnel and colonists on worlds with hostile lifeforms. On the commercial market, stun rods appeal to those seeking non-lethal options for personal defense. They are legal to carry on most worlds, even those that ban firearms and other weapons.

A stun rod consists of one or more super-conducting coils, which hold the energy used to power the rod, a grip, and a metal rod that carries the charge to the target when the weapon is activated. Built-in safety devices prevent the rod from being triggered accidentally while being carried.

Stun rods are non-lethal energy attack. Since they injure foes with an energy discharge rather than brute force, light stun rods have no normal melee damage (they are strong enough to avoid being broken in use, but are not intended to be striking weapons). Heavier models can be made sturdy enough to do double duty as blunt weapons.

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OmniCorp Stunwand - A popular self-defense choice, the telescoping OmniCorp Stunwand can be easily concealed and carried in a beltpack, briefcase, or handbag. The stunwand can be used at the range of a fist, or as a short melee weapon. It carries two charges, either one of which should be able to daze an attacker long enough for the wielder to escape. Charges are not expended unless the weapon makes contact. It recharges inductively in the presence of any power grid in a minute or so, or can be plugged into a standard power outlet and recharged instantly.

OmniCorp Stun Baton - A heavy-duty stun weapon, the OmniCorp Stun Baton is sold primarily to police forces and colonists on worlds with large or exceptionally tough hostile lifeforms. Heavy and difficult to conceal, stun batons are not intended for personal defense use and have 12 internal charges. OmniCorp Stun Batons are a medium length melee weapon. They can self-recharge one use per minute, or one per second when stored in a battery-equipped holster or vehicle mount. Special police-issue versions use detachable clips of superconductor coils for rapid recharging. This model of stun baton can also be used effectively as a blunt weapon, doing punch+1 half-lethal damage, either by itself or in combination with the stun damage. This stun baton can have its effect adjusted downward for long-duration crowd control, getting double the number of uses for each -1d to damage.

Neurolash - An illegal variant on the stunwand, the neurolash makes use of a metal-sheathed whip to deliver a painful electric shock to the target. Unlike conventional stun rods, neurolashes are designed to induce maximum pain as well as incapacitate foes. They are popular with criminals, torturers, and other underworld figures. Even so, they are more intimidating than practical, and the number of people who can use one to full effect is very small. A neurolash can do any trick a normal whip can do, such as entangling, and usually has a sharp metal tip that can do significant damage on a full-reach "crack-the-whip" strike (punch+1 lethal).

I know, I know. Everyone wants the fancy stuff - the lasers, the particle beams. But to my way of thinking there's nothing like an old-fashioned slug-thrower, unless maybe it's a railgun.

Look, suppose you and I are standing on Gawaine with a ghostwolf bearing down on us. I've got an Ares M-51A and you're packing a Coherence M-332 assault laser. Nice weapon. Oops, both of 'em stop firing.

I'll clear my jam and drop the ghostwolf while you're still trying to open the sealed circuit casing on your laser.

- Ash McCoy, arms dealer, 2237CE

▼ **KINETIC WEAPONS** - Kinetic weapons injure via the physical force of a bullet or other projectile.

Conventional Firearms - Firearms of many types are still in wide use in the 23rd century. Some are antiques, but most are modern products representing the latest trends in arms manufacturing, produced by such companies as Covenant Arms, Ares Corp. and the venerable Colt-Remington Co. Many smaller companies produce cheaper (and often less reliable) equivalents to many of these weapons.

Rugged, dependable, and easy to repair, old-fashioned slugthrowers are highly popular on frontier worlds lacking an extensive industrial base. The StarForces Marine Corps also relies extensively on firearms for standard-issue ground combat weaponry, due to the ease of field maintenance and repair.

Modern firearms use caseless ammunition, which replaces the metal jacket with a block of propellant. The elimination of shell casings permits a higher rate of fire and larger magazine. Firearms using caseless ammunition are also less subject to jams and other mechanical problems. Ammunition isn't exchangeable between rifles and pistols of the same caliber.

Shotguns fire flechettes rather than lead pellets. Flechettes are clusters of long, finned steel darts that cause injuries similar to shot but are effective at far greater ranges.

Firearms are noisy, and the muzzle flash of each shot is hard to disguise. They have serious recoil, making firearms ill-advised in low- or zero-gravity combat. Recoil also limits the effective energy a handheld firearm can deliver, especially with weapons made from lightweight materials. Recoil compensation is standard on most weapons larger than a small pistol, reducing the felt recoil to manageable levels. By and large, the U.W. tends to favor larger caliber firearms. Projectiles are seldom made of lead, except on primitive frontier worlds, and usually pre-fragmented cerametal composite with a polymer sheathing. They have much higher velocity than their 21st century counterparts, and the larger bores are more tolerant of minor dimensional changes that can occur in extreme environmental conditions.

Ares 9mm: A modern version of a classic pistol, the Ares 9mm carries a 20-round detachable clip. The semiautomatic pistol fires standard caseless rounds. Normal clips are sold as sealed, disposable units for 20Cr. Reusable clips cost 20Cr (empty), and ammunition is typically about .2Cr per shot.

A variant of this weapon is the standard StarForces sidearm. The military version has mounting rails for accessories and dataports for full combat integration. It is slightly bulkier and more expensive, but it is still an open item.

Covenant 10mm: A heavy pistol, the Covenant 10mm offers increased stopping power in return for higher weight and reduced magazine capacity. This pistol fires caseless rounds from a clip of 12. Clips cost 20Cr empty, and ammunition is typically about .3Cr per shot.

Colt-Remington Mini-7: A common "security blanket" or backup weapon, it is small and light enough to be concealed, and powerful enough to be useful. It uses a high-velocity 7mm caseless bullet and fires from a removable 6 round clip. Clips cost 10Cr empty, and ammunition is about .1Cr per shot.

Covenant Viper: The Covenant Viper submachine gun fires standard caseless 9mm rounds, and has proven popular with police and paramilitary forces in the United Worlds. The Viper fires up to five shots per second as autofire, or up to two three-round bursts. The viper comes standard with accessory rails and dataports. The Viper uses a 50-round detachable clip. Clips cost 50Cr empty, and ammunition is about .2Cr per shot.

Kaminari-juu: Built in secret yakuza syndicate arms shops, the *Kaminari-juu* is a 10mm submachine gun that fires caseless discarding sabot armor piercing rounds. The Japanese name translates to Thunderbolt-10. Ownership and sales of this weapon are illegal under United Worlds law. This is not because of any inherent danger of the weapon compared to other hand-held firearms, but because of the symbolic nature of the weapon and its links to the yakuza. Its illegality is as much a political statement as anything else.

The *Kaminari-juu* has a 30 or 60-round detachable clip and fires up to ten shots per second. Extra clips cost either 60Cr or 120Cr empty. Individual rounds are 1.0Cr each.

Colt-Remington 6 mm Rifle: The Colt-Remington 6mm rifle, a popular hunting weapon, fires standard caseless rounds. This semiautomatic rifle comes in a variety of configurations. Restrictions on weapons allowed during some hunting seasons make the 3-shot version with a non-removable clip the most popular hunting weapon (if you can't hit it with three shots, you shouldn't be out hunting). This version is the most accurate, and may include laser engraving and exotic woods used in the stock.

The "ranch rifle" comes with open sights and uses the standard 20-round magazine, while a faux-military version has a variety of synthetic stocks, a slightly shorter barrel, accessory rails and a dataport. Third-party manufacturers make clips of up to 50 rounds for the weapon. Ammunition is readily available and costs about .5Cr per shot.

Covenant 5mm Rifle: Hunters and other sportsmen seeking a lightweight small-game firearm favor the Covenant 5mm Rifle. This semiautomatic rifle fires lightweight caseless ammunition from a 100-round disposable magazine, which costs about 20Cr. Third-party manufacturers make reusable 50-round magazines, which cost about 10Cr empty.

▼ **Note** - Just as early 21st century hunters and target shooters may hand load custom ammunition, 23rd century shooters may do the same. Reloading equipment for caseless ammunition is somewhat more complex because of the need to create a propellant mix and bond it to the bullet, but the equipment is only a few hundred credits for the most basic setup and allows a person to tailor their ammunition to suit personal preferences. In game terms, you can usually push the damage of a weapon by 0d+1 at the risk of making it slightly unreliable, or perhaps make illegal ammunition types.

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Ares M-51A: A top-line military assault rifle, the Ares M-51A combines a 7mm autoburst rifle firing armor-piercing rounds with sophisticated targeting systems to produce one of the deadliest infantry weapons in existence. Produced under military contract, the Ares M-51A is standard issue for the StarForces Marine Corps. No commercial versions are available, though the Ares M-41 semi-auto series shares many cosmetic similarities and some parts.

Images from a zoom lens and optical/thermal dual targeting scope are relayed to the soldier's combat helmet or a wristband monitor, enabling him to fire around corners or over barriers without exposing himself to return fire (but at +2 difficulty). The built-in scope also provides a -4 to the difficulty of sight Awareness rolls to pick out target details. The M-51A has a 50-round detachable clip, but 100 round drums are also available. Empty clips cost 140Cr or 300Cr each. Marines deploying into combat carry at least three extra clips. Individual rounds cost 0.6Cr each.

As a concession to get the StarForces Marine contract, Ares went to the extraordinary length of embedding microtags inside every military component of the weapon, allowing detailed tracing of not just the weapon, but most of its parts, all of which are considered U.W. property (making a legal paper trail of ownership virtually impossible). Unusable M-51's are melted rather than being crushed and sold as scrap.

Covenant 6mm Assault Rifle: A less powerful but lighter and more compact alternative to the Ares M-51A, the Covenant 6mm assault rifle sees widespread use by planetary defense forces, police special weapons teams, and other official agencies. A semi-auto version of the weapon is available for open sale, but sales of the autoburst weapon are restricted. The weapon comes in a variety of configurations, depending on the budget of the buyer. You can get it as a bare-bones synthetic stock model, all the way up to the autoburst model with dataports, accessory rails and electronics and optics designed just for this weapon.

This rifle fires up to two 3-round bursts per second and has a 40-round detachable clip. Extra clips cost 50Cr empty, and ammunition costs about .3Cr per shot.

Colt-Remington 18mm Shotgun: The Colt-Remington 18 mm shotgun fires caseless rounds containing multiple finned steel projectiles, called flechettes, that carry to a greater distance and penetrate better than regular shot. Inexpensive and powerful, this weapon sells extremely well on frontier worlds. Frontier worlds often make conventional shot rounds for the weapon, as these serve most hunting and self-defense purposes, but are substantially cheaper. This weapon fires from a 12-round internal magazine. Flechette rounds cost 1.0Cr each, and conventional scattershot costs .5Cr per shot.

Special ammunition - Conventional weapons have the inherent flexibility of firing several types of rounds. Normal rounds act normally against most barriers and have no special effect.

Armor-piercing rounds are designed specifically to penetrate barriers and armor, and usually have a dense metal core, or use a smaller sub-projectile that has a higher velocity and better penetrating power. True armor-piercing rounds are military tech, but the system leaks enough of them that they are restricted for all practical purposes. In this case, "restricted" means you will get in more trouble if you are caught using them in a crime, and police will scrutinize you a bit more closely if you are carrying a legal weapon loaded with armor-piercing ammunition. Armor-piercing ammunition gives authorities a free "hassle the adventurer" card.

Elastomer or "rubber" bullets can be fired from most weapons, and are usually an option for law enforcement, military police or starship security. These do half-lethal instead of lethal damage, but they can still kill at close range, especially if aimed at an unprotected neck or eyes.

Taggant rounds are in use by many police and security forces on the more developed worlds, and may be required for civilian ammunition sales. These rounds have a frangible outer casing composed of unique microtags, which can be traced back to their original user down to a "per box" level. They are also RFID-enabled, which means anyone with their residue on them can be detected at most portal scanners. It means that anyone or anything shot with this ammo leaves a clear trace as to who did the shooting (or at least to who bought the ammo), making both criminal investigations and complaints about overuse of police force easier to manage. Taggant rounds cost twice as much as normal, and the capability can be added to any ammunition without affecting its performance.

▼ **RAILGUNS** - A railgun (or gauss gun) creates an intense magnetic force between two launch rails, propelling small projectiles out of the weapon at extreme velocity. Steel needles ten times longer than their caliber are most common, although railguns can also fire aluminum, plastic, or other lightweight projectiles with magnetic sheathing. The lightest projectiles are mostly designed for use in vacuum, as they tend to burn up in atmospheres.

Railgun projectiles strike with kinetic force, causing injuries similar to those from conventional slugthrowers, but with different visual characteristics easily discerned by medical or forensic personnel. Railguns have excellent range and penetration, are lighter than particle beam weapons, and are not diffused by atmospheric conditions. They also leave no forensic traces that can be tied to a particular weapon... Railguns are noisier than lasers and not recoilless, however. These high-tech weapons are less durable than conventional firearms and more susceptible to malfunction if not kept scrupulously clean. Unlike conventional firearms which might operate at reduced effect in water or semi-liquid environments, railguns will not work at all in such conditions.

While railguns are capable of firing fifteen shots per second or more, United Worlds law requires any weapon designed for sale to the general public to be fitted with inhibitor circuitry limiting it to one shot per pull of the trigger or three shots per second. Bypassing this circuitry is a felony under federal law, as are selling, purchasing, or possessing illegally modified railguns. Legitimate gauss weapons are produced by Tsai Gravitics, along with some of the better-known arms manufacturers.

A railgun consists of a receiver, accelerator, and superconducting energy storage coils, that can be internal, external, or a detachable clip. These clips hold energy charges that are instantly discharged to power each shot. Projectiles are contained in a magazine, that can also be either internal, external, or a detachable clip. Railgun clips are usually dual-purpose, containing a supply of projectiles along with enough energy to fire them all. Clips will hold a charge for months with negligible loss, but they are usually shipped in a discharged state for safety reasons and charged by the end user.

The ultra-high velocity of railgun projectiles make them inherently armor-piercing (reduce armor by 1d), and the stresses imposed on the projectile by firing make it nearly impossible to create specialized rounds as can be done for conventional firearms.

Tsai Needler: A semiautomatic pistol, the Tsai Needler fires 3mm steel slivers at hypersonic velocity. It uses a 30-round detachable ammunition and power clip, which costs 100Cr empty. Extra needles are .2Cr each. The Needler is a useful alternative to conventional firearms, and is more popular among the more affluent or technically oriented. A longer, more accurate model for competition target shooting is also available.

Ares R3mm: Capable of firing 10 shots per second, the Ares R3mm submachine gun packs a lethal punch for its compact size. This railgun fires steel needles from a 100-round ammunition/power clip. Additional clips cost 200Cr empty, and extra needles are .2Cr each. The R3mm comes standard with accessory rails and a dataport.

Tsai Lancer: A heavy, high-powered railgun, the Tsai Lancer rifle fires punishing 3 mm projectiles at an extreme velocity (even for gauss weapons). While not designed specifically as an anti-vehicle weapon, the rifle can completely perforate unarmored or lightly armored vehicles. Because of its tremendous stopping power (and ability to use it at very long range), it has proven popular on worlds with exceptionally large hostile lifeforms.

The semiautomatic Lancer has a detachable clip containing 10 rounds of ammunition plus superconducting coils for power. Additional clips cost 100Cr, and extra needles are .5Cr each.

Covenant Gauss Rifle: Favored by hunters and sportsmen for its greater ability to punch through brush and an action that is a bit more robust, the semiautomatic Covenant gauss rifle fires 4mm steel projectiles. The rifle has a detachable 20-round clip that also contains superconducting coils for power. A 3-round non-detachable retrofit is available for localities that have weapon restrictions for certain types of hunting. The weapon comes with a dataport that is usually used in concert with a special sensor package to compensate for gravity, wind, humidity and air pressure differences. Extra magazines cost 150Cr and extra needles are .8Cr each.

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▼ **ENERGY WEAPONS** - These weapons target foe with projections of energy, such as coherent light or hyperfast particles, rather than bullets.

Blasters - Blasters fire a plasma beam that strikes over a wider area for greater force but has reduced lethality compared to particle beam weapons. Blasters use an energy discharge through a carbon nanofiber matrix to generate a high-velocity plasma. Constricting nozzles and waveguides shape this into a toroidal (doughnut-shaped) "energy projectile" as it exits the weapon. Upon impact, it delivers the heat of the plasma and the kinetic energy of the original nanofiber mass. This can do a lot of damage to soft targets, but has less ability to penetrate armor than other weapon technologies. Blasters also lose 1d of damage at each range band past 23 meters (range level of +12).

Popular self-defense weapons, blasters can cause serious injury but will usually incapacitate foes without killing them. They are attractive to those seeking something more powerful than a stunner but less deadly than slugthrowers, lasers, or railguns. *A blaster will hospitalize you as fast as a railgun, it just won't leave a hole all the way through you.* Most core worlds have restrictions against carrying concealed blasters. Blasters have a bad reputation, but are in fact less destructive than conventional firearms. Regardless of core world restrictions, there are frontier systems where no one gives them a second glance.

A blaster consists of a clip of carbon nanotube disks, electrostatic accelerators in a high-voltage, sealed barrel, and energy storage banks, that can be internal, external, or clips. A superconductor coil holds a charge, which is discharged instantly to power the weapon. A blaster can fire as fast as it can cycle its ammunition, but it builds up heat rapidly and no handheld blasters are available in autofire or autoburst models.

Any rigid or magnetic armor is increased by 2d against blaster bolts (+4d for both), but flexible armors are reduced by 1d. Blasters always do half-lethal damage. Blasters do not work underwater or in extremely dense atmospheres. They will work in vacuum. Blasters usually need to be tuned to a particular pressure or atmosphere type for maximum reliability and damage. You are supposed to have a weaponsmith perform the adjustments to avoid voiding any warranty, but adjustment data for all U.W. worlds is readily available for those who want to do it themselves.

OmniCorp Blaster Pistol M4: A handy self-defense weapon, the OmniCorp Blaster Pistol Mk. IV is a semiautomatic pistol with a removable clip capable of powering 10 shots before recharging and reloading. Extra clips cost 50Cr, and blaster discs cost .5Cr each.

Ares 1KJ Blaster Pistol: The Ares 1KJ can fire 10 powerful shots before recharging and reloading its removable clip. Extra clips cost 70Cr and blaster discs cost .7Cr each.

OmniCorp Riotgun M11: The M11 resembles an old-fashioned sawed-off, double-barrelled shotgun. Some riotguns replace the stock with a pistol grip, allowing strong (or foolish) individuals to fire them one-handed. The M11 uses self-contained, disposable ammunition about the size and heft of a shotgun shell, each round costing 1Cr. Police forces have the ability to purchase irritant marker rounds. These do 1d less damage, but embed permanent dye particles in whatever they hit and leave a small cloud of irritant gas in the area, causing 1 additional non-lethal hit to anyone in that hexagon or adjacent hexagons. These rounds cost 3Cr each and are restricted items.

▼ **ELECTROSTATIC WEAPONS** - Electrostatic weapons incapacitate foes by delivering a shock attuned to the nervous system. Victims are dazed or even knocked unconscious without long-term injury. Metals disrupt the electrostatic charge, so even a light metal lining such as that found in e-suits can provide extra protection against electrostatic weapons. They also have a limited effective range.

Although expensive, stunners are popular consumer items as they are often legal to carry even on worlds that ban other types of weapons. They are favored for personal security, and are sometimes carried by law enforcement personnel.

An electrostatic weapon functions by firing a focused laser beam to ionize the air, creating a path to the target for the subsequent high-voltage pulse. The pulse is highly visible, accompanied by a distinctive crackling sound and ozone smell.

An electrostatic weapon consists of a lasing array, circuitry, and energy storage banks, that can be internal, external, or detachable clips. These superconductor coils hold charges that are instantly discharged to power the laser and high-voltage pulses. Most are sold with external batteries used to recharge spent storage banks. Electrostatic weapons do not work underwater or in vacuum, nor do they penetrate any kind of visual obscurement, nor go through transparent barrier materials like glass. While they do non-lethal damage, they can damage delicate materials or items which might be fractured by a high-voltage pulse, and they usually leave tiny but readily discerned burn marks where the pulse hit its target.

Even the relatively small laser used by an electrostatic weapon can cause permanent damage to any sort of delicate optics, whether cameras or eyeballs. Though both can be repaired or replaced, it still counts as vandalism or assault. While many offenses committed with an electrostatic weapon are considered less serious than the same offense committed with a lethal weapon, malicious use of electrostatic weapons is always a felony.

OmniCorp S5 Stunner: A popular personal-protection choice, the OmniCorp S5 produces an electrostatic jolt that can daze an attacker. Several hits will knock almost any person unconscious. The S5 has a built-in laser sight that is useful in all but the brightest conditions out to the weapon's 16 meter maximum range (police versions have 23 meter range). These weapons have internal energy storage sufficient to power 10 shots at full power, or 20 shots at a damage of 1d less. The S5 also comes with a training holo and a secondary line of color-coordinated grips, fashionable holsters and other fairly meaningless accessories. Because of potential lawsuits involving misuse, police models of the S5 incorporate a small low-light video camera that automatically starts recording when the weapon is drawn from its holster.

It came down to fighting corridor by corridor against the boarding party. Mackey, the bosun's mate, had an assault laser he'd picked up somewhere. Illegal as hell, but at full-auto he blew half the raiders away before they even knew what hit them. The rest ran.

- Kamala Singh, free trader, 2231CE

Lasers can be handy in the proper setting, but I'll never carry one on the ground. They aren't worth spit in fog, rain, or smoke, and I've never been on a battlefield yet that wasn't covered with smoke and vapor.

- Sgt. Ginsberg, StarForces marine, 2234CE

▼ **LASERS** - Lasers are an affordable, compact alternative to conventional firearms in the 23rd century, produced by specialists Coherence Inc. and any number of other weapon manufacturers.

Lasers are beams of coherent energy generated by running an electric pulse through a specially designed semiconductor matrix, usually an array of individual emitters collimated into a single beam. They cause burn wounds, and inanimate objects hit by lasers may catch fire or smolder, depending on their flammability. Steam explosions are possible if a laser strikes something with a high water content.

Laser beams are normally invisible unless shone directly in a person's eyes (after which they are *still* invisible, because you're now blind). The sound and sight of lasers striking targets make it obvious when lasers are in use. Certain atmospheric conditions, such as fog, smoke, rain, or snow, diffuse laser beams and reduce their effectiveness, while making those tuned to optical light frequencies visible. Lasers strike with no physical force and have no recoil, making them more accurate and easier to use than many other firearms. They fire fairly quietly, the only sound being the discharge "crack!" of their energy banks. Virtually all lasers incorporate laser sights as a standard feature.

While all lasers are technically capable of very high rates of fire, United Worlds law requires manufacturers to install a built-in inhibitor limiting non-military weapons to three shots per second or one shot per pull of the trigger. This circuitry can be bypassed to allow a laser to fire up to ten shots per second, but doing so is a felony under federal law. Anyone caught carrying an illegally modified laser also faces federal felony charges. U.W. technology hasn't yet resolved the heat buildup problems linked to continuous-beam lasers. At least for handheld models. Some specialized vehicles mount liquid-cooled continuous beam lasers, usually for missile interception duties.

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Handheld laser weapons consist of a lasing array, circuitry, and energy storage banks, that can be internal, external, or detachable clips. These superconductor coils hold energy charges that are instantly discharged to power laser pulses. Most lasers are sold with external batteries used to recharge spent storage banks.

Vehicle lasers can be larger versions of the same. Reactor-powered vehicles may use gas-dynamic lasers. These use a superheated gas pumped through supersonic nozzles into a resonant cavity to generate extremely powerful laser pulses. Most starship lasers use this particular technology.

The intense heat at the focus of a laser pulse can melt through just about any material, but lasers do not penetrate as deep as projectile weapons. This has advantages and drawbacks. On the plus side, it means all the energy is deposited in the target rather than blowing through and being wasted. On the minus side, laser wounds tend to be cone-shaped craters, and on very large creatures might not penetrate deep enough to damage vital organs (though shock effects often propagate through tissue, it is not guaranteed). Lasers in **Fires of Heaven** count as armor-piercing attacks (reduce armor by 1d), but maximum damage to a body location (**EABA**, page 4.8) is also reduced by 1d.

A laser's complete lack of recoil means that aiming bonuses are not lost on consecutive shots, they can be used in zero-g conditions with no penalty, and are not affected by spin-gravity modifiers because the damage moves at the speed of light. Lasers can work underwater if their electronics are properly sealed, but their range is very poor. Laser beams fired through smoke, fog, heavy rain, or snow will lose damage rapidly or be blocked altogether. Lasers are theoretically invisible, but the interaction of the beam with dust or water vapor may make the beam path visible, even if the laser itself is on a non-visible wavelength.

Ares Pocket Laser: Compact and lightweight, the pocket laser balances power against portability, and is popular for personal security and as a back-up weapon.

The pistol contains a superconducting internal storage bank capable of powering five 400-joule shots before recharging. An inductive charger keeps the weapon topped off, or recharges about 1 shot per minute in areas with a power grid.

Coherence 600J: A standard laser pistol, the Coherence 600J offers excellent firepower and a large magazine. It also has a good reputation for reliability and durability. The 600 Joule beam is powered by a detachable, rechargeable clip of super-conducting storage banks that powers 30 shots and costs 100Cr.

Coherence 800J: The Coherence 800J is a heavy pistol with dual laser/stunner functions. Security personnel and peace officers favor it for its ability to switch from non-lethal to lethal force instantly depending on the situation. Despite the cost, it is popular with beltlers and other "rural" spacer because of its punch, zero recoil, no need for consumable ammunition, and perhaps most importantly, because the controls and trigger are easy to work through an e-suit's bulky gloves.

A detachable magazine of superconducting energy banks powers up to forty 800-joule shots, and costs 200Cr. Stunner shots use one charge and do non-lethal damage at 2 points more than normal damage. A rechargeable holster battery weighs 0.5 kg and will completely recharge the pistol in 100 seconds.

▼ **Note** - While it voids warranties and is illegal in many jurisdictions, lasers can be modified or "hopped up". At a cost of about 25% of clip capacity, most lasers can be boosted to +1 damage over the listed amount. This makes them Unreliable(7) and a misfire usually means that you burned something out. Not readily field-repairable and probably will cost about half the weapon's price to have fixed. The other modification is a "stutter-fire" circuit. This is a pseudo-autofire setting that simply causes a semi-auto weapon to fire rapid multiple shots at lower power than normal. The usual mod is a -1d damage penalty and two shots, both using the same "to hit" roll and location (if one hits, they both hit). This makes the weapon more effective against unarmored or lightly armored targets, but less so against armored ones. This also makes the weapon unreliable, with the same effects.

OmniCorp L2: Rugged and inexpensive, OmniCorp L2 heavy laser pistols are still popular sidearms despite the fact that the line was discontinued in 2216CE.

Utilizing now-obsolete technology, these pistols are heavier than comparable weapons and have smaller magazines. Nevertheless, zero-g miners and other rough-and-tumble sorts favor the Mk. II for its low cost, high power, and intimidating size. The weapon has a mystique that exceeds its actual performance, much like the ancient Colt .45 pistol had. There is also a thriving aftermarket in parts that may or may not enhance durability, appearance or functionality of the weapon. If an adventurer wants a readily customized energy weapon, this would be the choice. The pistol is powered by a detachable clip of rechargeable storage banks. Each clip powers 20 800-joule shots, and costs 150Cr.

Ares L24 Burster: A compact autoburst laser, the Ares L24 Burster is a standard-issue weapon for StarForces security personnel in low-g or zero-g engagements where the recoil of a conventional firearm could create problems. The L24 has standard accessory rails and a dataport.

A detachable clip of superconducting storage banks powers fifty 500-joule shots at a rate of up to five shots or two 3-round bursts per second. Each clip costs 200Cr.

Coherence 2KJ: A favorite of hunters and other sporting enthusiasts, the Coherence 2KJ laser rifle packs a powerful 2,000-joule punch. The Coherence 2KJ is powered by a 20-shot internal magazine of superconducting storage banks that can be recharged with a battery carried in a belt pouch. Batteries weigh 0.2 kg and recharge the rifle fully in 100 seconds. The rifle is 58 cm long.

Coherence M3KJ: A military assault laser, the Coherence M3KJ provides heavy firepower for boarding actions and other combat in zero-g. Quartermasters typically issue it as a squad weapon to Marine units deploying for combat in space, and the normal zero-g deployment means its weight is not normally a problem. It has full accessory rails and dataports. This autofire assault laser fires at a rate of up to 10 shots per second. Detachable clips power up to one hundred 3000-joule shots each, and the M3KJ can fire at reduced power, getting double the number of shots for each 1d the damage is reduced (e.g. 200 shots at -1d to normal damage, 400 shots at -2d, etc.). Each clip costs 300Cr.

▼ **PARTICLE BEAM WEAPONS** - Particle beam guns (or p-beamers) are a relatively new form of personal weaponry, as technological advances have only recently made reasonably affordable handheld versions possible. Rifles are the only form now available, due to size and energy requirements for particle beam technology.

P-beamers work by stripping electrons from hydrogen atoms to create charged ions. Oppositely charged electrostatic fields, created behind the ions as they travel down the barrel, expel them from the rifle at relativistic speed. The beam of ions causes injury by punching through flesh or inanimate objects, as well as by generating heat and secondary radiation.

Adverse atmospheric conditions have no effect on particle beams, which literally burn a hole through the air to their targets. Magnetic shields provide some defense against the charged particles, however (negates the armor-piercing effect). Particle beams fire with no recoil and strike with little physical force. Particle beams are highly visible in an atmosphere, appearing as white-hot bolts of light accompanied by thunderclaps. In vacuum the beams are nearly invisible.

A p-beam weapon consists of a particle source, electrostatic accelerators in a high-voltage, sealed barrel, and energy storage banks, that can be internal, external, or clips. A superconductor coil holds a charge, which is discharged instantly to power the particle beam. P-beam rifles have a very low tolerance for dirt and humidity, and function poorly if the sealed barrel has been damaged or breached.

P-beam attacks are considered armor-piercing against everything except magnetic shielding. P-beam attacks against living targets automatically count as crippling injuries for healing purposes because of the radiation damage to tissue (see **EABA**, page 4.9).

Ares Ion Rifle: A bulky but high-powered weapon, the Ares Ion Rifle is one of the first personal armaments to utilize particle beam technology. A detachable clip of energy storage banks provides power for up to eighteen 3000 Joule hydrogen ion shots at a semi-auto rate of fire. Each clip costs 200Cr.

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▼ **OPTIONAL WEAPONS EQUIPMENT** - Many types of scopes, sights, silencers, and other accessories are available to enhance 23rd-century weapons. Some of these are already mentioned in the standard **EABA** rules, but others are new to this gameworld or operate in a different way.

Scopes - A scope enhances the vision of the shooter to help his aim, allow accurate shots at night, or provide other benefits. Scopes are accessories, and are most often added to rifles or assault rifles. The attacker must spend a major action to aim to use a scope. A scope usually provides a +1 to the Accuracy of the weapon, and may reduce the difficulty of visual spotting tasks for things viewed through a magnified sight. Most of the time, using a scope is a major action unless it is electronic and integrated with a heads-up display or a neural link, in which case it is a minor action.

Ares Thermal Scope: The Ares Thermal Scope picks up heat patterns, allowing a shooter to target living foes or other heat sources, acting as a 2d+0 Awareness roll for spotting these targets. The scope also detects heat traces, and can be used to track fresh footprints, for example. Infrared scopes are common enough that the conditions and ways in which they can be negated is common knowledge. A person whose heat signature matches the background warmth is not detectable with this sight.

Ares NightVision Scope: The Ares NightVision Scope intensifies available light to give the shooter a clear view at night or in other dark conditions. Automatic filtering and irised lenses allow use during daylight, though resolution does not match that of an optical scope. It offsets all penalties for darkness in its vision arc. The scope also is good for a 2 point reduction in difficulty to pick up details on anything being viewed.

Colt-Remington Scope: The Colt-Remington Scope magnifies the shooter's view, allowing greater accuracy at longer ranges. This very basic optical scope is produced primarily for sale on pioneer colonies where more sophisticated electronic scopes tend to be difficult to maintain and repair. The scope also is good for a 4 point reduction in difficulty to pick up details on anything being viewed.

Covenant Digital Scope: A masterpiece of electronic design, this scope provides a superior, digitized view with toggles for options such as telescopic sights, light-intensification features, color enhancement, or thermal vision. The scope also is good for a 4 point reduction in difficulty to pick up details on anything being viewed.

Sights - All weapons come equipped with basic sights, but enhanced models are available as accessories to improve or speed aiming. Sights can be added to any weapon, including pistols.

Coherence Laser Sight: The Coherence Laser Sight fires an extremely low-power continuous laser beam that places a dot on the target that is invisible except when seen through the sight. This allows the shooter to aim as a minor action instead of a major action. As with all lasers, it can be diffused or made visible by fog, smoke, or other atmospheric conditions, and they do not work in full daylight conditions. Laser sights add negligible mass and size to a weapon, and models fully dataport compatible are only about 100Cr. Manual models sell for 50Cr or less.

Weapon Computers - Weapon computers generally plug into the dataport of a weapon, and feed targeting correction information to a dataport compatible sighting device, like an thermal, night vision or digital scope.

Covenant Hunter: This is a computer designed for use with Covenant gauss rifles, but it can be reprogrammed for any projectile weapon and some blasters. It mounts on a small tripod somewhere within a few meters of the weapon, and constantly monitors air pressure, wind speed, temperature, gravity and humidity, and automatically adjusts the aiming point in a compatible electronic sight to show projected point of impact compared to point of aim. This is good for +4 Accuracy on aimed shots.

Ares Tactical C3: The Ares C3 is designed to mount on the accessory rail of the Ares M51 assault rifle, and is typically only issued to elite or special forces. It does not have the atmospheric monitoring capabilities of the Covenant Hunter, but instead provides aiming compensation based on range, target movement and shooter movement. It gives accurate information to lead the target, and can also be used to program rifle grenades for airburst at an exact range. The Tactical C3 provides a +2 to Accuracy on aimed shots, and negates up to 4 points of penalties for firer and target motion.

▼ **GRENADES** - Hand grenades are light and reliable in the 23rd century. They are armed by thumbing a switch, and contain digital timers capable of delaying an explosion for anywhere from three seconds to an hour, with millisecond accuracy. Rifle-fired models can be programmed by a targeting computer before firing.

While they are quite powerful, modern hand grenades only have a slightly greater explosive strength than archaic models - otherwise, grenades could be so powerful that a soldier could not throw it far enough to avoid being caught in the blast!

There are three main categories of grenades: concussion, fragmentation, and plasma. Grenades containing smoke, tear gas, and other specialized attacks also exist.

All grenades aside from smoke and irritant gas models are military-grade weaponry, and cannot legally be sold to civilians.

Concussion Grenade: Concussion grenades explode with tremendous force to incapacitate anyone nearby. They are also used to blow open doors and damage structures. They do not have fragments, and can be used at closer ranges than fragmentation grenades. Most military concussion grenades can accept fragmentation sleeves at an additional .1kg weight penalty, turning them into normal frag grenades.

Fragmentation Grenade: Fragmentation or "frag" grenades have a small explosive charge surrounded by a matrix of tiny metal fragments. The blast accelerates these fragments like thousands of tiny bullets, each one capable of causing significant injury. These fragments slow down fairly quickly in any atmosphere, and fragment density also drops quickly with range, but they are not something you want to be in the same room with when they go off. In vacuum environments, the fragments can be lethal for absurd distances, but the chance of being hit by one becomes increasingly remote with range.

Plasma Grenade: When triggered, a plasma grenade superheats a tungsten core into superhot plasma. The plasma expands rapidly, vaporizing the grenade and creating a white hot ball of gas. This ball of plasma contains a lot of heat, but does not generate as large an increase in local air pressure as a conventional explosive. Although they lack the kinetic force of other grenades, plasma grenades are still exceptionally lethal. They are chiefly used as anti-personnel weapons or in situations when stronger explosions would be unwanted, such as in starships.

Ares G81 Grenade Launcher: Produced under exclusive military contract, the Ares G81 is a standard fire team heavy weapon for the StarForces Marine Corps. One soldier in each fire team carries this powerful autoburst weapon, which can be used for either anti-personnel or anti-vehicle tasks. The G81 fires 35mm fragmentation grenades that are also effective at penetrating vehicle armor with direct hits. These grenades are fully programmable, and can also eject the rear half of their frag charge before detonating, giving a forward-facing semi-circular frag pattern instead of a circular one. The G81 uses detachable clips of 12 grenades each. Extra clips cost 100Cr empty and grenades are 100Cr each.

Ares G61 Grenade Launcher: This is a single shot grenade launcher designed to mount on the accessory rail of the M51 assault rifle. It fires the same grenades as the G81, but must be reloaded after each shot.

Colt-Remington RB3: This is a launcher designed to fire standard 30mm gas, smoke or riot-control grenades, and is common in most police arsenals. It can also fire oversized rubber buckshot as a half-lethal attack, and the buckshot is typically covered with an indelible dye and taggants to help police identify rioters up to a week later. Complaints from civil rights organizations mean that most RB3's are now equipped with digital video cameras to record the situations in which they were used. The RB3 uses a pair of four-round internal rotating magazines, allowing the user to load two grenade types and fire either one as needed. Gas, smoke or other riot-control grenades are typically 20Cr each.

▼ **HEAVY WEAPONS** - StarForces Marines have a variety of anti-vehicle, anti-fortification and anti-air missiles and weapons available. All of these are of course military-rated technology and most are not legal for civilians to own, even if they somehow managed to acquire them.

Ares HyperKinetic: The Ares HK is an armor-piercing anti-vehicle rocket that relies on extreme high velocity rather than a shaped charge. After a boost phase to get the rocket out of the shoulder launcher, it ignites a main motor to accelerate a tungsten cermet penetrator to speeds approaching Mach 6. The rocket is not guided, and relies on an Ares Tactical C3 scope to provide accurate aiming information for its very short flight time. The launch tube is disposable, and the targeting scope is detached and re-used on a new launch tube. It is not the heaviest anti-vehicle weapon available, but it is the most reliable, as there is no way to spoof it and once fired, taking out the firer has no effect.

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▼ **VORN WEAPONS** - Unlike federation lasers, which fire pulses causing flash damage to the skin and relatively shallow craters, Vorn lasers fire a short but continuous beam capable of tunneling into flesh and causing steam explosions in watery tissues. Vorn solve the heat buildup problem stalling U.W. development of continuous-beam lasers via a crystalline lasing medium an order of magnitude more efficient than U.W. technology. Researchers are studying captured Vorn laser rifles, but have been unable to duplicate the artificial crystals.

Vorn Laser Rifle: While there are slight cosmetic differences in weapons from different Vorn city-states, all Vorn laser rifles are functionally identical. The beam counts as an autofire attack. If it is aimed, a second "autofire hit" can instead be used to get +1d damage on a single hit, as the beam is held steady enough to penetrate in one spot, rather than leaving a charred gash across the target. If four autofire hits are made, the damage can be increased by +2d.

Detachable clips of superconducting crystals power up to 50 shots, and are inductively recharged near (within several meters of) any Vorn reactor. Grips are designed for Vorn hands, giving humans who try to use unmodified Vorn laser rifles +4 difficulty to hit. The listed price would be for an equivalent human-built weapon; captured Vorn lasers are rare, and thus fetch collector prices *many* times that listed, if only because they are illegal tech (However, the U.W. does pay civilians a "no-questions asked" bounty of the listed price for captured Vorn tech, simply so they can get more examples to study).

The drawbacks of lasers are factored into Vorn tactics. Vorn have the equivalent of blasters, powered by their own superconductor technology, though these are rarely seen. Captured weapons indicate that they can "grow" a laser into a blaster, and vice versa. How long this takes and whether any extra materials are required is unknown.

▼ **ARMOR** - Advances in metallurgy and materials research have yielded numerous varieties of light, highly effective armor. In general, personal armor balances increased protection against higher encumbrance and restricted movement. People have more powerful weapons, so they need better armor. Most adventurers will wear some armor in combat situations, although heavy armor will add to their encumbrance and cause penalties to physical Attribute and skill rolls.

Transparent armors can be manufactured in tinted or colorless varieties. Most transparent armors designed for combat (as opposed to things like store windows) will have a slight tint to them, as they are usually designed to absorb most of the wavelengths used by known laser weapons or communication devices.

Heavy Cloth: Numerous blends of synthetic textiles, many tough enough to offer protection, are available in the 23rd century. Flexible armors are made from several layers of the material, while resin or polymer-impregnated cloth provides more rigid protection, at a penalty to concealability and movement.

Leather: Leather garments are still fashionable on some worlds despite the presence of synthetic alternatives. Leather and other organic fabrics and materials are generally inappropriate armor against modern weapons.

Syntheleather: Syntheleather is an extruded synthetic material resembling leather in form and function, but providing greater protection, in that it acts normally against modern weapons. It is not a serious armor, but it is better than nothing.

Monoweave: A tightly woven mesh of high-tensile strength nanofibers, monoweave armor is the next generation of synthetic cloth. It provides excellent lightweight protection and is fairly flexible. However, it takes several layers to be a useful armor, so it is still a separate body armor, not a material for "armored clothing".

Composite: A rigid version of heavy cloth, sometimes with ceramic, cermet or metal fibers for increased protection against a wide variety of attacks.

Polycryl: A strong, lightweight plastic-like material, polycryl is also transparent, and the material of choice for most transparent armors. It can also be diamond or sapphire-plated for abrasion resistance, and anti-reflective coatings applied for better visibility and contrast.

Monoweave Composite: A rigid version of monoweave, sometimes with ceramic, cermet or metal fibers for increased protection against a wide variety of attacks.

Steel: A medium-weight iron alloy, steel is heavy, but inexpensive and easy to replace. When damaged beyond repair, it can always be recycled. It is typically only used on colonies without advanced manufacturing technology.

Glasteel: A medium-weight opaque or transparent armor, glasteel has a tensile strength higher than steel. Glasteel is the strongest alloy produced by humankind and represents the current peak of United Worlds metallurgy. It is the strongest per unit of thickness, but not necessarily the strongest per kilogram. But, because it can be worked by conventional tooling, it is the main choice for new starship hulls and critical mechanical parts on vehicles and weapons.

Diamondsteel: An opaque crystalline-metal alloy as hard as diamond, diamondsteel is beyond the ability of human metallurgists. Only the Vorn, with their mastery of crystalline technology, can create diamondsteel.

Duralloy: A transparent polymer-and-crystal compound, duralloy represents another feat of Vorn technology beyond the reach of human research. Components are prestressed to resist changes in shape, and duralloy is "springy" in a way that diamondsteel is not.

Crysteel: Crysteel is a single transparent crystalline molecule matrix grown in the shape of piece of armor, starship hull, or other desired form. The method by which it is created makes it one of the toughest materials known. Vorn warship hulls are grown of crysteel.

Adamantine: An exceptionally tough, dense metallic alloy used by the Progenitors in some structures and artifacts. The precise composition of adamantine has defied all attempts at detailed analysis, but it apparently uses some combination of elements that are theoretically possible on the periodic table but which humans have no idea how to synthesize.

Reflec: A lightweight, reflective coating applied to armor or clothing, reflec causes laser beams to scatter, and a network of optical fibers diffuses the beam's energy over a larger area, reducing penetration. Reflec-coated armor ignores the armor-piercing effect of lasers. Reflec is typically covered with a thin layer of paint or other coloration to hide the shine. This burns off in the first micro-second or two of a laser blast and does not prevent the reflec from working normally. Reflec generally only works for a handful of hits per body area protected, since each hit vaporizes a saucer-sized piece of the reflec compound.

Microplate: Most forms of armor can have a thin layer of metal deposited on the inside or between layers by a commercially common plasma-based process. This makes the armor mostly conductive, and adds an extra +1d of protection against electrostatic stun weapons. Such armor is automatically detected by most portal scanners, much as if you had a roll of aluminum foil wrapped around your body. It isn't illegal, or even restricted, but it does raise eyebrows if your profession is not one where this would be a useful fashion accessory.

Ablat: This is a phase-change polymer armor with an energy-absorbing ablative coating. When struck by distributed kinetic force like a fist or a blaster, it goes from flexible to rigid, and the ablative layer absorbs and dissipates heat. A relatively thin layer of this can be added to non-reflec armors. On a flexible armor, it provides +3d protection against the first hit to a body location from blaster hits, and +2d to subsequent hits, and counts as rigid armor against blasters or blunt trauma. On a rigid armor, it adds +1d against the first blaster hit to a location.

Average defenses - If an adventurer is wearing different armor on different parts of their body, and the campaign isn't using the Hit Location rules, they should calculate the average value of their armor. This is also appropriate when the adventurer is hit by an attack that isn't concentrated against a single area. For normal attacks, they are assumed to be directed at and hit the torso, and torso armor applies.

To get average defenses, add the armor on the head, arms, legs and torso, then divide by four and round to the nearest full 0d+1.

EXAMPLE: An adventurer has a 4d+1 armor vest, a 3d+2 helmet, and 0d+1 synthleather on the arms and legs. This adds up to 7d+5, which turns into 8d+2. Divide this by four and you get a little less than 2d+1, which rounds to 2d+1. Against area effects and explosions, the adventurer is counted as having an armor of 2d+1.

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Armor Suites - United Worlds manufacturers have produced various preconfigured armors for commercial or military sale. Custom-made suits can also be ordered, but are more expensive. While most sorts of armor can be purchased by anyone, peace officers and security personnel on most world will take an interest in anyone obviously wearing heavy armor.

Ares Combat Infantry Dress - StarForces marines deployed for battle wear standard-issue combat armor provided under military contract by Ares Corp. Technically known as combat infantry dress, the armor consists of a mono-weave composite chest and back plate coated with reflec, synthleather sleeves, leggings and boots, and a mono-weave composite combat helmet with glasteel faceplate, loaded with electronic gear. Details on the combat helmet can be found under **Military Equipment** (page 10.23).

Ares Assault Infantry Dress - StarForces elite teams use this armor or variants of it. It incorporates a high-g exoskeleton that gives the wearer +2d to their normal Strength and Health (for mobility purposes), incorporates all normal e-suit functions and can recharge energy weapons. Non-rechargeable powercells run it for 48 hours, or rechargeable ones for up to 24 hours (rechargeable powercells can be topped off in minutes from most vehicles or power grids).

OmniCorp Defense Jacket - The lightweight OmniCorp Defense Jacket is mostly synthleather, providing some protection against attacks while allowing greater freedom of movement and lower encumbrance than heavier armors. The jacket is two layers of synthleather, one very thin one on the outside, covering a layer of reflec, and a thicker backing layer. Defense jackets are commonly worn by security and police forces as an added layer of protection (usually providing a bonus on any torso armor worn, as well as adding a reflec bonus).

OmniCorp Defense Vest - The most common body armor worn by core world law enforcement, it is a flexible monoweave vest with microplating to resist civilian stun weapons. Other worlds typically use a slightly less effective synthetic cloth vest. Non-microplated versions are readily available. Anyone of reasonable apparent wealth would not get a second glance by security personnel if this was spotted on scanners.

▼ **EQUIPMENT** - The right equipment can mean the difference between life and death in a galaxy full of danger. But the people of the 23rd century also have access to gear that makes life simpler, easier, and more fun.

The equipment presented here is commercially available, and to be honest, a lot of it is just early 21st century gear with a few tweaks. Gamemasters can allow adventurers to order custom-made equipment at substantially higher prices, as long as the local technology can produce or import it. These listings present details on only a small sampling of the consumer products available in the United Worlds.

Global Positioning Satellite Transceiver: On worlds with global positioning satellites (all U.W. member worlds), inhabitants can buy linked transceivers providing a digital readout, a map of their exact location at any given time, or directions to any other coordinates. GPS transceivers, which are often configured as wristwatches, also provide information on longitude, latitude, altitude, and other location-related data. In emergencies, rescue crews can use GPS transceivers to locate someone who has become injured or lost. Most worlds with GPS systems also have private database services which can cross-reference most commercially available information with GPS coordinates for a nominal fee ("Is there a flower shop within a five minute walk of my position?").

Fujihara-Mutsuya Holocam: A holographic camera records three-dimensional images for later display. In order to present a true 3D image, multiple holographic cameras must be used. When a static object is being recorded, shots from multiple angles can be taken with the same camera and integrated using a home software package that comes with the camera. Images are stored on a removable dataspikes capable of holding a full hour's worth of holographic recordings. The camera can also take non-holo pictures (still or video) and make voice recordings. Blank dataspikes cost 10Cr.

OmniCorp Hologprojector: A hologprojector produces a three-dimensional image, either static or moving. Most projectors can accept recorded as well as transmitted images. A basic model projects over a two-meter area. Larger, more expensive holographic projectors capable of creating images over a greater area are also available.

Holographic projectors are used in all kinds of consumer products, from vidphones to home entertainment systems. Engineers use holographic projectors hooked to powerful computers for 3D design work, for example. Military vessels use larger holotanks to display spatial information.

The visual images are partially transparent and clearly identifiable as holograms, but are still clear enough to accurately depict the person, item, or scene being shown. More expensive models use ultrasonically generated water vapor fog and special software algorithms to make images seem more solid and less transparent.

Two-way radio: Radio gear can take many forms, from a nearly undetectable earpiece and throat mic to a full headset. Not as fancy as a vidscreen or vidphone, radio gear is less expensive and more reliable on undeveloped worlds.

Translator: Computerized translators are available for most known languages, including commonly spoken alien languages. These devices translate short bursts of speech from one language to another, displaying the translated words on a viewscreen or repeating them aloud in a computerized voice. A translator fits in a human's palm.

Translators are a recent innovation in computers and communications. Current models translate only from one pre-set language to another. They are capable of translating only simple sentences and may not always translate correctly, particularly if the speaker has poor pronunciation, a heavy accent, or speaks rapidly or in an odd dialect. Nonetheless, these remarkable devices are the first step in breaking the language barrier between people with no common tongue.

Fujihara-Mitsuya Vidphone: Vidphones are the standard form of communication on core worlds, present in every household and place of business. A basic vidphone transmits sound and a flatscreen image of the caller. The video image can be blanked for privacy, and for 50Cr can include a voice-programmable GPS interface.

Holovid Phone: A holovid phone, unlike a conventional flatscreen vidphone, projects a limited three-dimensional holographic image of the caller (usually front and sides of the face). Produced by Fujihara-Mitsuya, OmniCorp, and other electronics manufacturers, holovid phones are considered status symbols. Those without them tend to call those with them "talking heads" because of how they are portrayed on screen.

Larger and vastly more sophisticated models are used for conference calls, and can give a realistic representation of the full person, with enough mobility and sound quality to walk around a conference room and almost appear to be there in person.

Espionage Equipment - Advances in micro-miniaturization have made surveillance gear and other espionage equipment highly effective. Of course, similar advances in bug-detection technology even the odds.

Thermal Stealthsuit: A jumpsuit with headgear, boots, and gloves, the infrared stealthsuit has a dramatically reduced heat signature due to constant monitoring of the surrounding background and the ability to add or divert heat into an vacuum-insulated container. The suit also attempts to match the average coloration of its surroundings through use of electrochromic pigments. Corporate spies, military scouts, and others wear stealthsuits to slip past security systems that rely on infrared sensors. They can also be used to sneak by enemies armed with scopes or other gear providing infrared vision. A stealthsuit negates the advantages of thermal sensors, and increases the difficulty of being visually spotted by +2. Sales of stealthsuits are restricted, but they are available on the black market at inflated prices.

StarForces commando teams have this capability built into virtually all their equipment, either directly or in the form of special covers or sleeves that are linked to the main unit.

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SecDyne Microcamera: Miniaturized to the point of being virtually undetectable by the naked eye, microcameras are used by intelligence agents, law enforcement surveillance teams, and others to spy on particular locations. Microcameras are the current peak of "smart dust" technology. Each camera comprises only a few pixels of sensing capability, a microburst transmitter and a photoelectric coating. The area to be bugged simply has a handful of them scattered strategically about like grains of sand (they come in different colors to blend in with most common backgrounds). Whenever an individual camera gets enough energy to send a pulse of information, it does so. These tiny signals are forwarded and duplicated by any other microcamera that receives them. The specialized receiver takes all these tiny signals from hundreds of different perspectives, and integrates them into a holoid image of the area being observed.

The tiny size of the individual cameras does not leave any room for EM hardening. A "bugbuster field" will cause them to crackle and pop like miniscule fireworks, making their presence obvious. Detecting well-placed microcameras and their tiny signals is a Formidable(13) skill task for the person attempting to find them.

These devices transmit visual images and sounds to a receiver, which must be within 500m of its highly directional antenna. Microcameras should be placed by someone skilled at planting bugs; otherwise, the devices could wind up being next to useless or open to easy visual detection.

Aegis Sweeper: Sweepers are designed to detect electronic bugs by picking up transmitted signals. Once detected, the devices can be removed or crushed by hand. The Aegis unit can be bought (by licensed security personnel) with a "bug buster" low level EMP field, which will damage delicate circuitry within a meter of the unit. Licensed users know how to use to avoid damaging computers, videophones, and such, while amateurs can cause considerable hardware damage. Sweepers are used by law enforcement personnel, spies, corporate security personnel, underworld figures, celebrities, and just about anyone else with privacy concerns. An Aegis sweeper has an inherent 3d+0 skill roll on its "auto-sweep" detection setting, or decreases the difficulty of a skilled user's tasks by 3 points. This is a "professional-grade" unit. Personal or mass-market bug detectors are considerably less effective.

OmniCorp Respirator: Humans now reside on dozens of worlds, only a handful of which match Earthly conditions. Life support gear makes life on less-habitable worlds possible. In the void of space, envirosuits and other equipment are likewise indispensable. While the most common model of this respirator is designed for human use, is easy to make adaptations to meet the needs of other races.

Respirators allow humans to breathe in tainted, thin, or dense atmospheres. Respirators are only useful if the air is otherwise breathable; they are useless in poisonous atmospheres or vacuum. They can be purchased with optional full-face masks or goggles to protect the eyes from chemical irritants or variant air pressures.

Many people will find breathing through a respirator tiring (especially in thin atmospheres), but as long as the filters are cleaned or replaced after every 200 hours of use there is no limitation on how long a respirator may be used. For about double cost and a slight increase in mass, respirators can have a "power-assist" function linked to the user's respiration, making inhaling considerably easier.

Coleman Air Mask: Air masks are used on worlds with poisonous or reducing atmospheres unsuited for respirators but not quite hazardous enough to require a more cumbersome environment suit. The gear includes a rebreather, which recycles exhaled carbon dioxide into oxygen and extends the life of the compact air tank to 12 hours. The tank can be recharged at a facility with the appropriate equipment or on virtually any starship or hostile environment vehicle. A full-face mask also protects the eyes in hostile environments.

Environment Suit: The environment suit (also known as an envirosuit or e-suit) provides basic life support in hostile conditions. When sealed and pressurized, the suit provides a 12-hour air supply as well as protection against minor amounts of radiation, vacuum, and other natural hazards. The air supply can be recharged.

The helmet is equipped with a short-range radio, a light, and a polarized faceplate to protect the wearer's eyes from intense starlight in open space. For about 100 Credits extra, you can get a self-darkening faceplate that puts a black spot on the visor between the wearer's eyes and the sun.

While 20th-century precursors of envirosuits were bulky outfits that took a long time to don and severely hindered agility, centuries of refinement have produced lightweight, non-restrictive e-suits designed to be pulled on quickly in emergencies. The need for a good fit means most spacers own personal e-suits (and know a wide variety of jokes and urban legends about rental units). A fitted e-suit can actually be worn under loose clothing and some spacers will pay 200Cr extra for the "flexible helmet" option that folds back like the top of a 20th century convertible. This allows them to wear the suit as long as they can stand to.

E-suits are tough enough to withstand ordinary use, but can be punctured by sharp edges, bladed weapons, and most firearms. Areas like the palms, elbows and knees are reinforced to protect against damage to the suit from falls. OmniCorp and Coleman Co. are the chief manufacturers of e-suits, followed by a host of smaller competitors. To don and use an e-suit correctly is an Average(7) task for any sort of System Ops skill that involves working in or near a vacuum environment, or it can be used with an unskilled Awareness roll (Awareness minus 1d). Donning an e-suit normally takes about a minute.

Armored Environment Suit - The armored e-suit is designed for extreme conditions, such as corrosive atmospheres, in which standard e-suits do not provide sufficient protection. Armored e-suits are rigid, requiring additional time to don, and heavier, retarding movement and restricting the agility of the wearer. They carry the same basic equipment as standard e-suits. They are much more bulky than the form-fitting non-armored models. While regular e-suits protect against abrasion and punctures, the armored model will stop light weapons or natural hazards of similar damage.

StarForces marines have combat e-suits providing even more protection for boarding actions and other missions in hostile environs.

Shipsuits: Shipsuits are lightweight, comfortable working clothes that can serve as emergency e-suits for short periods of time. In a crisis, a shipsuit can be sealed against vacuum with the addition of an inflatable helmet and light gloves, normally carried in a pocket. A shipsuit also includes a compact cylinder carrying five minutes of breathable air and a two hour rebreather cartridge (plus a hose for hookup to life-support ports). *Shipsuits are the antithesis of fashion.* Despite efforts to make them attractive, they look like a cross between a jumpsuit and pajamas, and the need for vacuum integrity makes any sort of bathroom excursion a time-consuming affair of un- and re-sealing the waist seams. Shipsuits also keep most perspiration in, despite small fans to circulate air through them. Needless to say, while shipsuits serve a useful purpose, they are not all that popular. Shipsuits are fairly durable, but aren't as damage-resistant as e-suits. They are designed primarily to give spacers caught in a sudden decompression time to reach safety. If you have to, you can put an e-suit on over a shipsuit. A shipsuit is the normal emergency gear in commercial starship cabins and space habitat quarters.

E-suit Accessories - A number of accessories designed to enhance the comfort or utility of e-suits are on the market. For a reasonable price, these can be added to almost any e-suit, new or used.

Enhanced Helmet Radio: The line-of-sight helmet radio can be upgraded to a more powerful radio capable of sending and receiving radio or video messages on numerous bands over distances of several hundred kilometers in open space. Foremen of space construction crews, among others, often have these radios.

Extra Oxygen: Explorers or spacers planning an extended stay in a hostile environment can purchase extra oxygen tanks. Each tank is good for 12 hours and can be recharged. Two extra tanks can be strapped directly to the e-suit and hooked directly into the system, but beyond that, they have to be manually exchanged (an Average(7) task taking about a minute).

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Recycler: An atmosphere recycler uses electrical power to break down carbon dioxide and recover the oxygen for re-use. This is fairly energy intensive, and it is normally more practical to carry an extra oxygen tank, which has about the same mass. However, fighter pilots, work pod operators and others who may have to work long shifts may have this option, since they can plug the recycler into their ship's power supply. For some uses, a solar panel overlay on the back of the e-suit will provide most or all of the power needed for the recycler.

Food/Water/Waste Relief Unit: The food/water/waste relief unit has a variety of slang names that won't be delved into. It provides water and food concentrates through helmet tubes, as well as waste reclamation systems, to allow extended use of an e-suit. Each detachable and disposable unit is good for about 24 hours of normal use, and can be changed in vacuum conditions. Practical jokes involving these units are seldom considered funny and will literally get you shot in some places.

Magnetic Boots: Boots with adjustable electromagnets allow the user to walk in a zero-g environment, such as the outer hull of a starship or the interior of a ship without artificial gravity. Movement in magnetic boots is slow, but relatively safe. Magnetic boots are standard equipment for damage control parties on starships. While most modern starship hulls contain little ferrous material, hulls are usually woven with just enough magnetic material to make magnetic boots practical.

Stickyboots: These are used for traction on non-magnetic surfaces in zero-g. They are coated with a replaceable nanofiber layer that adheres in the same way as a gecko's feet adhere to surfaces like glass. Stickyboots will not work on dirt or other surfaces that have nothing to cling to.

Patch Kit: An e-suit patch kit can be used to temporarily seal a leak, giving the user enough time to get to safety before running out of air. The adhesive patches require an Very Easy(3) skill roll to apply, but do not always completely seal a breach. The amount the roll was made by plus 20 is the time level the patch is good for.

Thruster Pack: A thruster pack directs bursts of reaction gas (typically nitrogen or air) to propel the user in the desired direction. Thruster packs are only usable in vacuum; they provide so little thrust as to be useless against atmospheric pressures. They are also little use in gravity; the level of thrust provided couldn't do much more than knock an average man over against a pull stronger than 0.1g.

StarForces marines are equipped with faster-moving combat thruster packs, used for zero-g battles. A refillable air bottle good for about 100 meters of vector changes powers the pack.

There are "rocket packs", with dangerously hot backblast (as in "fission rocket" hot) and appalling amounts of thrust (imagine trying to fly an ejection seat). Aside from a minority of the "extreme sports" lunatics and StarForces commandos, no one in their right mind would willingly be strapped into one.

Coleman Bubble Tent: The bubble tent can provide shelter and air in hostile conditions. The tent provides 72 hours of air for one person, and proportionately less if additional people are inside. A 2.5 meter hemisphere, the tent can house two people comfortably or four people uncomfortably. It does not protect against vacuum, radiation, or variant pressures.

Designed for use in emergency survival situations, the tent can be inflated and sealed very quickly. Uninflated, the tent, small air tank and recycler system are about the size of a backpack. Larger bubble tents are available, and other life support equipment such as air masks or extra oxygen tanks, can be used to extend the air supply in a tent. The tent is not reusable once inflated.

G-Suit: A g-suit reduces the stress caused by high acceleration on the body. The pressurized g-suit chiefly keeps blood circulating normally, reducing the chance of a blackout or other physical problem during high-g maneuvers. G-suits are most often worn by fighter pilots, who are subject to tremendous g-forces as their agile ships maneuver wildly in dogfights. They are not normally worn outside of deployment conditions.

High-G Exoskeleton: High-g exoskeletons are a necessity on heavy-gravity worlds. It is almost a necessity for anyone moving around on a 2g or higher world. The titanium-alloy gear provides support to the skeleton and muscles, keeping the body upright and preventing injury in the intense gravity. Standard models are only helpful up to 4g; custom models usable at even higher gravities are possible but expensive. Each g countered by the suit is effectively +1d of Strength. In the high-g environment, this just lets the wearer act normally. If worn in a low-g environment, it adds to the Strength of the wearer. People with rare and debilitating neural conditions that are yet untreatable may have exoskeletons that allow them more or less normal movement in a standard 1g environment, and for species native to low-g environments, a 1g gravity field may be harsh enough to require an exoskeleton.

High-g exoskeletons can be worn over normal clothing or environment suits. They cannot be worn over armored e-suits, but a special high-g armored e-suit could be built.

An appropriate System Ops skill of at least +0d is required to safely use a high-g exoskeleton. Otherwise, all Agility tasks are done at -1d. The weight of an exoskeleton does not count as encumbrance to the person wearing it. Exoskeletons provide no armor protection, but will reduce all damage from impacts or falling by 1d.

OmniCorp Cold-Weather Suit: Designed for use on arctic worlds, cold-weather suits include an insulated full-body garment, glare-resistant goggles, hand and foot heaters, and respirators equipped to warm inhaled air. The suit also has a number of high-tech passive functions. The shoulders are small solar panels to recharge the faceplate defroster and optional GPS emergency beacon. Phase change chemical packs absorb sunlight when available, and release the heat when in the shade. Special pockets can be used to melt snow for drinking water. The cold-weather suit is rated to -50°C. E-suits under the cold-weather suit are recommended on planets with even lower surface temperatures.

Coleman Survival Kit: The survival kit provides a variety of items useful for roughing it on Earth-like worlds: nutritional supplements, water purification tablets, monowire saw, a foil survival blanket, a small book detailing basic things to do in emergency situations, and other basic survival gear. It is good for a -2 to the difficulty of any wilderness survival tasks for two days, and a -1 to the difficulty for an additional week.

▼ **MEDICAL EQUIPMENT** - The sophisticated medical techniques of the 23rd century are aided considerably by the existence of advanced healing technology. In the hands of a skilled physician, this equipment can work medical wonders.

Desaix Field Medikit: The field medikit provides basic supplies for first aid and emergency medical care. Proper use by a physician or medtech can keep even a seriously injured person alive long enough to reach a hospital or starship sickbay for more advanced treatment. It is the equivalent of a 20th century paramedic kit, but with more advanced equipment and supplies.

A field medikit allows a skilled user to make any sort of first aid or critical care skill roll at no penalty, perform emergency trauma surgery at +2 difficulty or prep a person for cryostasis if neither of the other options is a viable choice. A field medikit also contains a number of controlled pharmaceuticals, and this makes field medikits a restricted item.

Plastiskin: This artificial skin can be applied by a physician to cover burns or other injuries until the damaged tissues heal. It acts as a disinfectant, topical blood clotting agent, painkiller, and a protective sealant. It acts as a +1 to Health for recovering lethal hits if applied as part of a first aid roll. This modifier is in addition to any other modifiers except for complete hospitalization.

Baxter-Merck Sensor Bed: Sensor beds, standard equipment in hospitals and starship sickbays, constantly monitor a patient's vital signs. They also permit physicians to run an array of diagnostic scans without moving or disturbing the patient, a great benefit in cases of traumatic injury.

Sensor beds are crucial tools in 23rd-century patient care, but provide no medical treatment on their own. Results of the diagnostic scans must be interpreted and used by trained medical personnel to properly treat injuries or illnesses. A basic sensor bed simply provides a -2 difficulty to any sort of diagnostic task. In addition, a full sensor bed also gives the physician a +1d on their skill roll (like a Complementary Skill, **EABA**, page 2.7) to treat a particular problem identified on a successful diagnostic roll.

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OmniCorp Biostasis Tube: A biostasis tube can be used to place an injured or diseased person in suspended animation, keeping them alive during the journey to a more sophisticated medical facility. Many large starships have biostasis tubes for cases beyond the capabilities of shipboard care, and a standard sick bay usually includes one tube for emergency purposes.

The tube slows the metabolism to an extremely low level via a combination of drugs and very low temperatures. The process works *only* on individuals who are still alive, even if just barely. It can store the very recently deceased long enough for transport to a more advanced facility to attempt emergency resuscitation procedures.

On average, it takes about an hour to properly induce biostasis and is a Hard(11) task for a physician. For maximum safety, the process should be overseen by a medical professional. Retrieving someone from biostasis requires a physician and takes a few days, after which the patient will be quite weak physically. Successful retrieval from biostasis is also a Hard(11) task, but the physician takes penalties to their roll based on any injury penalties on the person being revived. Failing the task means the patient cannot be revived due to complications (but is not dead). Any subsequent rolls to revive them are at +2 difficulty.

Regardless of their state of health going in, a person recovering from biostasis is counted as being *at least* at a -1d level of lethal injury.

A biostasis tube is a bed-like apparatus with a sealed lid. Sensors in the apparatus monitor the status of the patient and dispense further drugs as needed to keep them in stasis. Stasis tubes usually have a backup power supply and can run for months without external power or resupply of drugs (assume it has a 1d+0 Strength radioisotope-based electrical generator).

Desaix Regeneration Tank: Regeneration tanks speed the body's natural healing process to make possible a faster recovery from serious injuries or illness. They also virtually eliminate the chance of infection. Expensive and bulky, regen tanks, as they are called, are found only in hospitals and the most advanced starship sickbays. Personnel and supplies for a regen tank normally run about 200 Credits per hour of use, and even one that is inactive goes through about 100 Credits of consumables and maintenance per day. A regen tank that has been powered down will take several days of preparation before it can be used.

A vat filled with nutrient chemicals and extracts made from a lichen found only on Hachiman (page 3.22), a regen tank requires nearly constant medical supervision (a Hard(11) roll each day) for maximum efficiency. Patients are fitted with a blood oxygenator and suspended in the tank, where they spend the next several days healing. Most patients sink into torpor as the body focuses all its energy on the healing process. After emerging from regen, patients who have suffered severe injuries may require physical rehabilitation to adjust to their regrown joints, tendons, and muscles.

Despite its name, a regeneration tank cannot regrow limbs or organs that have been severed or totally destroyed. In cases of massive tissue loss, the tank can enhance healing of the wound but that is the extent of its usefulness. Cybernetic or cloned replacements are available in most cases. A regen tank under proper medical supervision gives the patient up to +3d on their Health roll for healing purposes (up to double their uninjured Health). A regen tank can also undo some but not all of the effects of radiation sickness (see page 9.9).

▼ **MILITARY EQUIPMENT** - The StarForces and some planetary militias have access to classified and/or military equipment not sold to the general public.

Ares Combat Helmet: Frightfully expensive but awesomely effective, the combat helmet gives StarForces Marines a vital extra edge on the battlefield. Combat helmets are standard-issue equipment for Marine ground forces.

Along with glasteel armor protection, the helmet provides an array of enhanced sensory and communications gear to aid troopers.

A secure video-radio uplink allows officers and the command staff to see exactly what the soldier does, and permits video conferencing in the field. The helmet also continuously transmits medical data about the soldier to command and control personnel. All video and radio communications are real-time encrypted by an onboard computer. In time, they can be decrypted, but by then events have usually outstripped any data recovered. Each helmet can also act as a communications network node, and can route communications to or from a helmet that is out of normal range of the other party. To avoid network clutter, most data and other communications have to follow the normal chain of command unless there is an emergency. For instance, information from a squad goes to the squad leader, which goes to the platoon leader, and so on.

The faceplate, polarized to protect the eyes and tinted to protect from laser blinding effects, also provides low-light capabilities, digital contrast enhancement of visual images via the onboard computer, and up to 20x magnification (negates darkness penalties and provides -4 difficulty to visual Awareness tasks if a major action is used). A global positioning satellite uplink and heads-up navigation display keeps marines on the right track. It also relays information about each trooper's position to his fellow soldiers and commanders, reducing the potential for friendly fire incidents. Information from battlefield surveillance cameras can also pinpoint and display enemy positions. A laser detection feature picks up scatter and stray reflections from difficult-to-spot laser fire, informing the trooper through a heads-up display of the probable location and frequency of the fire (-4 to difficulty of locating a laser source).

▼ **RECREATION EQUIPMENT** - Not all advanced technology serves a life-or-death purpose. People in the 23rd century like to have fun, too, and the right gear can make taking it easy a lot more enjoyable.

Zero-g Wings: Zero-g flying has become a popular sport on starbases, space habitats, moons, and other places with little to no gravity. Participants don wings and glide through cavernous chambers filled with air. Their low body weight due to the minuscule gravity allows the wings to keep them aloft. Turbine-generated updrafts help fliers climb to higher altitudes to continue gliding.

Zero-g wings are relatively expensive for casual purchase, but most flying chambers have wings for rent at reasonable prices. Zero-g wings require a special Agility skill to use, and allow the wearer to fly at walk, run or sprint speeds using normal movement rules. In fractional gravity environments the wings will allow a lateral glide each turn of half the Strength bonus for that gravity (see [page 9.5](#)).

EXAMPLE: A .1g environment is an effective +10 to Strength, so you could glide a distance of +5 for each meter dropped.

▼ **SECURITY EQUIPMENT** - A number of high-tech tools exist to help security personnel in their work.

OmniCorp DNA Scanner: A virtually foolproof technology for checking identities, DNA scanners compare DNA sequences to those recorded in their memories to confirm identities. The scanner samples skin cells from a thumb- or palm-pad to run the analysis, which takes approximately one minute to complete; less efficient but faster devices (such as retinal or voiceprint scanners) are sometimes used in high-traffic areas. A DNA scanner can only confirm identities of people whose DNA patterns are already stored in its memory, although the pattern of an unknown person could be recorded for later comparison against data from other sources, such as police files. Because DNA samples are fairly easy to come by, most commercial transactions usually involve multiple identity checks. For instance, a credit or debit card might have a DNA pattern encoded, along with a unique ID number that is on file with the credit provider. A person makes a purchase by using their card and verifying it with a DNA thumbscan. Only if the two DNA patterns match *and* the ID number is verified will the transaction go through.

A DNA scanner provides an automatic identity verification if the sample is taken correctly. The only way to subvert the system is to hack into the database of DNA patterns, the difficulty of which depends on the system (but is generally very high).

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SecDyne Retinal Scanner: Patterns of tiny blood vessels inside the eye are unique to each person, and a nearly failsafe way to check identities. A retinal scanner compares this pattern to the ones in its storage banks, confirming the identity of the person being checked. Corporations, governments, and the military often use retinal scanners to control access to secure facilities, computer stations, or data. As with DNA scanners, retinal scanners are usually used in combination with some other means of identification, like requiring a an ID number on a keypad, or some other means that is fundamentally different than the primary scan.

A retinal scanner cannot determine the identity of anyone not in its databanks. An electronic simulation of an eye, one altered through microsurgery, or a dead eye could be used to try to fool a retinal scanner, although the difficulty may be increased depending on the skill of the forgery and the sophistication of the device.

A retinal scanner is a Heroic(15) task to try and spoof with any sort of countermeasure skill.

Gladius Voiceprint Scanner: A voiceprint scan analyzes the unique vocal pattern of a person, matching it to a stored pattern, to confirm an identity. Voiceprint scanners do not always give the correct result, however, as changes in health, emotions, and other factors between the live and stored samples can result in a pattern mismatch. Voiceprint scanners usually require the user to repeat a randomly generated phrase (to prevent a simple playback of previously recorded speech).

Easier to trick than a retinal scanner, voiceprint scanners are sometimes used to control access to low-security areas, or in cases where a corporation or agency opts for a lower-priced, if less secure, alternative. A voiceprint scanner has a bonus to detect recorded or synthesized voices, depending on the technology of the scanner and the skill used to create the fake voice. At the gamemaster's option, a skill vs. skill roll can be made if adventurers try to bluff their way past a voiceprint scanner with any sort of natural mimicry ability.

It is a Formidable(13) task to spoof a voiceprint scanner with natural mimicry. It is +2 difficulty to do it with a synthesized voice. If a valid user has suffered an injury or health condition that affects their voice, they have to make an Easy(5) Health roll to have the scanner accept them as a valid user.

Aegis Voice Stress Analyzer: A voice stress analyzer provides readouts on minute changes in vocal inflections due to stress, fear, or emotional undercurrents that can indicate attempts at prevarication. In the hands of a skilled investigator, it can be used to detect probable lies, evasions, or half-truths by the person being questioned with a much higher degree of reliability than galvanic skin response lie detectors.

A professional voice stress analyzer provides a -3 to the difficulty of skilled interrogation. Note that an adventurer with Experience (**EABA**, page 2.13) in "being interrogated" can counter this penalty.

▼ **SENSOR EQUIPMENT** - These technological devices expand and enhance human senses, providing people better, more detailed information about their surroundings. Most sensing equipment operates in one of two ways. The first is that it gets a "skill roll" to do automatic tasks. An automatic door opener at the supermarket is a sensor making an automatic scanning roll. The second way is that it gives a bonus to a skilled user, decreasing the difficulty of a particular task.

In general, each 1d+0 of skill roll the scanner has is worth a -1 to the difficulty of a task performed by a skilled user. A sensor that is limited to a 180° arc of operation gets a +1d bonus to its unattended scanning roll, one limited to a 60° arc gets a +2d bonus, and one that has to be aimed at a particular item before a scan can be made gets a +3d bonus.

EXAMPLE: A "bug detector" with a skill roll of 2d+0 for unattended use would give a surveillance tech a -2 to the difficulty of finding eavesdropping devices. The same size detector which is highly directional would have a 5d+0 roll or would give a tech a -5 to the difficulty of finding eavesdropping devices, but it would take far longer to scan an area, since every square centimeter of the room would have to be manually scanned, whereas the less capable scanner could pick up anything in its vicinity.

Diagnostic Scanner: Handheld medical diagnostic scanners use ultrasonics to generate sonograms aiding physicians in diagnosing broken bones, internal injuries, and other medical problems in the field. The equipment consists of a small, tube-shaped scanning device and a separate display pad to which the data is transmitted. Diagnostic scanners can also be used by scientists in other fields. Most small diagnostic scanners can operate with a 2d+0 skill roll to passively detect something appropriate to that type of scanner, or to provide a -2 difficulty on tasks when a person uses the device. Examples of diagnostic scanners might be metal detectors, medscanners, radiation counters, air quality monitors, and so on. The Desaix Field Medikit has a suite of medical scanning devices (a medical multiscanner) built into its case.

A multiscanner is a detection-optimized micro-processor that is designed to accept a variety of input probes. It has the computing power to interpret information and a display for showing the results, but a separate scanning probe is required for each type of detection.

Digital Binoculars: Digital binoculars utilize high-quality optics and advanced electronics to present an exceptionally sharp, magnified image. For an extra cost, these binoculars can also have thermal, low-light, recording and dataport capabilities. Digital binoculars counter up to 6 points of range difficulty when used as a major action for sight Awareness rolls.

Motion Detector: A handheld motion detector picks up disturbances in air currents, temperature and pressure to register and localize nearby movement, with threshold settings so things like insects and rodents can be ignored. StarForces Marine Corps squads sometimes use handheld motion detectors to track enemy movement. Efficient use of these detectors requires a Systems Operation roll by the user to ignore false or confusing readings caused by air vents or movement, for example. Any motion by the user adds to the difficulty of tasks with the device. A motion detector provides a 2d+0 Awareness roll to localize the position and movement of any unseen but moving item. A completely stationary but inert item will not register, but heartbeat and respiration are sufficient to trigger the device at maximum sensitivity settings.

Science Field Kit: A science field kit provides basic equipment for a specific science, like containers for collecting specimens of plant or animal life, reagents for running simple chemical tests, and performing other science-specific checks. It allows basic tasks for a *specific* science skill to be performed at +2 to normal difficulty, when otherwise they could not be performed at all.

▼ **TOOLS** - Workers, technicians, and others in the 23rd century have access to all kinds of tools and other equipment designed to help them carry out their jobs.

OmniCorp Cargo Exoskeleton: Commonly found in warehouses, starports, and starship cargo bays, the cargo exoskeleton allows workers to easily lift, carry, and store heavy crates. The 23rd century equivalent of a forklift, cargo exoskeletons are slow and cumbersome but capable of handling loads up to 1,600kg. Even more powerful, and more expensive, exoskeletons are available.

Some cargo exoskeletons are equipped with cutting torches and other tools. A System Ops skill is required to safely use a cargo exoskeleton, though some professions will naturally include this as part of their training. For instance, a StarForces damage control tech or flight deck worker probably has this as part of their particular System Ops skill, while a starport cargo handler or construction worker probably learns it as a separate skill. The weight of an exoskeleton does not count as Encumbrance to the person wearing it.

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A cargo exoskeleton provides the user with a 7d+0 Strength roll and 1d+0 Agility roll. This low Agility can be adjusted up to 2d+0 by spending extra time for doing delicate actions. Note that the low Agility of the exoskeleton means the maximum Agility-based skill roll it can do is 2d+0. The exoskeleton also fills three hexagons of space and is three meters tall.

Robot Repair Kit: A robot repair kit contains specialized tools for fixing the most common damage to robots, removing or adding industry-standard hardware modules, and so forth. It counts a minimal repair tools for robotic or exoskeleton repair work.

▼ **DRUGS** - Advances in chemistry and medical science, not to mention the discovery of bio-compatible alien life on many worlds, have fostered creation of many new drugs, medicines, and poisons. Some are entirely synthesized, while others are harvested directly from otherworldly plants or animal life.

While medicines are treating, preventing, or curing many 20th-century ailments, 23rd-century physicians must also handle medical problems that were non-existent or restricted to a tiny segment of the population in the past, such as spacesickness.

Anti-Spacesickness Patch: An anti-spacesickness patch alleviates the nausea experienced by many people during their initial exposure to weightlessness, or for those who suffer the problem on a chronic basis. Medicine in the patch is absorbed through the skin into the bloodstream. Anti-spacesickness patches are available over the counter and do not require a prescription.

For adventurers who have the Weakness of Spacesickness, a patch will offset 2 points of the 1d penalty on Health, but at gamemaster option may cause a 1 point penalty on Awareness or Agility.

You can't even go to some parts of New Detroit any more. Street gangs, criminals, thugs hopped up on jennies - they're everywhere. It's just not safe.

- Midori Toyotomi, programmer, 2236CE

Advances in pharmacology aren't limited to beneficial drugs. Underworld scientists have turned their efforts toward producing ever-more powerful and addictive illegal drugs.

JN-1293A: A synthetic drug, JN-1293A most commonly appears in the form of pills known on the street as "jennies". Jennies give an increase in energy, a feeling of euphoria, and heightened perception. Typical side effects include agitation, paranoia, and violent behavior. Long-term use can result in psychosis. Psychological addiction to JN-1293A sets in after about a week of regular use, although this varies from person to person.

Jennies provide a 0d+1 boost to Awareness and Health for several hours, and have no particular side effects when they wear off. They are somewhat psychologically addictive. Any time the user gets tired or feels they need a boost, they have to make a Will roll with a difficulty of the number of jennies they have taken in the past month. If they fail, they take another jenny. If none are available, scoring more becomes a priority, and if money is not available, getting some becomes a priority.

My sister got hooked on moods. Now she spends all her time blissed out, sitting on the couch in our apartment smiling at nothing. She forgets to eat, and don't even get me started on hygiene. Those moods will turn you into a zombie if you're not careful.

- Jalil Shekhar, EarthPort dockworker, 2235CE

Moods: Moods are enhanced, illegal versions of synthetics originally created to aid in psychiatric care of mental illnesses based on a chemical imbalance. Unlike their medical counterparts, which gradually correct an unbalanced emotional state over a period of time, moods are used to induce a desired emotion for a relatively short time.

Moods are typically sold as colored capsules, with each color corresponding to a particular emotion. Some of the more popular varieties include bliss, sorrow, vigor, rage, and passion. While moods are not physically addictive, frequent users can become psychologically dependent, relying on moods to artificially regulate their emotional state to the point of becoming incapable of experiencing normal emotions without chemical assistance. Moods usually act as a temporary Weakness on Will related to the emotional state they are supposed to induce. For instance a "rage" mood would reduce your Will for controlling your temper, or a "passion" mood would reduce your Will for seduction purposes. This is in addition to naturally feeling the state generated by the mood. The short-tempered person is looking for an excuse to get into a fight, and the passionate person is "looking for love". They are addictive in the same way as jennies, though failing the Will roll for addiction simply means the user "goes into a funk" and takes a general -1d penalty to Will for several hours.

Psi Boosters: Illegal psi boosters can temporarily enhance a psi power, at the risk of burning it out for a time. Psi boosters have no effect on non-psions; they can only increase the power of pre-existing psionic abilities. Psi boosters have been known to induce psychotic episodes in some cases.

Psi boosters act as a Forte on Fate for one particular psionic ability. Since psi boosters are illegal, there is no oversight on the quality, and impurities in any sort of neurochemical cocktail can have unforeseen effects. More details on psi boosters are on [page 5.61](#).

Poisons - Many alien lifeforms use toxins for defense. Some are effective against humans, and can be harvested for use as poisons.

Bloodrust: Derived from the deadly toxin of a plant native to Loki in the Epsilon Eridani system, bloodrust is a powerful coagulant. An injected poison, it causes death via the uncontrolled clumping of blood cells throughout the body, halting circulation of blood to the brain, and causing heart seizure as the muscle strains to pump thickening blood through the body.

Bloodrust is resisted with a Hard(11) Health roll. Making the roll means the victim takes 1d+0 lethal hits. Failing the roll means they take 2d+0 lethal hits. The first roll is made one minute after the toxin enters the bloodstream, and four more rolls are made at the end of each minute after that. All of these hits are counted as crippling hits for healing purposes.

I bought an OmniCorp Repair Bot last year for my ship. It was a big help, so one day I ordered it to fix a glitch in the drive while I hustled up some cargo. Big mistake.

Best I can tell, it couldn't figure out exactly what the problem was, so it started replacing parts at random. I suppose if I hadn't caught it, the damned thing would have rebuilt the whole drive.

By the time I got back to the ship, it had used up most of my spare parts stores. Last time I ever leave a robot unsupervised.

- Magdalene Koumoundouros, free trader, 2237CE

▼ **ROBOTS** - The sophisticated robots of the 23rd century are invaluable tools for handling routine chores and assisting with more complex jobs. Robots are highly reliable at simple, repetitive tasks such as parts assembly, crop-picking, or cleaning. More complex jobs, such as repairs or mining, require complicated decision-making that exceeds their capacity. While robots can be exceedingly helpful to humans performing these tasks, they are really not suited to performing them unsupervised.

Robots are a classic element of science fiction stories. While robots in the **Fires of Heaven** universe may lack the anthropomorphic forms or quirky personalities of other robots, they are still more than mere background scenery.

In practical terms, robots are an invaluable aid. They can handle many everyday tasks on their own, giving characters more time for adventure. Robotic assistants can also provide bonuses to skill rolls, in some instances spelling the difference between success and failure.

Robots lend an unmistakable high-tech feel to the game. Their logical, if limited, thought processes can lead them to behave in unexpected ways, which can be played for comic relief. Robots gone berserk due to faulty programming, tampering, or damage can be extremely dangerous, on the other hand.

While at least simple robots are within the economic reach of most people, they are still fairly expensive and thus something of a status symbol.

Some adventurers may become quite attached to their robot companions. In fact, many people name their robots to make them seem more human, or at least less coldly technological.

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Robots and laws - Mounting weapons of any sort on a robot violates United Worlds law. Robotic weapons other than things like fire-and-forget missiles were outlawed after the Biotech Wars due to abuses and atrocities. In addition, the basic program of every robot strictly prohibits it from harming, or through inaction allowing to be harmed, any sentient being.

Given the limited intellectual capacity of 23rd-century robots, these strictures are fairly basic in their application. Sentient beings are defined via shape recognition as humans, Nutoa, D'eira, Jodoni, and Vorn - robots have no ability to ascribe sentience to other lifeforms. The programming for avoiding harm by action or inaction is likewise crude. A robot cannot evaluate the long-term effects of its actions, but, for example, can recognize that dropping a one-ton platform crate on a human will probably kill them.

The core program of every robot prevents it from taking action that would harm a sentient being, even if so ordered. This is based mostly on:

1. Recognition of a sentient being
2. Ability to calculate kinetic energy
3. Ability to plot trajectories
4. A database of harmful substances
5. A database of substance interactions

A robot could calculate the energy and trajectory of a grand piano, and thus would not drop it where its trajectory and a person's trajectory would intersect. A robot gardner would never deliberately harm humans, but if someone filled a container with nerve gas and put it in a container labeled "liquid fertilizer", the robot would have no idea about the harm it was about to cause, nor recognize that its actions were the source of the harm. Malfunctions or damage may cause a robot to go berserk; instances in which robots have injured or killed people are quite rare, but not unknown.

The core program also requires a robot to obey all orders given by its controller, save those that conflict with the rules against harming sentients. These rules and prohibitions on weapons have been and continue to be broken and subverted, though it is fairly rare.

Form & function - Depending on their function, robots take many different forms. Bipedes, cylinders, globes, cubes, often with multiple arms or other appendages appropriate to the robot's job, are most common. There are no androids, or human-appearing robots.

Frugal adventurers may decide to purchase used robots to save on money. Most dealers have a few used or obsolete robots for sale. Some bargain buys may not be in perfect working order - the gamemaster may add some known or hidden glitch to the write-up. Prices for used robots vary greatly depending on quality, but in general range from 50% to 90% of the price for one bought new.

Basic robots follow orders given by vocal commands or via handheld controllers. A robot can be ordered not to respond to vocal commands except by authorized users, but otherwise it will accept orders from anyone who speaks to it. An optional voice recognition module or badge scanner allows a robot to recognize and respond only to orders from certain individuals.

Due to their logical thought processes and built-in programming, robots may interpret orders in ways other than intended. In particular, open-ended or ambiguous orders can inspire odd results. A robot presented with confusing orders or a situation not covered by its program must make an Awareness roll. Success indicates the robot correctly resolves the problem. A failed roll causes the robot to stop to await new orders or proceed on a false presumption, possibly with costly or even dangerous results.

Damaging Robots - Robots are counted as vehicles. They take no non-lethal hits and have an armor rating and possibly a damage limit, just like any other vehicle. A robot *definitely* stops working when it loses all its Hits, but will suffer performance losses before this happens, and if vehicle hit locations are used, may suffer other effects. For an autonomous vehicle like a robot, a "passenger" hit indicates possible damage to the computer brain that controls the operation of the robot.

Robot power - Robots operate much as a vehicle. They have an on-board fuel or energy supply that is good for a certain duration. Most robots are electrically powered and are smart enough to seek a recharging station when not performing other tasks or if their energy reserve drops below 20%.

Programming - Robots are typically designed for a certain task or suite of tasks. While their computers may be standard models that can accept any type of robotic programming, the form of the robot will affect how well it can do a particular task. One doesn't want a heavy cargo bot trying to make pizza or clean your dishes...

Within the realm of "common sense" Awareness tasks, robots typically have rolls of $2d+0$. If you ask a robot what time it is, it will know. If you ask it for directions to someplace in its database, it can tell you. Whether or not it will give you the time of day or tell you where to go depends on the interaction defaults the owner programmed into it.

For doing generalized tasks within their main programming, robots would have a total skill roll of $3d+0$, and for *specific* aspects of that programming, they would have a total skill roll of $4d+0$. What the robot does if it fails a skill roll depends on whether it can figure out that it failed, and the orders it was given.

Writing new software for robots is not a trivial task. At the moment, most of the robot software is written as a collaborative effort between human programmers and AI's.

Sample Robots - These are some of the more commonly found commercial robots in the United Worlds.

OmniCorp Heavy Cargo Bot MHC-3: One of the largest robots on the commercial market, the OmniCorp MHC-3 has raw strength and durability to perform just about any cargo-loading task required. Capable of lifting 6,400kg, this robot can stow or offload almost any cargo conceivable. It has a usable lifting Strength of $9d+0$, and manipulators suitable for all UW-standard cargo containers. Its armor of $3d+1$ is sufficient to withstand minor mishaps ($2d+1$ against modern weapons), and it has 14 Hits and a Damage Limit of 5. It travels at a leisurely 4m/sec and because of its potential to do inadvertent harm, has a very sophisticated set of "do not run over people" sensors and software routines.

Typically found at starports, warehouses, and other heavy-use facilities, the robot consists of an extra-heavy chassis and professional cargo-loading software. Ships needing service typically download hold specifications to the port authority, and the cargo-moving robots automatically figure out the best loading, unloading and packing strategy for that particular hold and cargo manifest.

OmniCorp Repair Bot RMC-2: The OmniCorp RMC-2 has become standard equipment on many starships, space habitats, and just about anywhere else repairs are frequently needed. The robot consists of a standard chassis equipped with tracks, a selection of tools and repair software. In this configuration, two hardware ports and one software slot remain open for further customization as the customer desires.

It has a usable lifting Strength of 3d+0, one large manipulator and one small one. Its armor of 2d+1 is sufficient to withstand minor mishaps (1d+1 against modern weapons), and it has 8 Hits and a Damage Limit of 7. Top speed varies with chassis type. A wheeled chassis moves at up to 7m/sec, and the tracked one at up to 4m/sec. The tracked version can be bought as "outdoor" or "indoor", the difference being that the latter has non-marring synthetic pads on the treads and electromagnetic inserts to allow moving on hull plates in zero-g conditions (at up to .2g acceleration). For zero-g, full-vacuum use, a gas thruster module is available (one hundred 1m/sec vector changes).

While technically capable of carrying out simple repairs on its own, a repair bot works best as an assistant to a human engineer. An RMC-2 is considered one person with adequate tools for any repair task it is equipped and programmed for.

Wexler CleanBot: A staple throughout most of the United Worlds, the popular Wexler CleanBot efficiently and thoroughly keeps any home, office, or starship sparkling clean. The robot combines an extra-light chassis with a cleaning hardware module (complete with telescoping arms), and a professional software bundle.

It has a usable lifting Strength of 2d+1, one large manipulator and one small one. Its armor of 1d+1 is sufficient to withstand minor mishaps (1d+1 against modern weapons), and it has 6 Hits and a Damage Limit of 6.

The bot is typically sold as a basic chassis, with mobility and cleaning tools and programs for a particular environment. For instance, a carpeted office would require quite different options than a model configured for a spin-habitat starship. The robot is flexible enough to change its own attachments if bought with multiple sets. Cleaning bots are extremely common and people tend to pay them little notice. Normally, they will not clean an area that is occupied, both to avoid disturbing occupants and because of privacy considerations.

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▼ **COMPUTERS** - Computers are an indispensable part of 21st century life, and are likely to be no less critical in the future. Talking super-computers, complex computer networks, and so forth are all staples of the science fiction genre. Of course, computers play a central role in cyberpunk-flavored science fiction, but they are also important (even if as nothing more than a background element of the setting) in mainstream science fiction stories.

Aside from handling many of the boring chores associated with everyday life (leaving more time for adventure) computers can provide ready access to enormous amounts of knowledge. For example, adventurers pursuing a mystery can turn to global computer datanets to hunt up useful information pertaining to the person, place, object, or event in question. **Author note:** *As someone who grew up having to use libraries, phone calls and the postal service to get research material, people who have only ever had to use the internet have no idea how good they have it...*

In addition, computers and those who can use them to good effect are excellent complements to an adventurer's skills. A little computer assistance can spell the difference between a failed skill roll and a successful one in many cases.

Computers are an essential element of life in the 23rd century **Fires of Heaven** universe. In space, computers are vital for maintaining the delicate balance of environmental systems needed to sustain life, not to mention assisting astrogators with the meticulous interstellar jump calculations that make interstellar travel possible. Computers also oversee automated factories producing the technological wonders of the era, manage traffic control systems in core-world cities, handle financial transactions, disseminate information via world-wide datanets, and perform a million other tasks necessary to keep United Worlds civilization functioning.

Computers are also inextricably woven into the daily lives of federation citizens. People wear wristcomps to keep their schedules, use datapads as mobile personal computers, and rely on household computers to regulate home environments. Computers passively route their calls, monitor their vehicle's performance, process credit transactions and a host of other tasks that go on seamlessly behind the scenes, 24 hours a day, 7 days a week.

Optronic computers, based on pulses of light rather than electricity, are the norm in the 23rd century. Capable of phenomenally fast calculations, modern computers rely on light-activated crystalline memory cores with information-storage capacities rated in terabytes. Crystalline cylinders known as dataspikes are used for temporary information storage; blank dataspikes cost 10 Credits, while preprogrammed dataspikes cost 50 to 500 Credits depending on the program, with popular games averaging 50-100 Credits.

Quantum computers operate on entirely different principles, and are not used for most day to day purposes. They are, however, extremely effective at solving certain probabilistic functions very rapidly, and most starship jump calculations are done by quantum computers if the ship's owner can afford one.

As a rough guide, general-purpose processors will have a certain rating in dice, which can be used for any applicable skill a program is available for. A computer whose hardware is optimized for a particular skill will have a rating 1d higher for a package the same size. Doubling the number of computers linked together for a particular task provides a +1 to the roll (times 8 for a +1d to the roll). Quantum computers can get the "Larger than life" Trait. This subtracts 1d from its overall roll, but allows it to keep the "best four" instead of "best three".

Computers performing tasks unattended would operate much like sensors, using their dice against the difficulty of the problem assigned. Used with an appropriate program by a user, they would give a -1 to the difficulty of a task per 1d+0 of skill roll, like a fast computer running a graphics program in the hands of an artist.

Computers in Play - Most computers can be operated via keyboards or voice activation systems. Powerful interaction programs enable 23rd-century computers to decipher complex instructions or ask appropriate questions to untangle incomplete or contradictory commands. These user-friendly features mean that almost anyone can use a computer. Programming, reprogramming, or breaking into a computer requires the Computer Programming Skill.

WristComp: Worn on the wrist like a watch, wristcomps are handy devices for keeping schedules, appointments, names, vidphone numbers, datanet addresses, and the like. They are voice-activated and can display data on a small viewscreen or read it aloud in a computerized voice. Many people in the business world own wristcomps to help keep track of their busy schedules. Some prominent manufacturers of wristcomps include OmniCorp and Nova Electronics. WristComps generally have a rating of 1d+0. High-end personal communicators will usually have WristComp capabilities.

Datapad: Datapads are personal computers approximately the size of a clipboard. They are phenomenally faster and possess orders of magnitude more memory storage capacity than their 20th-century predecessors. A datapad consists of a flatscreen and keyboard, although voice-activation capabilities are standard on most models. These compact computers also have a dataspikes drive and wireless comm capability for connecting to a datanet or other computer system.

Lightweight and convenient, datapads are used for most personal computing needs in the 23rd century. Datapads generally have a rating of 3d+0 to 4d+0, depending on how much you want to spend on the unit.

Household Computer: Sophisticated computers are integrated into the design of most core-world houses and apartments. These computers regulate the environment to suit residents, monitor home security, access entertainment, and perform other useful chores.

A typical household computer, found in almost any core system residence whether it be a country cottage or a suite in an orbital space habitat, is equipped with a basic security system that monitors air currents to detect motion when the occupants are not at home. This system can be adjusted to ignore household pets, if any. More extensive security arrangements can be purchased as accessories to the basic model.

Household computers are usually a home's personal computer(s), wired or wireless terminals used to access its functions (instead of having a desktop CPU). Household computers generally have a rating of 5d+0 to 6d+0, though older models in lower-income housing may be as low as 4d+0.

Ship computers: Starships will have computers ranging in sophistication from that of a datapad to that of a university supercomputer cluster. It really depends on the size and role of the ship. A ship's computer is part of its bridge hardware, and is included in that cost. Normally, the rating of this computer will be 1d+0 for each level of size the ship has (so a size 6 hull will have a 6d+0 computer). The normal maximum rating of a ship's computer is 8d+0. Each +2d it would have after that counts as a level of "Larger than Life".

EXAMPLE: A size 10 hull would have an 8d+0 computer that uses "best four" instead of "best three" for its skill rolls.

A military bridge has a +1d rating, but this really just means it can apply a normal rating to more than one task at no penalty. So a size 6 hull with a military bridge also has a 6d+0 computer, but it can be 6d+0 for more than one thing on any given turn, unlike a civilian bridge, which takes a penalty if it splits its effort. The rating of a ship's computer is for *ship-related* tasks. It is 1d less for general tasks.

A ship's computer of the appropriate level of capability, running the program suite for that ship, is *required* in order to perform the astrogation calculations for that ship at the levels listed under Astrogation skill (page 5.15). A Post-Atomic Era bridge is assumed to have a quantum computer add-on for its jump calculations.

AI's - An AI, or artificial intelligence, is a self-aware computer, a digital sentience that occupies a unique place in U.W. law. An AI has many of the rights and privileges of a federation citizen, but is also limited in ways that ordinary citizens are not.

AI's are generally not creative. While sentient, they lack the intuition or hunches or "fuzzy thinking" that lets humans and other races come up with innovative solutions to problems. For instance, no one has managed to successfully create an AI that can manage an automated asteroid mine. Also, the personality of an AI is limited so that it follows the same guidelines as programs for robots. That is, it cannot harm a human or act in such a way as to result in harm to a human. This places it in a subservient position. AI's may not be physically connected to any type of weapon system. Starship AI's are quite physically separate from all targeting and weapon systems, and may also be physically disconnected from other systems with relative ease.

AI's can be bought and sold, and do not have to be paid for their services (though they often are). However, AI's cannot be deactivated without their consent.

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All of these add together to make AI's a sort of high-tech slave, one which is programmed to not resent this status, but which is kept away from anything dangerous...just in case.

AI's are shaped and limited by the capabilities of their hardware. When an AI is first activated, the neural configuration it generates is unique to the fairly substantial computer it resides on. While extra memory can be added and processing capability somewhat upgraded, that hardware is the AI. It *cannot* be "backed up" and moved to a different computer. The information can be archived, but it will generate a different personality of AI if installed on different hardware. It will no longer be the same individual. Since AI's cannot be deactivated without their consent, there are some AI's on ancient hardware and there is an entire subset of law devoted to the maintenance and powering of unwanted AI's.

An AI is composed of a number of interlinked components. First is its "hardcore", the instructions written into a read-only memory. The hardcore is effectively the DNA of an AI. It is not self-aware on its own, but the seed from which the consciousness of the AI grows, through which most of its instructions and thoughts eventually pass, and thus is highly influential on the AI's personality. All the limits and prohibitions against harming sentient beings reside here. The AI cannot function without its hardcore.

Second is the AI's neural net. This is a special bio-optical memory medium that is designed to be cross-linked and connected, much like the neural patterns of the human brain. Unlike the memory in a dataspikes or most other computers, this memory is *not* perfect. It has just enough error and noise in the system to force the AI software to constantly update itself, repairing and rerouting lost or damaged neural links. This noise and constant updating is what makes the AI an AI. It *has* to learn and adapt in order to survive.

Last is conventional optical memory, lots and lots of the same memory as used in personal computers or dataspikes. The AI accesses factual memories and information that needs to be perfectly stored and recalled from this memory. Any sort of knowledge can be loaded into this conventional memory, allowing the AI to recite by rote any sort of stored data. However, the ability to integrate this information into its psyche and use it in a skilled manner is done much the same as it would be for a person. *Practice*.

Building and using an AI - AI's can be bought as fully fledged personalities, or bought as "neonates", a set of hardware and software that develops into an AI once activated. An AI will usually have a self-Awareness of one-quarter the rating of a normal computer (round to nearest $0d+1$), for quadruple the monetary cost, and can have a *total* skill suite of about eight times its Awareness (round to nearest $1d+0$). The minimum rating of a computer that can become an AI is $6d+0$ (which makes it Awareness of $1d+2$ with a total of $+13d$ of skills). To make things simple, a starship can have an AI if it spends double the cost on its bridge. The AI takes little extra space and is considered part of the bridge hardware, except it is usually protected inside a small vault with $6d+0$ armor and radiation protection.

EXAMPLE: A $9d+0$ computer would be a $2d+1$ Awareness AI, and could have a total of $19d+0$ in skills. Since it has an Awareness of $2d+1$, none of the individual skills can be higher than $+2d$ each.

The limit on skills represents the capacity of its bio-optical neural net. Once this is full, there is no room to learn any new creative abilities. The AI can choose to erase part of its ability, but it usually will not. An AI that has filled its possible skill set is said to be 'fully mature'. A fully mature AI's personality and attitudes are unlikely to significantly change. A fully mature AI can learn new information by accessing new data, but the way in which it processes that information will not. *It has become an old dog that can no longer learn new tricks.*

A neonate AI will mature from being unaware to being fully aware and having one skill at $+1d$ in about a week (this skill will be based on how it was "raised"). Its personality develops extremely rapidly in this period, and so the owner/parent really should be there during the process. There are numerous guides and how-to manuals for how to get the AI personality you want, but it is still an art rather than a science. After this rapid maturation, an AI can gain experience at the rate of $1S$ per week for anything it chooses to put its mind to. Its personality will also evolve as it gets older and wiser. The only limits on an AI's skills are those related to behavioral limits as regarding interactions with sentient beings. AI's also have an inherent Weakness on their Awareness for any skill that relies or includes 'intuition'. AI's are really good with numbers, but if there is any sort of subjective 'feel' or 'gut instinct' to the use of a skill, AI's will be weaker at it than a biological sentience. Figuring out jump calculations happens to be such a skill, despite astrogation's math-heavy nature.

So, AI's make great course plotters for in-system travel, but they are lousy at doing interstellar jump calculations.

AI's are entirely Awareness, but they can have non-Awareness skills. A ship could have its repair bots under control of the ship's AI, and use Agility-based skills through the repair bots.

For purposes of making tough decisions, an AI will have a Will equal to its Awareness. AI's do not have Fate, cannot use Fate to alter their rolls, and do not have psi powers (though the biological component of their neural net might *theoretically* be infected with Ethereal spores). The prohibitions against harming sentient beings would be a $+10$ difficulty in ever performing such an action.

AI's and the law - Some specific notes about how AI's interact with the biological sentiences of the U.W. AI's are legally on par with the children of a citizen. As long as the citizen claims 'parentage', the AI is under their control. An 'owned' AI may be sold, though the AI may lodge a protest with authorities if it objects to the new owner or feels it may be mistreated. An AI may be confiscated from its owner if it has been abused or mistreated. Keeping an AI from access to public comm channels is considered serious abuse, and owners who have done this have been jailed for lengthy periods in some cases. Owned AI's may own property or have bank accounts, much as children might, but this is under the overall "guardianship" of the owner. An owned AI is not legally responsible for its actions. The owner is, much as a parent can be held financially liable for damage done by a wayward child. If an AI has a behavioral problem that the owner cannot or does not want to deal with, and no buyer can be found, the AI can be emancipated or donated to the U.W., which has a small bureau that rehabilitates the small number of artificial 'problem children'.

An AI's owner can at any time emancipate the AI by filing the appropriate forms and meeting certain conditions regarding the support and maintenance of the AI. Mainly, the AI has to have sufficient funds to pay for its storage and upkeep for several months (about 5,000 Credits) and have a steady, paying job available (which *could* be working for its previous owner). An emancipated AI is *almost* a regular U.W. citizen. It can make its own financial decisions, own property, run a business, get married(!), and even vote, though the AI bloc is less than a thousand individuals federation-wide, and far too small for any politicians to actively court. An emancipated AI could conceivably own the ship it is installed in and hire the adventurers to be its crew!

Damaging an AI - If an AI takes any physical damage, it is like a brain injury to a person. There may be personality changes and memory loss. The AI is much more capable of recovering from these losses, but destroyed neural connections and the information they held is forever lost. New bio-optical memory gel can sometimes be implanted in ruined areas, but this does not always take, and at best allows the AI to learn new information to replace the lost capacity.

Assume an AI takes penalties from injury just as a person does, but in addition to the penalty until the injury "heals", the effect is also the complete loss of that many skill dice from a random skill. So, a -1d penalty from injury means that the AI permanently loses +1d from a random skill.

▼ **VEHICLES** - Starships may be the most glamorous vehicles of the 23rd century, but options for planetary modes of transportation exist as well. Hovercars, aircars, military ground effect vehicles, submersibles, hypersonic aircraft, and maglev trains are just a small sampling of the varied types of vehicles available in the United Worlds.

Highly advanced vehicles, such as flying cars, are often used in science fiction to reinforce the futuristic feel of the setting. They have a similar function in a science fiction game, as well as meeting some other important needs. Vehicles are, of course, mostly useful in getting characters from one place to another. They are also a source of interesting personality quirks - an adventurer may fear a particular kind of vehicle due to a bad experience or spend endless hours souping up their hovercar, for example. Finally, vehicles can be an exciting setting for combat, whether a wild aircar chase weaving through the skyscrapers of 23rd-century New York City or a desperate fistfight atop a speeding maglev train.

Hovercar - A popular form of personal transport, hovercars ride on a cushion of air to provide an exceptionally smooth, speedy ride on planets with reasonably dense atmospheres. They can even cross short stretches of open water or travel cross-country, although flat roads are best. Retractable wheels can be lowered to park the hovercar or move a malfunctioning one. While slightly more expensive than wheeled vehicles, they comprise about half the vehicles on most core world roadways. Because they are susceptible to crosswinds and bad weather, most major roadways have vertical wind barriers on either side. The added expense is more than offset by the vastly decreased wear and tear on the road itself.

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Hovercar

Strength	10d+0
Top speed/Acc	53/4
Armor	1d+1
Hits/Damage limit	12/5

This represents a standard-model, four-seat, fuel cell-powered hovercar with a top speed of about 190kph and a cost of about 55KCr. This model comes equipped with an onboard computer capable of uplinking to a citywide traffic control computer for a safe, automated trip via the fastest route. When the autopilot is not engaged, drivers can use a map readout showing the hovercar's precise location, obtained via GPS, for navigation.

Groundcar - Groundcars are the second most popular personal vehicle. They have the amenities and features of hovercars, but can carry higher loads, and can operate in weather conditions that air-cushion vehicles would find unmanageable.

Groundcar

Strength	10d+2
Top speed/Acc	48/4
Armor	1d+2
Hits/Damage limit	12/5

This represents a standard-model, five-seat groundcar with a top speed of about 170kph and a cost of 50KCr. It is designed for on-road use. Off-road models are somewhat slower, but less likely to get stuck.

Scooter - A common fuel-cell powered scooter, often used for personal transport in urban areas and larger space habitats. It can carry one person and a few small parcels at up to 130kph, or lumber along with two people on it. Colony worlds might have more primitive internal combustion models, which have similar performance, but which cannot be used safely inside sealed environments. Cost for a scooter is generally between 4-6KCr.

Scooter

Strength	6d+2
Top speed/Acc	36/5
Armor	1d+0
Hits/Damage limit	8/8

Many cargo ships and exploration ships carry slightly slower models that have off-road capability, allowing planet-side crews or explorers to more quickly get from a landing site to other facilities or locations without having to hire local transport.

EABA

POST-ATOMIC ERA MELEE WPNS

NAME	DAMAGE	DAMAGE TYPE	LENGTH	WEIGHT	COST	ARMOR	HITS	NOTES
Combat knife ⁰	punch+0	lethal	short	.3kg	50Cr	1d+2	2	balanced, short blade skill
Survival knife ⁰	punch+0	lethal	short	.4kg	50Cr	1d+2	2	-1 difficulty to survival tasks
Nanowire knife ⁰	punch+0	lethal	short	.2kg	200Cr	2d+0	1	slashing only, AP
Nanowire garotte ³	punch+2	lethal	short	.1kg	100Cr	2d+0	1	uses both hands, AP
Nanowire whip ³	punch+1	lethal	long	.5kg	350Cr	1d+2	2	AP, cannot block/parry
Stun wand ⁰	3d+1	non-lethal	short	.2kg	70Cr	1d+1	1	2 uses
Stun baton ⁰	3d+2	non-lethal	medium	.5kg	200Cr	1d+2	2	12 uses, or punch+1 half-lethal
Neurolash ³	3d+1	non-lethal	long	.8kg	500Cr	1d+2	2	12 uses, cannot block/parry. may also do punch+1 lethal

POST-ATOMIC ERA RANGED WPNS

NAME	USES	ACCURACY	DAMAGE	SHOTS HELD	WEIGHT	COST	ARMOR	HITS	NOTES
Ares 9mm ⁰	9mm bullet	1	3d+1	20 clip	.6kg(.1)	700Cr	1d+2	2	
Covenant 10mm ⁰	10mm bullet	2	3d+2	12 clip	.6kg(.1)	1.0KCr	1d+2	2	
Colt-Rem Mini-7 ⁰	7mm bullet	1	2d+2	6 clip	.3kg(.0)	350Cr	1d+2	2	
Tsai Needler ⁰	3mm needle	2	3d+1	30 clip	.9kg(.1)	1.0KCr	1d+2	2	AP
OmniCorp M4 ⁰	blaster disk	1	5d+1	10 clip	1.1kg(.2)	1.0KCr	1d+2	2	half-lethal dmg
Ares 1KJ ⁰	blaster disk	2	6d+0	10 clip	1.5kg(.3)	1.4KCr	1d+2	2	half-lethal dmg
OmniCorp S5 ⁰	energy	1	3d+0	10 internal	.6kg	700Cr	1d+2	2	16m, non-lethal
Ares Pocket Laser ⁰	energy	2	2d+1	5 internal	.5kg	700Cr	1d+2	2	AP, no recoil
Coherence 600J ⁰	energy	3	3d+0	30 clip	1.0kg(.2)	1.4KCr	1d+2	2	AP, no recoil
Coherence 800J ⁰	energy	2	3d+0	40 clip	1.4kg(.4)	1.4KCr	1d+2	2	AP, or +2 non-leth.
OmniCorp L2 ⁰	energy	2	3d+0	20 clip	1.2kg(.2)	1.0KCr	1d+2	3	AP, no recoil
Covenant Viper ¹	9mm bullet	2	3d+2	50 clip	1.5kg(.5)	2.0KCr	1d+2	2	autofire, autoburst
Kaminari-juu ³	10mm bullet	1	4d+0	30 clip	1.6kg(.4)	2.0KCr	1d+2	2	autofire
Ares R3mm ¹	3mm needle	3	3d+0	100 clip	1.9kg(.4)	4.0KCr	1d+2	2	AP, autofire
Ares L24 ¹	energy	2	3d+0	50 clip	1.5kg(.5)	2.0KCr	1d+2	2	AP, burst, no recoil
Colt-Rem 6mm ⁰	6mm bullet	4	5d+2	20 clip	2.8kg(.3)	1.0KCr	1d+2	3	
Covenant 5mm ⁰	5mm bullet	4	3d+2	100 clip	1.7kg(.2)	500Cr	1d+2	3	AP
Tsai Lancer ⁰	3mm needle	7	5d+1	10 clip	3.2kg(.2)	8.0KCr	1d+2	3	AP
Covenant Gauss ¹	4mm needle	8	6d+0	3 clip	4.1kg(.1)	8.0KCr	1d+2	4	AP
Coherence 2KJ ¹	energy	9	5d+1	20 internal	3.6kg	5.7KCr	1d+2	4	AP, no recoil
Ares Ion Rifle ²	energy	11	6d+2	18 clip	4.7kg(.7)	11KCr	1d+2	4	AP, radiation
Vorn laser rifle ³	energy	5	5d+2	300 clip	11kg(4kg)	32KCr	2d+1	5	AP, autof, no recl.
Vorn blaster ³	blaster disk	3	7d+2	30 clip	11kg(4kg)	32KCr	2d+1	5	half-lethal dmg
Ares M-51A ²	7mm bullet	5	5d+2	50 clip	4.5kg(.5)	5.7KCr	1d+2	4	autoburst, AP
Covenant 6mm ²	6mm bullet	4	5d+0	40 clip	3.3kg(.4)	4.0KCr	1d+2	3	autoburst, AP
Coherence M3KJ ²	energy	6	6d+0	100 clip	9.0kg(3.0)	23KCr	2d+0	4	AP, autof, no recl.
Colt-Rem 18mm ⁰	18mm bullet	2	4d+0	12 internal	1.3kg	1.4KCr	1d+2	2	slug
	flechette	2	3d+0x3						flechette
Omnicorp M11 ⁰	blaster disk	1	6d+2	2 internal	1.6kg	1.4KCr	1d+2	2	half-lethal dmg
Ares Hyperkinetic	rocket	4	12d+1	1 internal	4.0kg	8.0KCr	1d+2	4	AP, disposable
Ares G81 ²	grenade	3	-	12 clip	5.8kg(3.8)	2.8KCr	1d+2	3	see grenades
Ares G61 ²	grenade	2	-	1 internal	1.8kg	2.0KCr	1d+2	3	see grenades

POST-ATOMIC ERA OTHER WPNS

NAME	DAMAGE	DAMAGE TYPE	LENGTH	WEIGHT	COST	ARMOR	HITS	NOTES
Concuss grenade ¹	5d+0	half-lethal expl.	-	.3kg	25Cr	1d+2	2	
Frag grenade ²	4d+1	lethal expl.	-	.3kg	25Cr	1d+2	2	
Plasma grenade ²	4d+0	lethal expl.	-	.3kg	40Cr	1d+2	2	does no structural damage
Anti-vehicle gren. ²	7d+1	lethal	-	.3kg	100Cr	1d+2	2	AP, plus 3d+1 lethal explosion
C10 explosive ¹	6d+0	half-lethal expl.	-	.5kg	50Cr	1d+2	2	+1d per 2x used

POST-ATOMIC ERA PERS. ARMOR

NAME	ARMOR	COVERS	WEIGHT	COST	NOTES
Normal clothing ⁰	0d+1	all	2.0kg	125Cr	inappropriate as armor vs. most attacks
Syntheleather clothing ⁰	0d+2	all	2.0kg	250Cr	suitable as armor vs. melee attacks
Monoweave clothing ⁰	0d+2	all	2.0kg	350Cr	suitable as armor vs. most attacks
Clothing modifiers:					
Tailored	-	-	-	+2 cost lev.	+2 difficulty to spot concealed items
Mid-level	-	-	-	+3 cost lev.	executive or middle-upper class
Formal	-	-	-	+6 cost lev.	wealthy or formal occasion
OmniCorp defense jacket ⁰	2d+0 1d+1	torso arms	.8kg	500Cr	suitable as armor vs. most attacks, reflec
OmniCorps defense slacks	1d+2	legs	.6kg	450Cr	suitable as armor vs. most attacks
Polycryl riot gear ¹	3d+1	all head torso arms legs	8.0kg .6kg 2.0kg 2.3kg 3.1kg	1250Cr 250Cr 500Cr 400Cr 800Cr	rigid, not concealable face protection against laser blinding
Monoweave composite ¹	4d+2	all head torso arms legs	10kg .8kg 2.5kg 2.8kg 3.9kg	5000Cr 800Cr 1600Cr 1250Cr 2500Cr	rigid, not-concealable
Monoweave composite ¹	4d+1	torso arms legs	1.6kg 1.0kg 2.0kg	2500Cr 1100Cr 2100Cr	rigid, concealable, custom-fitted not hands not feet
Ares combat dress ¹	6d+1 5d+0 5d+0	torso arms legs	8.0kg 3.0kg 5.0kg	8000Cr 3100Cr 6300Cr	hardened against most AP attacks
Ares assault dress ²	6d+2 6d+0 6d+0	torso arms legs	32kg 16kg 32kg	32KCr 28KCr 32KCr	full set gives +2d to Strength and Health
Ares combat helmet ²	6d+1 5d+1	head face	2kg	10KCr	see page 10.23 protected against laser blinding
OmniCorp defense vest ⁰	4d+0	torso	2.2kg	1250Cr	concealable, flexible
+upper arm	3d+2	upper arms	.6kg	600Cr	
+upper leg		upper legs	.8kg	800Cr	front only
E-suit ⁰	2d+1	all	6.3kg	5000Cr	flexible, inapprop. as armor vs. non-melee
Armored e-suit ⁰	3d+0	all	20kg	20KCr	rigid, see page 10.19
Shipsuit ⁰	1d+0	all	3.0kg	350Cr	see page 10.20
OmniCorp cold weather suit ⁰	1d+1	all	5.0kg	1600Cr	suitable to -50°C
Reflec add-on ⁰	-	-	-	+1 cost lev.	cancel armor-piercing effect of lasers
Ablat add-on ⁰	-	-	+10%	+1 cost lev.	+3d against first blaster hit to a location on flexible armor, +2d after that, +1d if applied to rigid armor
Microplate add-on ⁰	-	-	-	+1 cost lev.	+1d vs. electrostatic/stun weapons

EABA

WEAPON ACCESSORIES

NAME	WEIGHT	COST	ARMOR	HITS	NOTES
Ares thermal scope ⁰	.4kg	2000Cr	1d+2	1	see page 10.12
Ares night vis. scope ⁰	.2kg	1000Cr	1d+2	1	see page 10.12
Colt-Rem. rifle scope ⁰	.2kg	300Cr	1d+2	1	see page 10.12
Covenant digiscope ⁰	.4kg	700Cr	1d+2	1	see page 10.13
Coherence laser sight ⁰	-	50Cr	1d+0	1	negligible weight, allows aiming as a minor action
Covenant huntcomp ⁰	.5kg	1000Cr	1d+1	1	see page 10.13
Ares Tac C3 comp ¹	.7kg	5000Cr	2d+0	1	see page 10.13

E-SUIT ACCESSORIES

NAME	WEIGHT	COST	ARMOR	HITS	NOTES
Enhanced radio ⁰	.1kg	200Cr	-	-	see page 10.20
Extra oxygen ⁰	1.0kg	300Cr	-	-	see page 10.20
Recycler ⁰	2.0kg	1000Cr	-	-	see page 10.20
Food/waste unit ⁰	1.0kg	1000Cr	-	-	see page 10.20
Magnetic boots ⁰	.3kg	200Cr	-	-	see page 10.20
Stickyboots ⁰	.3kg	200Cr	-	-	see page 10.20
Patch kit ⁰	.2kg	100Cr	-	-	see page 10.20
Thruster pack ⁰	3.0kg	1000Cr	2d+0	3	see page 10.21

POST-ATOMIC ERA STUFF

NAME	WEIGHT	COST	ARMOR	HITS	NOTES
Generic outfitting	-	20KCr	-	-	<p>"Grab & go" starter package for adventurers. Includes:</p> <ul style="list-style-type: none"> Any two open weapons plus accessories, total cost ≤5KCr Any four open clothing or armor items, total cost ≤5KCr One normal e-suit and two accessories Any six open gear items plus a wristcomp and vidphone Shipping luggage plus backpack or shoulder bag One 2nd class orbital fare and 30kg of baggage One 3rd class starship passage of ≤20 days One core world T-pass or equivalent for this world On-planet secure storage area or apartment for 1 e-year, total cost ≤5KCr

TRAVEL

NAME	COST	NOTES
Coreworld T-pass ⁰	1000Cr	Good for one e-month 2nd class surface travel by rail, high-speed rail or mass transit
Starship, 1st class ⁰	1000Cr/day	See rules for travel times on page 8.6
Starship, 2nd class ⁰	500Cr/day	See rules for travel times on page 8.6
Starship, 3rd class ⁰	200Cr/day	See rules for travel times on page 8.6
Beanstalk, 1st class ⁰	500Cr	Takes 2 days, includes 40kg of luggage, +5Cr per extra kilogram
Beanstalk, 2nd class ⁰	200Cr	Takes 2 days, includes 40kg of luggage, +4Cr per extra kilogram
Beanstalk, 3rd class ⁰	100Cr	Takes 2 days, includes 40kg of luggage, +3Cr per extra kilogram
Airfare, 1st class ⁰	1000Cr	Includes 40kg of luggage, +3Cr per extra kilogram
Airfare, 2nd class ⁰	500Cr	Includes 40kg of luggage, +2Cr per extra kilogram
Orbit fare, 1st class ⁰	2000Cr	Includes 20kg of luggage, +5Cr per extra kilogram
Orbit fare, 2nd class ⁰	800Cr	Includes 20kg of luggage, +5Cr per extra kilogram
Taxi fare ⁰	60Cr/hr	
Limo fare ⁰	120Cr/hr	Double fare for 4d+1 armored limo & trained driver
1st class lodging ⁰	≥200Cr/day	Prices vary with locality
2nd class lodging ⁰	≥100Cr/day	Prices vary with locality
Third class lodging ⁰	≥50Cr/day	Prices vary with locality

POST-ATOMIC ERA GEAR

NAME	WEIGHT	COST	ARMOR	HITS	NOTES
GPS transceiver ⁰	.2kg	100Cr	1d+1	1	see page 10.17
Wristcomp ⁰	.1kg	100Cr	1d+0	1	see page 10.31
Datapad ⁰	.8kg	500Cr	1d+1	2	see page 10.31
Holocam ⁰	.2kg	300Cr	1d+0	1	see page 10.17
Holoprojector ⁰	.9kg	500Cr	1d+1	2	see page 10.17
Two-way radio ⁰	.2kg	100Cr	1d+1	1	see page 10.17
Translator ⁰	.3kg	200Cr	1d+1	1	see page 10.17
Vidphone ⁰	.1kg	200Cr	1d+0	1	see page 10.17
Holovid phone ⁰	.1kg	500Cr	1d+0	1	see page 10.18
Digital binoculars ⁰	.4kg	500Cr	1d+2	2	see page 10.25
Science field kit ⁰	8kg	3500Cr	1d+2	5	see page 10.26
Robot repair kit ⁰	10kg	2500Cr	2d+0	5	see page 10.26
Tools of the trade ⁰	4.0kg	2000Cr	1d+2	4	generic items for minimal use of a professional skill
G-suit ⁰	3.0kg	2000Cr	0d+2	4	see page 10.21
High-g exoskeleton ⁰	25kg	5000Cr	2d+0	7	see page 10.21 , armor only protects itself, not the wearer
Cargo exoskeleton ⁰	500kg	25KCr	2d+2	11	see page 10.26 , armor only protects itself, not the wearer
Microcam ¹	.1kg	250Cr	-	-	see page 10.18 , disposable
Bug sweeper ¹	.3kg	500Cr	1d+1	1	see page 10.18
DNA scanner ⁰	.5kg	1000Cr	1d+1	2	see page 10.24
Retinal scanner ⁰	.3kg	400Cr	1d+1	1	see page 10.24
Voiceprint scanner ⁰	.2kg	300Cr	1d+1	1	see page 10.24
Voice stress analyzer ⁰	.1kg	100Cr	1d+1	1	see page 10.25
Motion detector ¹	.4kg	500Cr	1d+2	2	see page 10.26
Thermal stealthsuit ¹	3.0kg	2500Cr	0d+2	4	see page 10.18
Respirator ⁰	.4kg	100Cr	1d+1	1	see page 10.19
Air mask ⁰	1.0kg	200Cr	1d+1	2	see page 10.19
Bubble tent ⁰	1.3kg	200Cr	0d+2	3	see page 10.21 , takes no damage from punctures
Survival kit ⁰	.3kg	30Cr	1d+1	2	see page 10.21
Camping/travel kit ⁰	.7kg	50Cr	1d+1	2	camp/travel eating utensils, hygiene supplies, etc.
Camping food ⁰	.3kg	15Cr	1d+0	2	dehydrated, sufficient for 1 day for 1 person
Field medkit ⁰	2.5kg	200Cr	1d+1	3	see page 10.22
Plastiskin kit ⁰	.5kg	200Cr	1d+0	2	see page 10.22
Diagnostic scanner ⁰	1.0kg	700Cr	1d+1	2	see page 10.25
Sensor bed ¹	25kg	5000Cr	1d+2	6	see page 10.22
Biostasis tube ¹	100kg	10KCr	1d+2	8	see page 10.22
Regen tank ¹	1000kg	100KCr	2d+0	12	see page 10.23

REAL ESTATE

NAME	COST	NOTES
Storage unit	1000Cr	per year
Apartment	4000Cr	per year
Small home	140KCr	plus 1400Cr per e-year in taxes and fees
Large home	400KCr	plus 4000Cr per e-year in taxes and fees

Modifiers:

Core world	+1 cost	Highly urban	+2 cost
Secondary world	+0 cost	Urban	+1 cost
Frontier world	-2 cost	Suburban	+0 cost
		Rural	-1 cost

Gear key:

⁰Open - No restriction on purchase, potential limits on carry, transport or use

¹Restricted - Usually requires permit, professional qualifications and/or background check. May include legally acquired ex-military equipment

²Military - Restricted to active duty military in course of official duties. May count as Restricted in some locales or if key components are removed

³Illegal - Illegal for civilian possession in all circumstances

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