

YIARN GAARDEE

VEHICLE CATALOG

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YIARN CAARDEE VEHICLE CATALOG

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ABOUT THIS SUPPLEMENT

This book is intended for use with *Classic Traveller (CT)* and *Traveller20 (T20)*. Background material is of course also fully compatible with other versions of Traveller.

This volume is the first in a series dealing with vehicles in use in the Traveller universe. It details the range of ground vehicles available to travellers at various tech levels. Note that specialist military vehicles - AFVs etc- are not covered, being detailed in the forthcoming Military Hardware volume.

To produce this volume, QuikLink Interactive, LIC has joined forces with the well-respected Yiarn Caardee Design Bureau and a team of freelance experts of interstellar renown. However, inaccuracies are possible, and QLI LIC cannot accept responsibility for any harm or injury incurred due to use or misuse of the vehicles described herein.

Additionally, opinions expressed in the text are those of contributors, and are not those of the editors or publishers....

YIARN CAARDEE VEHICLE CATALOG

YIARN CAARDEE DESIGN BUREAU

Yiarn Caardee Design Bureau, LIC is a premiere designer of vehicles and equipment throughout the Trailing sectors of the Imperium. Founded on Terra in -192, Yiarn Caardee supplies detailed work prints, prototypes, and provides consulting for manufacturing design. Our catalog provides a listing of local manufacturers and sales locations for your shopping needs. If you have a specific need your local supplier cannot meet, please contact our helpful sales staff about custom design work.

The Yiarn Caardee Design Bureau catalog presents a collection of vehicles to demonstrate the variety of available designs. This is merely a teaser to spark interest. Specialized catalogs for each category of vehicle are available if the example design presented doesn't quite meet your requirements

TECHNOLOGY DISCUSSION

GROUND VEHICLES

TRACKED VS. WHEELED VEHICLES

Most vehicle purchasing guidelines provide a simple rule: wheeled vehicles for on road, tracked vehicles for off road. Our design tip shows you the exceptions to that rule.

Tracked vehicles generally do better off road. The long broad tracks spread the weight of the vehicle over a larger area to ensure it won't get bogged down and the extra traction provided by the track design allows getting out of tricky situations. However, within Charted Space there are numerous worlds without a large hydrosphere. Such worlds tend not to create rough or soggy land requiring tracked drivetrains. For such smooth, hard surfaces, a less expensive and easier to maintain wheeled drivetrain vehicle may well be more appropriate.

Wheels, being smaller and lighter than tracks, allow wheeled drivetrains to achieve much higher top speeds. However, wheels generally require roads, and constructing roads is an expensive and time-consuming project. Even where roads are available, tracked vehicles are still useful as heavy load haulers. Their higher traction offers better pulling power and lower ground pressure does less damage to the roadway if equipped with specialized road tracks.

For vehicles under 5000 vl, wheeled drivetrains are best. Such vehicles are light and small enough to avoid the worst terrain, and carrying extraction equipment takes almost no space. Note that this is general advice; for specific cases it is always best to consult a local expert.

TUNED VS. MULTIROLE ENGINES

Air breathing power plants, including internal combustion, turbines and fuel cells come in two types: Tuned engines and Multirole or multi-fuel engines. The environments on the myriad of worlds in and around the Imperium can be tough on engines. Varying levels of oxygen and other atmospheric

gasses and variations in fuel types can damage or destroy a power plant. For example, internal combustion engines are very sensitive to fuel contaminants or additives, and an engine not designed to handle them will work at a reduced level of efficiency - or not at all. Fuel cells are sensitive to atmospheric taint; even contaminants which don't normally bother people can damage or destroy the catalyts.

The most common air breathing engines are tuned engines, optimized for a specific atmosphere and available fuels. Since people only rarely move air-breathing vehicles from world to world, not being able to adjust the engine for a new environment is no great problem. Such engines are smaller and more powerful than their multi-fuel counterparts, creating cost and weight savings.

If you are planning to move a vehicle from world to world, for example for use on a multi-world scouting expedition, you will require a multirole engine design. Built more strongly and designed to be adjusted in the field to suit local conditions, advanced multirole engines use onboard sensors and computer controlled systems to tune the engine.

When mounting an expedition to another world, you may be able to buy or rent what you need locally. However, if you have joined the ranks of star-hopping travellers, investing in a multi-fuel engine for your favorite ATV or ground car can save time and money.

AIR BREATHING ENGINES IN A LOW OXYGEN ENVIRONMENT

Air breathing power plants, including steam engines, internal combustion engines, turbines and fuel cells all require oxygen to burn fuel and provide power. On worlds where the atmospheric pressure falls below 0.5 atmospheres, rises above 3 atmospheres, or where there is no oxygen in the atmosphere, these engines are of no use. It is possible to supply the required oxygen and allow air-breathing engines to function properly.

Engines specifically designed for low oxygen worlds have a split fuel tank, one half containing the normal fuel and the other a compressed or liquid oxygen supply. Refueling is more time consuming and the vehicle has half the usual range. It is possible to convert a conventional power plant to use an onboard oxygen supply. Many dealers for All Terrain Vehicles can supply the parts required as a kit; most will install it for a fee.

Referee's Note: In Traveller terms, the world's atmosphere UWP code must be between 4 (thin) and 9 (Dense, Tainted) for the air breathing plant to work properly. An atmosphere without oxygen has a UWP code of A (Exotic) or B (Corrosive). Steam engines, internal combustion plants and turbines all require an oxygen supply equal to the fuel consumption of the plant. Fuel cells require an oxygen supply equal to half the fuel consumption of the plant. If the players want to replace the fuel tank, the vehicle now has half the range, two-thirds with a fuel cell. Alternatively, they can add an appropriate size fuel tank, which occupies cargo space.

Players wanting to install the conversion kit (which costs Cr100) should make a T/Mechanical roll against DC 15 (CT:

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Mechanical Skill) to install it correctly. Failure indicated the engine either doesn't work at all, or catches fire and explodes at the referee's discretion.

OVERSIZED WHEELS VS. MORE WHEELS

Improving off-road speed for either wheeled or tracked vehicles requires adding more wheels or tracks. You can design a vehicle with improved off road performance without adding more wheels or tracks by making the wheels or tracks larger. The vl and cost required to make wheels or tracks larger is the same as adding additional pairs.

For example, the wheeled ATV has 8 wheels. The ATV normally has an off-road speed of 10 kph, but adding 3 additional pairs of wheels adds +15 kph to the offroad speed. Instead of 8 wheels, the ATV could be built with 4 oversized wheels, with the effective wheel size of 8 wheels. This 4-wheeled ATV has the same vl and cost for the wheeled drive train and has the same off-road speed.

GROUND VEHICLES IN THE IMPERIUM

At the lowest tech levels, ground vehicles are animal drawn carts and wagons. Roads are simple dirt tracks with a few stone roadways connecting the large and important population centers. A common powered vehicle on low-tech worlds is a biofuel steam engine supplied as a kit for converting locally produced wagons or carriages. At TL4 the first locally manufactured motorized carriages begin to appear. These first few motor cars sell only to the rich, to show off their wealth, or to eccentric tinkers looking for new equipment to work with. Due to the poor state of the roads, the few imported vehicles have off-road capability even when appointed with luxury interiors.

As technology advances people become wealthy enough to enjoy the benefits of powered vehicles, and the manufacturing techniques allow production of models inexpensive enough for many people to buy them. A vehicle support infrastructure built by government and industry emerges, including a fuel distribution system, an entire profession specializing in fixing and maintaining the vehicles, and an extensive road network connecting the major population centers and the little towns in between. These middle tech levels are where the ground vehicle dominates. Grav vehicles are expensive, imported luxuries.

On worlds where technology has matured further, the main form of transport becomes the Grav vehicle. Faster and immune to the effect of the terrain below, they offer the speed and freedom of the skies. Even on these worlds the ground vehicles still fulfill several specialized roles. Worlds which slowly adopted Grav vehicles maintain their road networks for cargo transport. The road networks, largely emptied of passenger traffic, are sufficient for speedy delivery by haulers who prefer the less expensive wheeled trucks.

Another role is emergency and support vehicles in places where the airspace is already crowded. For example, most starports maintain a small fleet of wheeled emergency vehicles and fuel tankers. The response time for these vehicles is as fast as grav vehicles and they avoid interfering with the takeoff and landing of the starships.

Worlds with sealed arcologies may use ground vehicles as support vehicles. Governments ban flying vehicles to prevent

GROUND VEHICLES AND ROADS

Wheeled vehicles do best when they travel on roads. The most basic roads are simply flattened ground, a smoothed layer of gravel or dirt. These dirt tracks, while being only slightly better than no road at all, are simple to construct and easy to maintain. More advanced roadway construction uses fitted stone or brick and allows for faster travel.

At TL 5, when the internal combustion engines allow the widespread adoption of powered vehicles, road building technology keeps up. Surfaces are constructed of gravel with a binder material (concrete or asphalt are common, but other materials are known) permitting faster travel and heavier loads. The ultimate road surface is fusion forming; using high temperature plasma to melt a layer of sand (or other material) until it fuses into a solid mass. Since construction firms use whatever is most available and cheapest, you can find some unusual road surface materials. On very cold worlds, fusion formed road surfaces consist of ice mixed with strengtheners. Another example is Kukelu (C272688-6) with its concentration of heavy metals. Since metal is ridiculously cheap, the world surfaces its highways with a layer of stainless steel.

Referee's Note: Dirt or gravel roads restrict vehicles to half-maximum speed or twice off road speed, whichever is higher. Stonework roads restrict vehicles to three-quarters maximum speed. Other roads allow full movement speed, with the fusion formed roads able to take heavier loads without damage.

ROAD MAINTENANCE AND COSTS

Road maintenance is expensive and usually paid for by drivers through a combination of tolls, licensing fees and taxes. Who does the actual road maintenance and who collects the various fees varies from world to world. About half the worlds of the Imperium commission private corporations to collect fees and perform roadwork, the other half have created various government agencies collect the taxes and oversee the work.

Road tolls are between Cr0.1 and Cr5 depending upon the length of the trip. Fuel taxes are between Cr0.1 and Cr10 per liter. Inspection fees are usually between Cr10 and Cr100 to ensure the vehicle meets current standards. License fees for registering the vehicle are between Cr20 and Cr200. License fees for drivers to ensure they have proper skills are between Cr10 and Cr100. Companies that haul cargo tend to pay higher taxes because the large trucks do more damage to the roads. Since the agency in charge of collection sets amounts and types of fees and tolls, significant variation is encountered from system to system.

When importing vehicles, many worlds impose limits based upon weight, dimensions, or other criteria and may refuse to issue a license if the vehicle exceeds regulated values, or if it lacks certain required equipment. Vehicles within regulation limits are subject to additional fees for inspections to ensure they meet current standards. Usually these inspection fees range from Cr100 to Cr1000, and inspectors may impose a further cost of Cr1,000 to Cr10,000 to install or upgrade equipment on the vehicle.

Referee's Note: The restrictions on importation of vehicles is to avoid the problem of excessive property damage caused by characters driving their tank-like ATV through crowded city streets. If the players insist that they need to take their vehicle off the starport grounds, roll a check against DC equal to the world's Law level (CT: roll higher than Law Level on 2D). If this check fails, government regulations do not allow the vehicle. If the check succeeds, have the characters make a P/Admin check against DC 10 plus the World's Law Level (CT: Roll 8+ on 2D, DM Admin skill). If this check succeeds, impose a 2d6 x Cr100 fee for registration and inspection. If the check fails, add a 2d6 x Cr1,000 fee for new equipment installation including safety equipment, special tires or tread coverings, speed governors, fuel converters, emissions equipment, and so on. In either case, the process takes 2d6 weeks for the inspection, plus an additional 1d6 weeks for any required vehicle modifications.

accidents both inside and outside the sealed environments. Ithukar (B4438BF-A) has its entire population sequestered in more than 80 small domes. Regulations restrict travel between the cities to a network of public buses and cargo trucks, all of which are wheeled.

GRAV VEHICLES

Grav technology is one of Traveller's breakthrough technologies, and is described as follows; "Anti-gravity is the second major [technological] breakthrough. The postulated technology produces both neutralization of weight and lateral thrust." *Striker* Book 3, pg. 5. The "sufficiently advanced technology" description works for most campaigns, however if you or your players want more detail, there are any number of pseudo-science explanations that you can utilize.

GRAV TECH IN THE IMPERIUM

The introduction of Grav technology is a world-altering event that has an impact upon every aspect of life in both overt and subtle ways. Academic studies of these changes have been going on since the first discovery of the technology and a few Imperial worlds still serve as living laboratories.

The most visible change caused by Grav technology is in architecture. In Grav-friendly cities buildings are broadly divided into two types; open access and closed access. An open access tower contains landing platforms regularly spaced around the exterior at various heights, giving the tower a tree-like appearance. Closed access buildings, usually secure installations like military headquarters or starport administrative offices, have a slab sided or decorative appearance similar to buildings on low-tech worlds.

Grav technology also influences architectural layout. For pre-grav cities, buildings must have sufficient space between them to allow ground level access for both vehicles and pedestrians. In cities where Grav vehicles are common the requirement for ground traffic access is gone and buildings can be butted up against each other to form a ground level mall. The tower roof becomes the primary access point, the front door as it were, and the elaborate rooftop designs are quite impressive. Building support systems like power plants, cooling and filtration systems or elevator mechanisms that would be placed on the inaccessible and otherwise unused rooftops are now placed at ground level.

Grav technology does not make structural material stronger but it does allow for construction of taller buildings. Elevator systems, which provide access to each floor in a tower, take up space within the building and in order to provide timely access to each floor the amount of space grows as the building gets taller. With Grav vehicles acting as exterior elevators and structures with multiple access points, buildings require fewer elevators. Grav lifts and acceleration compensation systems allow elevators to be smaller and faster than the mechanical versions. Freed of the constraints of the interior elevator, towers can grow to astounding heights.

The ultimate expression of compacting buildings is the arcology, a complete city in a single building. Grav powered transport systems, which move both horizontally and vertically, allow citizens and visitors quick access to the entire city. The best example are the arcologies on Dadegadi (Ley 1836

A443745-C) which are 10km or more in height and house several million people each.

Grav vehicles also allow people to move out of the cities. Roads are both expensive and form a bottleneck for travel. When housing does not require a road, people can build literally anywhere and frequently do so. Developers use a town plan, a number of houses connected by walkways or small vehicle roads with a town center for shopping and socializing, for rural developments. These small towns surrounded by farms or wilderness, look like isolated communities but connect by a short Grav vehicle flight.

About one third of the worlds in the Imperium do not have the infrastructure to support Grav technology adequately. These worlds, either by choice or by circumstance, rely upon an array of lower technology to maintain themselves. Technology including the ground vehicle roadways, the fuel distribution system for the internal or external combustion engines, airports and seaports, traffic monitoring and control systems and the maintenance infrastructure for all of these. Replacing the established infrastructure would be an expensive and time consuming undertaking, even assuming the population would accept the change. Make no mistake; every architect in Chartered Space is aware of the existence of Grav vehicles and their impact. Buildings reflect the dominant available technology on the world, but even a stone castle on the lowest tech world will have defenses against the "magic flying carpet".

ARMORED FIGHTING VEHICLE DESIGN

The four essential elements of armored fighting vehicle design are firepower, armor, speed, and maneuverability. The challenge for designing armored fighting vehicles is balancing these elements.

Firepower is a measure of how much damage a weapon can do to an enemy force. Firepower is a combination of injury causing capability, weapon range, rate of fire, and support requirements (ammunition, power plant or both). Except in some very specific circumstances, one larger weapon has better firepower than two (or more) smaller weapons. That is, the single larger weapon will have a longer range, greater destructive power and smaller support requirements than two smaller weapons. This is why most AFVs have only one main weapon system, usually a single large gun.

Armor protection is a matter of the thickness and strength of material used for the armor plating. These plates are heavy, and large amounts of armor reduce the performance of the AFV. Rather than trying to make the AFV invulnerable, the ideal AFV design balances the armor protection against the potential threats.

Speed determines how quickly the AFV can engage enemy forces. Very frequently, the speed of an AFV determines the flow of battle, with control of the situation going to the quickest.

Maneuverability is more than just pure speed; it also reflects the size of the craft, its ability to use cover to avoid enemy fire, and its responsiveness to a fluid situation. The ability of an AFV to maneuver into a more advantageous firing position or hide under more cover adds to its effective firepower and armor. Experienced tank commanders rate maneuverability as highly as either armor or firepower.

Thus, the modern armored fighting vehicle utilizes a single large main weapon with a small crew, and a balanced design of armor, speed, and maneuverability.

An exception to these guidelines is the impressive size and firepower mounted on wet navy vessels built at middle tech levels, and space naval vessels. The specific circumstances of naval design is dictated by their environment; sensor ranges vastly exceed weapon ranges, the almost complete lack of cover or concealment, and the relatively low maneuverability of ships compared to the distances they travel. Under these conditions, bigger is better. Since neither speed nor maneuverability is of much assistance to these vessels, they rely entirely upon firepower and armor.

Another exception is the highly maneuverable fighters, both aircraft and spacecraft. Sacrificing armor for speed and maneuverability, they carry only enough armament to attack similar vehicles or other unarmored vehicles.

ARMORED FIGHTING VEHICLE CREW SIZE

Crew size is an important design consideration for vehicles in general and military vehicles in particular; too many and the vehicle is larger than it needs to be, too few and the overwhelmed and fatigued crew are ineffective in an engagement.

The list of tasks required for every AFV is Driver/Pilot, Sensor operations, Communications, Gunner, Loader, Navigation, and Commander. The Loader's job is to load a new round of ammunition into the gun after the Gunner has fired the weapon. If the round of ammunition is large, or the reloading process complicated, each weapon may need more than one Loader. The modern automatic weapon loaders or energy weapons like laser or plasma weapons eliminate the need for a Loader. Modern integrated electronics combine the sensor, communication and navigation data into one console, and these tasks are assigned to one person. A modern tank will have a crew size of four; Driver/Pilot, Gunner, Electronics Operator, and Commander.

The advent of computerized electronics and integrated control systems eliminates the electronic operations position and splits the remaining tasks among the three crewmembers; Driver/Pilot does navigation, Gunner does sensor operations, Commander does communications. The tradeoff is the more complex control system that requires more training for each of the crew.

For craft not expected to be the front line attack units, crew sizes can be smaller. For the air/space superiority fighters crews of one or two are common. The state of robotic control systems in the Imperium has not yet advanced to the stage where an unmanned AFV can be a consistent threat, though some of the Hiver designs are very impressive.

The danger of having too few people is the crew, having to split their attention between too many tasks at once, becoming overwhelmed and fatigued, leading to mistakes and mission failures. While training can overcome these limitations, building and maintaining these skills is both cost and time intensive.

Thus, modern AFVs have a crew size between two and four. Generally, the AFVs with a smaller crew size require more training for the personnel. There are AFVs with crews larger than four, particularly on lower tech designs where more than one loader would be required for the weapons.

COMBINATION VS. DEDICATED THRUSTERS

One of the design decisions for buying (or building) a Grav vehicle is which style of Grav modules to use; dedicated thrusters or combination thrusters.

The dedicated thrusters provide unidirectional thrust, and are directed to provide either lift or thrust. The dedicated thrusters are smaller, more reliable, and usually cheaper. Control of the vehicle is less complex; many of these craft have simple fly-by-wire controls. The downside of dedicated thrusters is a craft requires more of them for safe operation. The failure of a forward thruster may mean a loss of the ability to stop the vehicle.

The more expensive combination thrusters provides both lift and thrust, requiring a sophisticated computer control system and finer manufacturing practices. A vehicle requires fewer Grav modules but the more complex modules are more prone to failure. The combined thrusters are safer because the loss of one module does not mean a partial or complete loss of control; the remaining modules are usually capable of stopping and landing the craft.

Which to select for your new Grav car is a matter of which missions you intend for it. Dedicated thrusters are ideal for well-populated areas, where emergency crews can quickly handle the rare case of Grav module failure. Combined thrusters are better suited for wilderness areas where the loss of a finicky module will not strand you some place beyond help.

WATERCRAFT

HULL SHAPES

The shape or design of the hull of a boat is more important to determining performance characteristics than the construction materials. Hull design has three broad classifications; displacement hulls, planing hulls, and multi-hulls. Each shape has advantages and disadvantages, and frequently hull builders combine types in an effort to get the best elements of both designs.

Flat bottomed hulls are the earliest designs for boat hulls and as their name implies, the hull has a flat bottom. These hulls are very stable in calm water and have the shallowest draft. With very little of the boat sitting in the water, flat hulls also maneuver easily at low speed. These factors make the flat hulls ideal for river transport, canals, harbor duties, and other places where very shallow draft is beneficial. On the down side, flat hulls don't handle well on rougher waters or at higher speeds. The flat hull absorbs the pounding of waves and boat motion, transmitting them to passengers and cargo giving a rough ride.

The next development for boat hulls is the round bottom or vee bottom hulls. The keel provided by the bottom of the hull gives these boats more stability at higher speeds. The deeper draft of the "V" hulls and smaller area in the water gives them a smoother ride in rough waters or at higher speeds. Most boat and ship hulls have a round or vee bottom hull as they offer the best performance and maneuverability under many conditions.

The flat bottom and vee bottom hulls are displacement hulls, called so because they push the water aside, displacing

it. In contrast, performance boats use a planing hull, where the motion of the boat lifts the hull partly out of the water and skims on the surface. The planing hull has a keel like a vee hull does for better stability and handling at low speeds, but adds a flat section on the bottom for the boat to skim on the water at speed.

The ultimate development of the planing hull includes both hydrodynamic and aerodynamic streamlining. These hulls, called hydroplane (water flier) or tunnel hulls, work by trapping a layer of air in a tunnel under the boat. Some jet-powered hydroplanes can achieve speeds in excess of 450kph. Hydroplanes are very sensitive to environmental conditions and an unexpected wave or gust of wind can send the speeding boat flying out of control.

Ships can be constructed by attaching multiple hulls, like the two hulled catamarans or the three hulled trimarans. Catamarans are a very early development for sailing and paddled vessels. Until boat builders have the tools and skills to perform large-scale joinery, ships are limited to the size of the natural flora, usually the largest tree trunks. The general design consists of a raft or bridge lashed between the two tree trunks. In some ships the hulls hold cargo or crew, in others the hulls only provide flotation.

The wide base of a catamaran makes it stable, and the smaller hulls with less surface area in the water make it exceptionally fast. The downside of the catamaran is its lower cargo capacity, as the smaller hulls cannot support as much weight as a larger hull. After the development of the larger single hull design, shipbuilders continue to construct catamarans because the two smaller hulls are faster, stable, and require fewer resources to construct.

The development of hydrofoils comes from an understanding of airfoils and aircraft, where the concept of a wing providing lift works better in water than in air. Hydrofoils are normal watercraft with the addition of a set of two to four wings mounted on struts attached to the underside of the boat. Once the boat achieves "liftoff," the entire boat lifts from the water, supported by the submerged wings. The drag produced by the large area of the boat hull is reduced to the smaller area of the wings and struts, allowing for high-speed travel. The size of a hydrofoil craft is limited by the ability of the engine to get the hydrofoil up to the takeoff speed, generally between 20 and 50 kph.

WATERCRAFT PROPULSION TECHNOLOGY

The first source of power for boats is the paddle. In its most basic form, a paddle is a stick with a wide area to move more water backwards with each stroke. An oar is a paddle attached to side of the boat, giving the rower better leverage and more power for each stroke. The suggestion of rowers and paddlers to customers new to the human powered boats was to learn the skill of feathering. Feathering involves tilting the paddle blade on the return stroke so it travels edge on through the air rather than on the flat side. For every hundred strokes, feathering saves you one more.

Referee's Note: Feathering is part of the Sailor or Vehicle (Watercraft) skill and not a separate skill.

The development of sail technology occurs very early in the development of watercraft. Wind as a source of power is free and almost constantly available. The many hundreds

of sail and rigging combinations can be divided into three categories; square sails, triangular sails and wing sails. The core of sail rigging is a vertical beam called a mast. Small sailboats have only one mast but the largest commercial and military sailboats may have as many as five masts. Square sails are a square piece of cloth hung from a horizontal beam, called a yardarm, tied to the top of the mast. The bottom of the square sail attaches to a second yardarm or tied to the ship's hull. A triangular sail rigging has a horizontal beam, called a boom, attached to the base of the mast and the sail fills the space between the mast and the boom. Sailboats with more than one mast use a combination of square and triangular sails to maximize the area of sails presented to the wind. There are many variations of sails within these three broad categories and if you have an interest in sailing vessels, we suggest consulting a specialist.

The final development of sails comes with an understanding of aerodynamics. By mounting an airfoil on the mast of a ship, the same force that provides lift to an airplane provides thrust to a sailboat. The wing shape allows the motion of the boat to add to the airflow and under the right circumstances, the wing sail powered boats can sail faster than the wind, something not possible with conventional sails. The usual form of a wing sail is a single large airfoil but larger ships the "sail" is a deck covered with hundreds of 10 cm wide airfoils standing between two and ten meters tall.

Despite their archaic nature, worlds throughout the Imperium still use a variety of sail craft. Simple to understand, requiring little maintenance and no fuel or high-tech parts, sailing vessels are for recreation, commercial transport and even a few training warships.

Modern aquatic propulsion systems follow the design of modern aeronautical ones. The most common propulsion system uses one or more propellers. The size and number of propellers varies with the anticipated function of the vessel. Larger propellers offer more push for a given engine size, but the ship then requires more draft to accommodate the larger circle cut by the propeller.

The aquatic equivalent of the jet engine is the hydrojet. A hydrojet uses a pump or turbine to place water under pressure then ejected, moving the boat forward. Hydrojets are smaller and have fewer moving parts than a propeller drive train, but require more precise engineering and are more vulnerable to damage.

In any field of engineering there are exotic technologies that seem promising, but have various technological limitations, usually that they cost more with no greater benefit than existing technology. The Magnohydrodynamic drive uses a very strong magnetic field and the electrical conductivity of water to accelerate the water out the stern of the ship. In theory, this is an ideal propulsion system as it requires no moving parts and is completely silent. Unfortunately, the conductivity of water, at least water not considered poisonous, is too low to make an efficient drive system. The MHD drive can still work and with impressive results, but requires generating an intense magnetic field. With the modern power sources and superconducting materials available generating magnetic fields of the strength required is not difficult, but the drive system is still less efficient than existing alternatives.

SUPERCAVITATION SUBMARINES

Submarines seem forever labeled as the slowest moving of all craft, because of the drag induced by water. However, an understanding of the physics of water under pressure can allow a submarine to travel at enormous speeds, flying through an air bubble generated by the ship's motion through the water.

Water, like all liquids, is incompressible which means it cannot expand either. Low-pressure conditions that in air would form a partial vacuum, in water cause the formation of bubbles filled with water vapor. The formation of these bubbles, called cavitation, is a problem that has vexed engineers since the first motorized boats were tested. The problem is once the water pressure returns to normal, the cavitation bubbles violently implode creating small shock waves. At close range the shock wave can cause damage, pitting or cracking propellers, boat hulls, and other equipment. At longer ranges sonar equipment can detect the shock waves as a loud pop. Under the proper conditions, like a propeller spinning too fast, the cavitation bubble completely covers the low-pressure side of the propeller in a condition known as supercavitation. The extreme pressure differentials produced by the supercavitation, in addition to the problems of cavitation, can break propellers or rupture hulls.

It is possible to design a hull that deliberately produces a supercavitation bubble over most, or all, of the submarine. Because the boat's hull is flying through air (more accurately, water vapor) rather than water, drag on the hull is dramatically reduced and the boat can achieve impressive speeds. There are some engineering challenges in building the nose cone of the submarine to withstand the pressures of moving at high speed under water and designing propulsion systems that work in both water and air. Supercavitating vessels are as loud as they are fast and the design is limited to applications where performance considerations far outweigh stealth requirements. In most cases, supercavitation is for torpedoes or the first stage of submarine launched missiles. The primary use for crewed supercavitating submarines is search and rescue vessels.

SENSORS

Many people are familiar with the manner in which light sensors work. Infrared, microwaves and visible light generated by a source are gathered and analyzed. Radar bounces a beam of radio waves off potential targets to get information about them. Water absorbs radio and light waves, which renders the traditional radar and passive sensor/targeting systems almost useless. However, water is an excellent medium for sound and for underwater vessels, sound replaces many of the uses of radio waves, for both sensors and communications.

In the simplest terms, passive sonar is simply a microphone on the hull of the ship through which the sensor operator listens. More sophisticated passive sensor systems use a series of microphones and a computerized filter to determine distance and direction to the source of sound. The array of sensors are either mounted along the hull or attached to a wire and towed behind the ship. The towed sensors can be reeled back into the vessel to protect the sensors and the operator from damage during combat.

Most sensor operators are listening to the vibrations

caused by engines, crew, passengers, and shifting cargo on the target vessel. Complicating the sensor operators task is the confusion of noise produced by their ship, other vessels, and other life forms in the water. Many aquatic animals can produce a range of sounds and listening to them can be a fascinating experience, except when you are trying to listen to something else. In addition, the speed of sound in water varies with depth, temperature, and composition. This can cause sounds to distort or reflect in strange ways and requires an experienced operator to sort out.

Active sensor systems take the power of the passive sensors and add a transducer to produce specific sound waves. These signals reflect off objects in the water and return to the array of microphones. The returning signal is processed and used to determine range and bearing to targets. Like the passive sensors, the composition of the water and other sounds may render active sonar confused or blocked.

UNDERWATER HABITATS

If you have an interest in submarines and underwater environments one of the more fascinating places to visit are the underwater habitats that occur on almost every world with a hydrosphere. In terms of life support systems, underwater habitats and submarines are similar to space habitats. Where space habitats need to supply artificial gravity, light, and heat, the underwater habitats need to supply only light and heat.

One engineering problem for underwater habitats not shared by space habitats is the enormous pressure generated by the depth of the water. An elemental manner of dealing with the pressure is to pressurize the habitat to match the external water pressure. Pressurized habitats are constructed of lightweight materials, as the habitat doesn't have to support the water pressure. However, atmosphere under pressure has strange and detrimental effects upon both human and alien races. Nitrogen in a pressurized atmosphere acts as a narcotic, an effect called nitrogen narcosis, which causes feelings of giddiness, drunken behavior and finally unconsciousness. The severity of the nitrogen narcosis effect depends upon both general racial and the specific individual physiology. Oxygen under pressure is both toxic and a fire hazard, so the pressurized atmosphere must have the percentage of oxygen reduced to avoid the harmful effects. At depths over 50 meters the effects of nitrogen narcosis are so severe the nitrogen must be replaced with other inert gases, usually helium, which do not have the narcotic effect. Balancing the atmospheric pressure and percentages of oxygen, nitrogen, helium and other trace gases is a straightforward engineering problem but the high pressure and different atmospheric gases can magnify minor racial and personal atmospheric tolerances, restricting pressurized habitats to short term projects and trained personnel only.

The alternative is a pressure hull, a reinforced hull capable of withstanding the external pressure and leaving the air inside at comfortable atmospheric pressures. The drawback of pressure hulls is they must be strong enough to resist the external pressure, and the strength requirement increases with both the depth of the habitat and its size. In addition, entering and exiting the habitat requires passing through a series of airlocks.

Submarines and similar sized habitats use a single walled

reinforced hull, frequently internally divided with bulkheads. Larger habitats use a spaced armor construction, where a gap separates layers of reinforced hull. The spaces, typically between 10cm and 1m, are filled with either water (for ballast) or air (as a life support reserve) under pressure. The spacers act as a safety mechanism for when the walls crack and leak, the small pressure differential restricts the influx of external water long enough to effect repairs.

WATERCRAFT IN THE IMPERIUM

After walking, boats are one of the first modes of transportation developed. In every single human culture, and most alien cultures, development of watercraft occurs before written history. Boats transport huge loads both faster and more easily than ground transport. In many cases the construction of river or seaworthy craft are the impetus for the creation of the first empires.

Despite the seemingly archaic nature of watercraft in this age of fast grav vehicles, ships of all sizes still perform vital duties, from recreation to research to cargo hauling on worlds throughout the Imperium.

NEW DESIGN FEATURES

HOW BIG IS MY VEHICLE?

The volumes (vls) used by the **T20** vehicle design system represents both weight and volume. This is an abstraction to make the vehicle design process easier and faster. You can calculate the real world sizes for vehicles by doing the following. Calculate a vehicle's volume by multiplying the vls by 5 to get the size in liters, then divide by 1000 to get cubic meters, and again by 14 to get starship tons. A vehicle's loaded weight in kg is equal to its size in vls. To get an empty weight, subtract 100kg for each passenger and 1kg for each 1vl of cargo.

A common size measurement for ships and submarines is displacement tons, a measure of the amount of water displaced (in metric tons) by the ship while floating under full load. Because water occupies about one cubic meter per metric ton, the displacement tonnage also defines the volume of the ship below the waterline. Most ships have about 2/3rds of their structure above the waterline, with some heavily armored ships leaving only about half their structure above the waterline. You can estimate the size of a ship in vl by multiplying the rated displacement tons by 600. For example, a 100-ton ship would be about 60,000vl.

Submarines, in order to sink and rise, are much closer in volume to their tonnage. Estimate the size of a submarine by multiplying its rated displacement tons by 200. For example, a 100-ton submarine would be about 20,000vl.

GROUND VEHICLES

IMPROVED SUSPENSION

A wheeled or tracked vehicle's agility, its ability to make violent maneuvers, is determined by its contact with the ground. At TL8 a number of technologies are perfected including all-wheel steering, active suspensions and anti-

lock braking systems which allow the vehicle to be much more agile without having to increase the size of the power plant. Improved suspension increases the cost of a wheeled or tracked drivetrain by an additional 50% and adds +1 to the vehicle's agility and initiative. This is cumulative with the agility rating based upon the excess Energy Points (THB pg. 252), but does not allow the vehicle to exceed the agility limits of its drivetrain.

TIRES

Tires are what connect the wheels in a wheeled drivetrain to the ground. The **T20** vehicle combat system treats the tires as part of the wheeled drivetrain. As an option, you can treat the tires as a separate component, allowing characters to target the wheels in order to slow or stop a wheeled vehicle without destroying it. The vehicle's armor does not protect tires, making them attractive targets.

Each tire weighs 0.5kg times the number of wheeled drivetrain units installed in the vehicle. If you didn't construct the vehicle, use the number of EP for the drivetrain. Tires cost Cr25 per kg. Calculate the SI of tires per the Structural Integrity table. If you are replacing the tires on a vehicle, they must all be of the same type. There are three options for tires other than the standard inflated polycarbon design.

Heavy-duty tires are reinforced and filled with foam, making them self-sealing against small punctures. Heavy-duty tires cost four times as much as standard tires and have an armor rating of one.

Off-road tires are broader and designed with more traction by adding deeper treads or spikes. Off-road tires cost four times as much as standard tires, but add 3kph to the vehicles off-road speed.

Solid tires, constructed of solid reinforced polycarbon cost ten times as much as standard tires, but have an armor rating of two.

Characters wanting to damage tires must target them specifically. For most cars, the tires are small size targets and are -6 to hit. As accumulating damage destroys the tires, the vehicle loses thrust because the wheels no longer connect to the road and the top speed of the vehicle drops correspondingly. In addition, each tire destroyed forces a control check.

When the vehicle has no tires left, the driver must still make a control check (CT: Drive roll as above) to bring the vehicle to a controlled stop. Failing any of these control rolls means the vehicle crashes (THB pg. 174). If attacks destroy two or more tires in the same round, use the most difficult DC check.

TIRES CONTROL CHECK

Tires Left DC Check

5+ 10

4 15

3 20

2 25

1 30

0 30

CT: Roll 8+ to maintain control.
+DM: Drive skill. -DM: -2 per tire missing.

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TRACKS

Tracks are to tracked drive trains what tires are to wheeled drivetrains; they are what connects the vehicle to the ground. As an option, you can treat the tracks as a separate component, allowing characters to target the tracks in order to slow or stop a tracked vehicle without destroying it. Unlike tires, the vehicle's armor protects the tracks.

Each Track weighs 0.75kg times the number of tracked drive train units installed in the vehicle; if you didn't construct the vehicle, use the number of EP for the drivetrain. Tracks cost Cr3 per kg. Calculate the SI of tracks per the Structural Integrity table.

One option for tracks, other than the standard metal link design, are lighter weight road tracks allowing for faster (and less damaging) road movement. Road tracks cost the same as standard tracks. Using them adds 10% to the road speeds, but drops the off road speed by 10kph.

Characters wanting to damage tracks must target them specifically. For most tracked vehicles, tracks are small size and are -6 to hit. As accumulating damage destroys the tracks, the vehicle loses thrust as the tracks fall off and the top speed of the vehicle drops accordingly. In addition, each track destroyed forces a control check.

When the vehicle has no tracks left, the driver must still make a control check to bring the vehicle to a controlled stop. Failing any of these control rolls means the vehicle crashes. If attacks destroy two or more tracks in the same round, use the highest DC check.

HALF-TRACKS

Half-tracks are a combination of tracks and wheels or skids. The large track offers superior off road performance, while the front wheels or skids make the drivetrain lighter, improving on road performance and maneuverability.

First available at TL5, half-track drivetrain produces 6 units of thrust (TH) per EP of power applied per round. 10vl per unit installed. Cr25 per unit. Half-tracks have a maximum agility of 4. Calculate off-road speed the same as tracks.

TRACKS CONTROL CHECK

Tracks left	DC Check
3+	20
2	25
1	30
0	30

CT: Roll 8+ to maintain control. +DM:
Drive skill. -DM: -4 per track missing.

AMPHIBIOUS VEHICLES

Amphibious modifications allow ground vehicles, which are usually restricted to dry land, to travel through water.

For air breathing engines, the wading option adds a snorkel and exhaust system to allow the vehicle to ford rivers, streams and other wet areas. Water sucked into an air-breathing engine will damage it, which can happen if the

vehicle travels through water deeper than about 20cm. The snorkel ensures that no water gets into the working parts of the engine unless the vehicle is completely submerged. The snorkel system costs 1/100 the cost of the power plant, and may be installed at any time.

The amphibious option adds a floatation system to the vehicle and a watercraft drive train. Design a ground vehicle normally, but add a surface water drivetrain. The vehicle uses the two drivetrains independently and the power plant needs to supply enough power for one drivetrain at a time. Switching between drive trains is a full round action by the driver.

GRAV/WHEELED COMBINATION VEHICLES

Grav/Wheeled or Grav/Tracked combined vehicles have two drivetrains, the ground (wheeled or tracked) drivetrain and the Grav drivetrain. The vehicle uses the two drivetrains independently and the power plant needs to supply enough power for one drivetrain at a time. Switching between drive trains is a full round action by the driver.

RAM PLATE

Ram plates are a reinforced front (or rear) mounting designed to absorb impacts, allowing the vehicle to do more damage in a collision without suffering additional damage itself. Military organizations like to mount ram plates on their urban assault vehicles, allowing them to overcome the frequent barriers in the city. Private security firms frequently have a ram plate mounted on their vehicles to avoid uncomfortable situations. Some police vehicles mount them, either as a specialized assault carrier or in places where lawless drivers have begun to take the upper hand.

Ram plates take space and cost as much as two points of armor; multiply the chassis armor factor by the Tech Level modifier and then by two to get the vl, Cost is Cr3,000 + Cr9 per vl. The ram plate adds 25% to the vehicle's SI for collisions (THB pg. 163 & 174), both for calculating damage done and taken by the vehicle. If the damage taken in the collision does not exceed the additional SI given by the ram plate, the vehicle takes no damage at all. Ram plates do not add to the AR or AC of the vehicle and adding a ram plate does not affect how much armor can be mounted.

BUSH CUTTER

A bush cutter is a large front mounted blade designed for clearing brush, shrubs, and other obstacles from the path of the vehicle. Military designers were the first, and still most frequent, bush cutter users.

Bush cutters take space and cost as much as one point of armor; multiply the chassis armor factor by the modifier for Tech level to get vls. Cost is Cr3,000 plus Cr9 per vl. Like the ram plate, the Bush Cutter adds 25% to the SI of the vehicle when determining collision damage. Unlike the ram plate, if the damage done to the vehicle exceeds the additional SI granted by the Bush Cutter, the collision destroys blade and the owner must replace the blade (at full cost). Bush cutters do not add to the AR or AC of the vehicle and adding a bush cutter does not affect how much armor can be mounted. You cannot mount both a bush cutter and a ram plate on a vehicle.

ADAPTING APPENDAGES TO NEW USES

Appendages in the **T20** vehicle design system (THB pg. 244) are intended to represent robot arms, but you can use the appendages to represent a wide variety more mundane lifting apparatus. Usually these lifting tools are limited to Dex 0, making them useless as combat tools and in fact dangerous to their operators if they are not careful. If you build a lifting tool, give it enough strength so the rated load is at the high end of the Medium Load for the arm strength, a safety margin in case something unexpected occurs.

Unit	Size	Cost	EP	Notes
1 Ton lift	18	1,800	3.6	A 1-ton hydraulic lift.
Tow Hook	23.5	2,350	4.7	A small crane for hauling vehicles up to 5,000vl
Tow Hook	26	2,600	5.2	A small crane for hauling vehicles up to 10,000 vl

A long arm for lifting weighs 3kg, takes 15vl, and costs Cr50. Multiply by the length of the arm in meters. To attach a motor to the arm, add an appendage capable of lifting the arm plus 500kg, the load the arm can hold before collapsing. You can make the arm stronger, multiply the weight and cost of the arm by the same amount you need to increase the load. For example, an arm capable of holding 1,500kg (three times the basic capacity) would weigh 9kg and cost Cr150 per meter.

A ladder weighs 3kg, takes 30vl, and costs Cr50. Multiply by the height of the ladder in meters. To attach a hydraulic lift to the ladder, add an appendage capable of lifting the ladder plus 1,000kg, the load the ladder can hold before collapsing. You can purchase a stronger ladder; multiply the weight and cost by the same amount you need to increase the load. For example, a ladder capable of holding 3,000kg would weigh 9kg and cost Cr150 per meter.

TRAILERS AND TOWING

Trailers are unpowered vehicles moved by attaching them to powered vehicles, allowing a single vehicle to have a larger cargo capacity at the cost of reduced performance. Build a trailer like any other wheeled or tracked vehicle, except you omit the power plant, fuel and controls.

To build a tractor, a vehicle designed specifically for towing, add a specific volume for "Towing Capacity" to the vehicle description. Include this volume in the total vehicle size, meaning the vehicle cost, controls and drivetrain will all be larger than a similar sized vehicle. This reflects the space and cost for strengthening the frame, adding towing attachment points, increasing the transmission power, and similar enhancements. Calculate performance for the full size vehicle, including the towing capacity. As long as the size of the trailer does not exceed the tractor's towing capacity, the performance does not change. When calculating vehicle size and SI values for the tractor remember to remove the Towing capacity from the vehicles overall size.

For example, the Steam Powered Tractor has a size of

1,500vl and a towing capacity of 1,000vl. The drivetrain is for a 1,500 vl vehicle, allowing the tractor to pull a trailer up to 1,000vl without affecting its performance. When calculating the vehicle's size and SI, subtract off the towing capacity, making the actual tractor only 500vl.

Other vehicles can also tow trailers, even if not specifically designed for it. This requires recalculating the vehicle's performance. When you attach a trailer to a towing vehicle, recalculate the top speed based upon the total of the vehicle and trailer vls. (This method can also be used for tractors towing trailers that exceed their designed towing capacity.)

For example, the ground car has a size of 2000 vl and a drive train which puts out 300 TH, which gives it a top speed of 150kph (300 TH / 2 TH required). If we add a 500 vl trailer, the total vehicle size becomes 2,500 vl, the top speed drops to 120kph (300 TH / 2.5 TH required), and the acceleration drops to 12.

GRAV VEHICLES

FRAMES

The airframe chassis configuration (THB pg. 237) allows a craft to fly safely at speeds up to Mach 1, the speed of sound in a standard atmosphere. The faster and more agile chassis configurations are more expensive because they require more design work and finer manufacturing tolerances. Chassis frames designed for vehicle speeds above Mach 1 require additional bracing and reinforcement to ensure they are strong enough to withstand the stresses placed upon them.

Supersonic: A supersonic chassis costs eight times the Basic Chassis cost and requires 1% (1 vl per 100vl of chassis volume) of the chassis volume to reinforce it against the stresses of high speed. The supersonic chassis has a maximum safe speed of 2500kph (Mach 2); the operator suffers a -1 control check penalty for every 50kph (or fraction thereof) of speed above 2500kph. Like the Airframe chassis, the supersonic chassis provides a +2 maximum Agility for aircraft and a +20% maximum speed and cruising range for all vehicles. This Agility bonus does not add to the Agility score itself; rather it increases the maximum possible Agility of a vehicle based upon the type of drive train installed.

Hypersonic: A Hypersonic chassis costs ten times the Basic Chassis cost and requires 5% (5 vl per 100vl of chassis volume) of the chassis volume to reinforce it against the stresses of high speed. The Hypersonic chassis has a maximum safe speed of 4800kph (Mach 4); the operator suffers a -1 control check penalty for every 50kph (or fraction thereof) of speed above 4800kph. Like the Airframe chassis, the hypersonic chassis provides a +2 maximum Agility for aircraft and a +20% maximum speed and cruising range for all vehicles. This Agility bonus does not add to the Agility score itself; rather it increases the maximum possible Agility of a vehicle based upon the type of drive train installed.

NEW COMPUTERS:

All computers used in this catalog are Advanced Model/1 computers with 200 cpu. Included as part of the basic package are both Low Basic logic systems and a Limited Verbal command system.

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Computer Designs by TL

- TL8 Linear Hardwired, Cr14,000, 91vl 6.075EP
- TL10 Parallel Hardwired, Cr 2,250, 7.3vl, 0.16 EP
- TL12 Synaptic Hardwired, Cr1,700, 3.6vl, 0.16EP
- TL14 Adv Synaptic Hardwired, Cr1,125, 1.8vl, 0.12EP

Specific Software Installed

Targeting Computers: Gunner Interact, Select, Anti-Missile, Return Fire, Weapon System and Predict.

Autopilots: Drive-4 (specific to the vehicle), and Navigate-4. With the -4 due to the Int 2, this comes out as +0 in the skill.

Medical Computer: K/Medical-5 and an Medical Interact program (similar to the Gunner Interact) giving the user a +2 to their medical skills.

GRAV VEHICLES IN A WIND

Grav vehicles are subject to the same weather effects as other vehicles and in some ways are more sensitive to winds while flying. If the pilot wishes to fly in a high wind, add the following modifier to any piloting check required based upon the wind speed. Wind speeds are described in the Wind Effect table (THB pg. 383-385).

Wind Speed	DC	(For CT: roll 4+ to maintain control while trying precision maneuvers. +DM: Pilot skill, -DM: -1 per 15kph of wind speed).
Light	+0	
Moderate	+0	
Strong	+10	
Severe	+15	
Windstorm	+18	
Hurricane	+20	
Tornado	+30	

FLYING LOW

Grav vehicles, like airplanes and helicopters, fly at maximum speed while above all congestion on the ground. However, there are times when flying low is essential. For example, when characters are trying to avoid detection by enemy forces or find cover while being shot at by the same enemy. There are two modes of flying low; Terrain Following or Nap of Earth. Terrain Following (TF) mode is flying a few meters above the highest terrain feature, over the tops of trees and buildings. Pilots use Terrain Following to avoid being spotted but still fly at very high speeds. Nap of Earth (NOE) mode is flying a few meters above the ground level, around trees, buildings or other obstructions. Pilots use NOE to find cover and avoid being spotted or fired upon. Flying NOE counts as hiding for purposes of an encounter (see hiding THB pg. 76). When flying in either mode, the pilot (or autopilot) must make an Avoid Collision check (THB pg. 160) each round. When flying in TF mode use a base DC 0, and NOE mode use a base DC 5. Failing the Avoid Collision check causes the vehicle to collide with a terrain feature, like a tree, building, or the ground (see collisions THB pg. 163 & 174).

(For CT: Roll 4+ for flying TF or 6+ for NOE. +DM: Pilot Skill, -DM: -1 per 15kph of vehicle speed).

RAM PLATE

See Ram Plate, pg 10.

WATERCRAFT

CHASSIS FOR WATERCRAFT

The Chassis configuration for watercraft provides different top speed than chassis configuration for ground, grav or air vehicles because of the higher drag water has on the vehicle. A standard configuration, which includes everything from barges to most normal watercraft hull shapes, has a maximum safe speed of 65 kph. The standard configuration includes both flat bottom hulls and vee bottom hulls. The Partially Streamlined configuration represents the planing hull or catamaran designs for high-speed water travel. Partially Streamlined hulls have a maximum safe speed of 150 kph. Streamlined hulls, using hydrofoil technology, have a maximum safe speed of 275kph. Airframe chassis represents a hydroplane skipping across the top of the water with a maximum safe speed of 500kph. For all watercraft hulls the operator suffers a -1 to control checks for every 5kph over their maximum safe speed.

CHASSIS FOR SUBMARINES

For submarines, the underwater environment is even more restrictive. Standard streamlined chassis has a maximum safe speed of 50kph underwater. A Partially Streamlined hull has a maximum safe speed of 70kph. The Streamlined hull has maximum safe speed of 85 kph. The Airframe chassis has a maximum safe speed of 100kph. For all submarine hulls, the operator suffers a -1 to control checks for every 5kph over their maximum safe speed.

In addition to building the submarine chassis for speed, you can apply a chassis configuration (which increases cost) to allow the submarine to submerge deeper. These chassis configurations alter the shape of the pressure hull, which contains the life support equipment, passengers and delicate equipment, to resist the forces deep underwater better than a standard hull. If you want a submarine which can both dive deep and move quickly, you will need to buy both options for the vehicle. For example, if you want a partly streamlined and reinforced deep water hull, the hull cost is (2 x 3) or six times the Basic Chassis cost.

Deep water hull: A deep water hull doubles the cost of the chassis and allows the craft to safely dive to one and a half times the depth of a standard submersible hull.

Reinforced deep water hull: This options triples the cost of the basic chassis cost and allows the submarine to dive two times deeper than a standard submarine.

Bathyscaphe: A bathyscaphe hull quadruples the cost of the basic chassis and allows the submarine to dive safely five times deeper than a standard submarine. The crew compartment on a bathyscaphe hull consists of a single large sphere with the remaining equipment outside in a separate compartment.

Supercavitating Submarines: Supercavitation hulls require a specially designed and constructed hull. The supercavitation hull costs eight times the Basic Chassis cost. Like a streamlined chassis, the craft gains a +1 to

maximum agility and a +10% to maximum speed and cruising range. The maximum safe speed for the supercavitating hull is 85 kph. However, once the craft accelerates past 80kph the supercavitation effect begins. When the vessel is supercavitating the engines provide three times their normal submarine thrust and the maximum safe speed for the submarine becomes 800kph.

RAM PLATE

See *Ram Plate*, pg 10.

ADDITIONAL DRIVE TRAINS FOR WATERCRAFT

- The surface water drive train represents a set of oars, paddles, or most frequently, one or more underwater propellers.
- The Hydrojet is first available at TL-5, each DTU generates 20 TH for each EP applied, takes up 10vl and costs Cr800 per unit.
- The MHD Drive is first available at TL-8, each DTU generates 5 TH for each EP applied, takes 25vl and costs Cr1000 per unit.
- Grav Drive trains installed in a watercraft are a much more efficient drivetrain than either the propeller or hydrojets. Aquatic Grav drive trains do not allow the watercraft to fly; they produce thrust only. Aquatic Grav drive trains are available at TL-9, each DTU generates 100 TH per EP applied, occupies 4vl and costs Cr46, 000 per unit. Maximum Agility for all watercraft is 2.

ADDITIONAL DRIVE TRAINS FOR SUBMARINES

- Because of the enormous additional drag produced by the underwater environment all surface watercraft drive trains used on underwater craft produce only 1/5 of the thrust for each EP applied. Maximum agility for all submarines is 1.
- The Underwater Hydrojet is first available at TL-5, each DTU generates 5 TH for each EP applied, takes up 10vl and costs Cr800 per unit.
- The Underwater MHD Drive is first available at TL-8, each DTU generates 1 TH for each EP applied, takes 25vl and costs Cr1000 per unit.
- Underwater aquatic grav drive trains are available at TL-9, each DTU generates 25TH per EP applied, occupies 4vl and costs Cr46, 000 per unit.

SAILS

Sails are a large area of cloth, or a similar material, suspended from a mast and using wind power to propel a vessel through the water or across land. Sails replace both the drive train and power plant onboard a craft. While watercraft are the most frequent user of sails, they can also be used on wheeled vehicles. If the vehicle is going to include other power consuming items like communicators or sensors, you will need to mount a separate power system, which will not add to the propulsion of the craft.

The top speed of a sailing craft is based upon the percentage of the vehicle devoted to the mast, booms, sails, and rigging. Select a percentage between a minimum of 5% and a maximum of 60%. All sails cost Cr5 per vl.

Sail %	Top Speed	Sail Volume (Vls)	Sail Cost (Cr)
5	1	5	25
10	2	10	50
20	4	20	100
30	6	30	150
40	8	40	200
50	10	50	250
60	12	60	300

Sail %: is the percentage of the craft's vls devoted to sails

Top Speed: is the top speed movement (in kph) for ships in a light wind (See Wind Effect table, THB pg. 385). In a Moderate wind, ships can make twice the listed speed and in a Strong wind three times the listed speed. In Severe winds, the boat travels at only twice the listed speed as the crew must take in most of the sails to avoid the wind damaging the sails and rigging. In stronger winds, the ship is in danger of being destroyed and cannot be safely powered by sails. Ships can travel slower than the listed speeds by not deploying all their sails, but not faster.

Sail Volume: is the vls required for the sails for each 100 vl of vehicle volume.

Sail Cost: is the cost in Cr for each 100vl of vehicle size.

Wing sails, available at TL-7, allow ships to travel at twice the speed listed. Wing sails cost five times what regular sails cost or Cr25 per vl of sail.

MUSCLE ENGINES

A muscle power plant, available at TL-0, allows one or more creatures provide power for a vehicle and its components through a series of levers, gears, or harnesses. The characters or creatures powering the muscle engine are either inside or outside the vehicle. In either case, the Muscle power plant takes 10vl and costs Cr10 for each EP it can produce, though the actual output of the engine depends upon the strength of the creatures driving the engine.

Creature Strength	EP Output	EP Output
10	0.05	0.075
11	0.065	0.085
12	0.08	0.10
13	0.095	0.12
14	0.11	0.13
15	0.125	0.15
16	0.14	0.17
17	0.155	0.20
18	0.17	0.23
19	0.185	0.27
20	0.20	0.30

If there are multiple creatures, add the EP output for each creature to get a total EP output. If a creature is stronger than strength 20, for each +10 Strength, multiply the EP output by 4.

YIARN CAARDEE VEHICLE CATALOG

For creatures weaker than strength 10, divide the EP output by 4. If the creature is larger or smaller than medium size, multiply the EP output by the multiplier shown.

Creature Size	EP Multiplier	Creature Size	EP Multiplier
Small	X 3/4	Large	X2
Tiny	X 1/2	Huge	X4
Diminutive	X 1/4	Gargantuan	X8
Fine	X 1/8	Colossal	X16

Creatures or characters can sustain working a muscle engine for up to eight hours before having to use the Forced March rules (THB pg. 119). Creatures are capable of generating double the EP output by using the Hustle rules (THB pg. 118) or three times the EP by using the Run rules (THB pg. 118).

DRAFT

Draft is the distance on a watercraft between the waterline and the bottom of the keel, defining how deep the water must be for safe passage. The draft of a ship depends upon its size and shape of the hull. Check the size of the hull against the table, and select a draft in the range given. A flat hull has a shallower draft than a vee hull or planing hull and is one category smaller. For example, the Steamship, a gargantuan vehicle, has a draft between 2 and 4 meters but because it uses a flat bottom hull, it has a draft between one and two meters. The hydrofoil hulls add between one and three meters to their draft for the foils, but only if the ship is traveling at less than hydrofoil lift speed.

Ship Size	Minimum Draft (meters)	Maximum Draft (meters)
Small	0.125	0.25
Medium	0.25	0.5
Large	0.5	1
Huge	1	2
Gargantuan	2	4
Colossal	4	8
Enormous	8	Cube Root (vl) / 12.8

MAXIMUM SAFE DEPTH

The maximum safe depth for a submarine depends upon the strength, size, and shape of the hull. Calculate the maximum safe depth for a submarine by adding the armor factor of the hull and the AC Modifier due to size (THB pg.148). Then look up the sum on the table below:

Armor Factor + AC Modifier	Maximum Depth (meters)	Range Band (meters)
+1 or more	250 x (AF + AC Mod)	15 x (AF + AC Mod)
+0	125	8
-1	60	4
-2	30	2
-3	15	1
-4 or worse	Can not submerge safely	n/a

If your vehicle has the deep water hull or bathyscaphe hulls, multiply both the depth in meters and the range band in meters by the chassis multiplier. The submerging hull modifiers are times 1.5 for deep water hulls, times 2 for reinforced deep water hulls, or times 5 for a bathyscaphe hull.

Exceeding the maximum safe depth is possible in a submarine, but as the name implies, it may not be safe. Once a vessel has gone below maximum safe depth, it must make a save vs. DC1, +1 for each range band below the maximum safe depth. If the save is failed, make a roll on the vehicle internal damage table (THB pg. 164), as the enormous pressure causes failures on already stressed components. The vehicle must make this roll if the depth increases to the next range band, once an hour if the craft remains at depth, or when the pilot tries violent or stressful maneuvers (Avoid Collision or Evade Attack maneuvers).

For example, our adventurers have taken a Seahorse shallow water explorer to investigate an underwater archeology site as a commission for their patron when they discover unfriendly agents in another submarine are pursuing them. To avoid being spotted, the pilot dives into a nearby canyon, and sits the submarine on the bottom, some 50 meters from the surface. The submarine must make a check at $[(50 \text{ (current depth)} - 30 \text{ (max. safe depth)}) / 2 \text{ (range bands)}]$ DC10 or suffer an internal failure.

The Maximum safe depth also applies to characters diving using SCUBA gear, artificial or natural gills, or simply holding their breath. Recreational diving equipment has a maximum safe diving depth of 30m with a range band of 2m. Trained free divers, diving using artificial gills or simply holding their breath, may dive up to 125m with a danger range of 8m. Diving using gear for deep diving, pressurized atmosphere tanks with air mixtures for the depths, can achieve a safe depth of 250m with a danger band of 15m. Luriani may also dive to 250m with a danger band of 15m. Characters diving beyond their safe depth and fail their check take 1d6 points damage for each failure.

As an optional extra step, if you are operating the submarine on a world where the gravity is different from the 1G normal, divide the maximum safe depth and range bands by the gravity force in Gs. Submarines diving on low gravity worlds can go 1.5 times as deep. Submarines diving on very low gravity worlds can go four times as deep. Submarines diving on heavy gravity worlds can only go 3/4 as deep.

(For CT: Roll above the number of danger bands on 3D or the vehicle suffers a failure. Characters failing their check take 1D hits.)

MANUFACTURERS

The following firms are all active in the field of ground vehicle manufacture. Some are specialist firms while others manufacture components either directly or through their subsidiaries.

GROUND VEHICLES

- **Naasirka**, one of the oldest megacorporations, specializes in the manufacture of information storage and processing equipment, software, computers, robots and other complex electronic devices. Naasirka's broader interests include energy, transport and luxury goods.
- **Sternmetal Horizons** is primarily engaged in mining and manufacturing. It produces mostly power generation equipment of all types, including power plants for starships, air and ground vehicles, cities, and industrial installations. Additionally, Sternmetal is the largest manufacturer of food synthesis equipment in the Imperium.
- **TransInnovations**, founded during the Sylean Federation, was one of the first pure design bureau firms in the Imperium. Since its founding the company has moved into vehicle manufacture, primarily in the Imperial core. The firm supports one of the largest databases of vehicle designs in the Imperium.
- **Dakaan Emergency** designs and manufactures emergency response vehicles. Found throughout Ley sector, Dakaan Emergency fire response vehicles have been given a Recommended rating by the Imperial Starport Authority review board.
- **Irekaraar** is one of the many subsidiaries of Naasirka, specializing in military vehicles. Irekaraar's wheeled vehicle division fills a specialist market niche, building unarmed military-grade vehicles for small mercenary companies, very low-tech worlds and the rugged individualist markets.
- **Titanstorm Mobile**, a subsidiary of Sternmetal Horizons, specializes in personal transport vehicles with distribution throughout the Titanstorm subsector. Well regarded, and frequently luxuriously appointed, Titanstorm Mobile's cars and motorbikes are frequently sold on to secondary markets throughout Ley Sector.
- **Lowdrag Longwheels** designs and builds specialty vehicles such as ambulances, armored cars and ships throughout the Satyressia subsector. Their internal ergonomics are outstanding and frequently copied. With the recent shift in Imperial government, the firm is expecting to make huge gains in the Highlord and Outreaumer subsectors.
- **Justovian Custom Wheels** designs and hand builds high performance wheeled vehicles for people willing to pay for quality. The small crew produces only a few vehicles per year but the firm boasts a large following among vehicle enthusiasts.
- **El Jerarquía Heavy Haulers** holds a monopoly on heavy vehicle manufacture on El Jerarquía. They build a variety of specialized cargo transports, and recently have expanded their market beyond El Jerarquía.
- **Statakii**, located on Asili, is another manufacturer with a local world monopoly now looking to break into the interstellar market. Competitors ridicule Statakii vehicles as unsafe and lacking in passenger comfort, but the extremely cheap

vehicles still find markets throughout the subsector.

GRAV VEHICLES

- **Delgado Trading, LIC** is expected to become the youngest megacorporation, as the merger of several smaller Imperium wide companies is due to be completed by 997. Divisions of Delgado include military hardware manufacture, heavy metal mining and refining, publishing, antiques trade and toys. Delgado Trading is still undergoing growing pains from its recent merger.
- **Instellarms LIC**, an Imperial Megacorporation, is a specialty supplier to all sizes and types of mercenary units. It manufactures, buys, and sells military equipment and provides military training, advisors, and personnel for military units. Interstellarms dominates the mercenary arms trade throughout the Imperium. Interstellarms vehicles are of excellent quality and generally respectable pricing.
- **Ling-Standard Products** is another Imperial megacorporation with offices throughout Ley sector and the entire Imperium. LSP manufactures electronic equipment of all sorts, ground and air vehicles, starships and starship armaments systems, drive systems, power systems, computer systems and software, small arms, and a variety of other items.
- **Nova Bright-Star Nest** is the local manufacturing concern for the Hiver colony on Gashuki (Ley 2232 A401431-F) and sells excess inventory to support the colony. Nova Bright-Star Nest manufactures goods needed by a small but growing colony, including grav vehicles, electronic equipment, life support systems, and a wide variety of tools. Like all Hiver equipment, Nova Bright-Star Nest's products are very high tech and excellent quality.
- **Gvedueksaez Aengue Goek** is a large Vargr trade corporation and the primary long-distance hauler between Ley sector and the Vargr Extents. Goek does not manufacture its own equipment, but frequently re-labels items. Vehicles are of moderate quality and somewhat more expensive, but Goek is the only reliable source of vehicles designed for the Vargr physiology.
- **Hagajaya Sarana, LIC**, a subsidiary of Ling-Standard Products, is LSP's primary vehicle manufacturer within Ley sector. Hagajaya Sarana concentrates upon the smaller private Grav vehicles, and offers excellent maintenance and warrantee packages.
- **Finmeccanica** specializes in cargo lifters and heavy transport craft. Finmeccanica's recent series of mergers and acquisitions throughout Ley sector has placed them in a position to dominate the Grav transport market. Customers admire Finmeccanica's vehicles for their ease of use and maintenance.
- **Intergrav Logistics** is a joint venture between several smaller manufacturers to supply Grav vehicles to the Ley sector Imperial Army. Usually the domain of the larger Megacorporations, Intergrav Logistics continually manages to underbid their larger competitors. However, the smaller size of Intergrav means their products are only available on the open market through Imperial Army surplus sales.
- **Dinabarib, LIC** was one of the arms suppliers for the Sydymic Empire, and after the fall of the empire the company turned to producing civilian vehicles. Recent acquisitions

YIARN CAARDEE VEHICLE CATALOG

indicate Dinabarib may be returning to military vehicle manufacturing. Dinabarib supplies vehicles and spare parts to most of the worlds in the former Sydymic empire.

- **Raakugaageniram Adiikhak** is a large vehicle designer and manufacturer, supplying to worlds in the Gateway sector and has begun an aggressive marketing campaign to worlds in the Outworld and Sydymic subsectors. RA's vehicles demonstrate some innovative applications using lower tech equipment. Ra's aggressive moves into the former Sydymic Empire are causing disruptions in Dinabarib's market.
- **Ballistica Maximas, LIC** is the primary supplier to the Huangfeng (Ley 0813 B110889-C) colonial defense force. Previously, when the Huangfeng government adjusted the CDF budget, they would sell large quantities of Balistica's equipment at auction. Taking advantage of this situation, Ballistica Maximas now sells new equipment to interested and approved customers.
- **Hiishirenaa Mekhii** provides military support vehicles to COACC forces on Sharpe (Ley 1023 B4379BD-D). Interstellar Mercenary Review Board reviews of Hiishirenaa Mekhii's vehicles describe them as overpriced and of only medium quality. Hiishirenaa Mekhii has gained a reputation for being very indiscriminating about whom they sell to and consequently their vehicles are throughout Ley sector.

WATERCRAFT

- **Ling-Standard Products**, an Imperial megacorporation with offices throughout Ley sector and the entire Imperium. LSP manufactures electronic equipment of all sorts, ground and air vehicles, starships and starship armaments systems, drive systems, power systems, computer systems and software, small arms, and a variety of other items.
- **TransInnovations**, founded during the Sylean Federation, was one of the first pure design bureau firms in the Imperium. Since its founding, the company has moved into vehicle manufacture, primarily in the Imperial core. The firm supports one of the largest databases of vehicle designs in the Imperium.
- **Halcom Alien**: A small manufacture of vehicles for "Alien Environments", which includes vacuum, underwater and exotic atmospheres. Halcom Alien focuses on scientific research vessels. Many of the universities in Ley sector which have students and staff performing field research use the Halcom Alien vehicles.
- **Makhuniim Gisham**: The largest and oldest watercraft manufacturer based on Daramm (Ley 0812 A76AA76-E). Recorded corporate history dates back to the First Imperium, making Makhuniim one of the oldest companies in the Imperium. They manufacture a variety of surface and subsurface craft, with subsidiaries located throughout Ley sector.
- **Luur Ghisabzu**: A watercraft manufacturer from the water world of Luur (Ley 0811 A56A770-C). Luur Ghisabzu ocean ship building yards construct large cargo ships, fishing vessels and the occasional wet navy warship. Luur Ghisabzu exports many of their fishing vessels and is one of the largest sponsors of racing boats on Luur.
- **Kuchenwald Water Boat Works** is a consortium of companies located on Kuchenwald (Ley 1830 E757887-2). On Kuchenwald the companies compete fiercely with each other, producing sailing cargo vessels, fishing boats and river barges. For export, the consortium produces luxurious boats and yachts of various sizes, all handcrafted from local materials.
- **Sauma Forain Recreational Watercraft** is a large-scale manufacturer and distributor of watercraft and boat supplies throughout the Guadix Drift and Spearhead subsectors. SFRW aggressively pursues the entry level market with an array of low cost and low maintenance products.
- **Island Gypsy Watercraft** is a subsidiary of the megacorporation Naasirka with a concentration on mid-tech and high-tech recreational watercraft. Island Gypsy concentrates on a higher end market than Sauma Forain, with more powerboats and luxury craft.
- **Greenwater Farsails** is a design firm specializing in watercraft, particularly low-tech designs like sailboats and oared crafts. The designs are aimed at the personal hobbyist, to be built either from a supplied kit of materials or allowing the builder to supply their own. Builders throughout the spinward side of Ley sector enjoy Greenwater's designs though some of their designs stretch the definition of personal hobbyist. Greenwater Farsails has seen a surge in the past two years for some of their historic designs and is expanding their markets to take advantage.
- **Blohm und Voss AG** is a large commercial ship builder headquartered in the Glimmerdrift Reaches. BuVAG uses a modular design system to build a ship, take it apart for transport, and reassemble it on the market world. The process allows low-tech worlds to purchase very high tech designs without having to import an entire manufacturing plant.



GROUND VEHICLES

The Yarn Caardee Design Bureau catalog presents a mélange of ground vehicles to demonstrate the variety of available designs. This is merely a teaser to spark interest. Specialized catalogs for each category of ground vehicle are available if the example design presented doesn't quite meet your requirements.

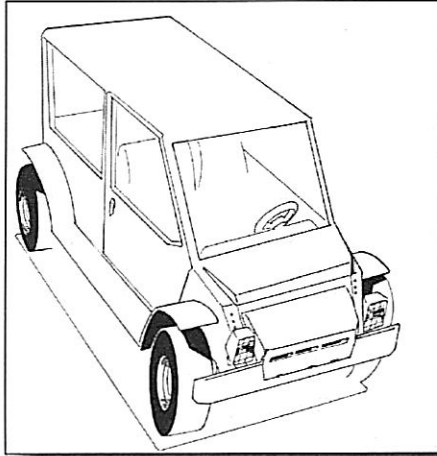
You will note there are no specifically military vehicles in this catalog. While many examples of wheeled or tracked tanks exist - our full catalog has several hundred designs - almost all military ground vehicles are produced and consumed locally. We have found that when governments decide the local manufacturing is not up to producing the quantity or quality of armed vehicles and look to import, they generally decide to import Grav vehicles. The additional mobility, firepower capability, and armor of Grav vehicles make them a first choice of militaries throughout the Imperium despite their hugely

expensive nature.

However, most of these vehicles can be adapted for light military work. Many are already built to meet or exceed the standards of the Imperial Army, and any qualified technician can add a pintle mount for a light weapon or two. If you are serious about military upgrades for one or more of these vehicles, please contact your local dealer or one of our friendly sales staff.

1

MOTORIZED STEAM CARRIAGE



TL4, Cr1175, 750vl. A small enclosed carriage, powered by a steam engine. The cab carries two passengers and up to 124 kg of cargo. The fuel bunker holds fuel and water for 7 hours of travel, but part of the cargo space is frequently filled with additional supplies for longer range. External combustion engines spew smoke, soot and still-burning cinders, though better designs, like the Sternmetal engine, do better in this regard.

Below is a typical example of Sternmetal Horizons' biofuel conversion system in completed form. The kit, costing Cr500, supplies a small steam engine, a heavy-duty axle, and steering apparatus that a cart maker attaches to an already completed wagon or carriage. While the engine is low-tech, requiring only simple fuels and a supply of water, its construction is extremely high-tech, using the latest in composite materials. The design ensures the boiler can't explode; the entire system requires no maintenance and should last for fifty years or more.

Locally produced variations are less safe, but are generally more powerful and allow for larger cargo and more passengers. The most common variations are carriages with space for four to six passengers and cargo hauling carts with load capacities up to 1 ton. Very few steam cars are designed to go any faster, because the neither the vehicles nor the roads they are driven on can handle the higher speeds.

There are a number of steam powered car enthusiast groups scattered throughout the Imperium. Members like to design, build and race their own steam-powered cars. In Ley sector, Shamokin and Integron both host large and active steam engine car clubs.

Design Specifications

Installed Components	Size	Cost	EP
750 vl Chassis	-750	750	-
Controls	150	375	-
Wheeled Drivetrain (4)	22.5	93.75	-1.875
Steam Engine	50	50	+2
Fuel	3.5	-	-
Passenger Seats (2)	400	200	-
Cargo	124	-	-

Subtotals Cr1,469 (Cr1,175 with 20% production model discount)

STEAM POWERED TRACTOR

TL4, Cr2195, 1500vl. A wheeled tractor used throughout farming communities. Hitches and power attachment points are fitted for hauling farm equipment and trailers of various types. There are few, if any, amenities for the driver, and no provisions for passengers or cargo. The four oversized wheels provide good off road performance. The fuel bunker and water tank hold supplies for up to 8 hours of operation.

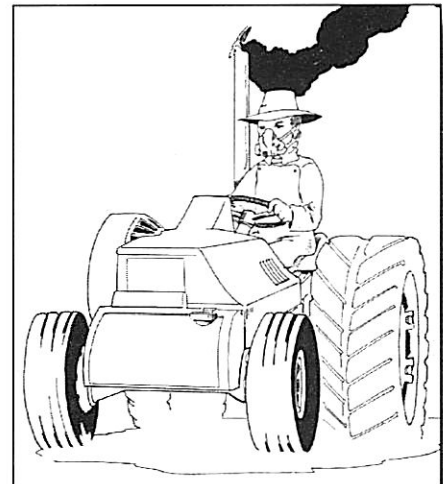
Our example here, the Statakii all-purpose tractor, is typical. The four oversized wheels haul large loads on or off road with equal ease. The geared down transmission allows moving loads at a mere fourteen meters per hour. As with all Statakii designs, this is a no-frills design, lacking even a top for the driver, a common after-market addition. The Statakii engine burns fuel hotter than most steam engines, resulting in fewer cinders and less ash. This makes the boiler hotter, but the overbuilt steam chamber and multiple pressure relief valve system results in almost no chance of dangerous overloading. Statakii has done an excellent job of providing multiple hitch points and the dealers we spoke to have a wide array of adapters for the various powered farming implements.

The Statakii all-purpose is relatively small as tractors go; larger designs can haul 50 tons or more. Despite their low-tech nature, these tractors are simple to maintain and very insensitive to variations in fuel. These facts ensure you may find these tractors somewhere in the backlands of even the most advanced worlds.

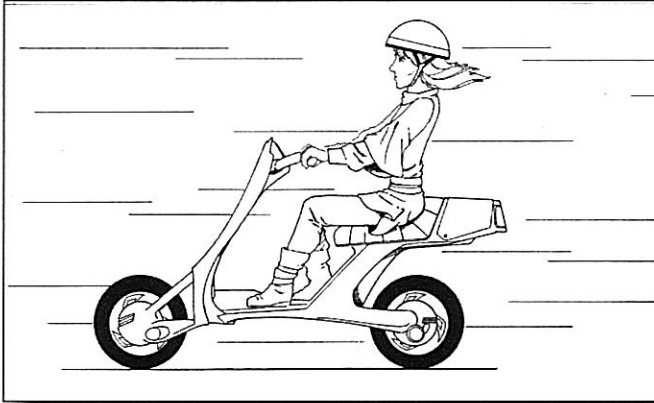
Design Specifications

Installed Components	Size	Cost	EP
1,500 vl Chassis	-1500	1,500	-
Controls	300	750	-
Wheeled Drivetrain (8)	48.75	375	-3.75
Steam Engine	118.75	118.75	+4.75
Fuel	9.5	-	-
Cargo	23	-	-
Towing Capacity	1000	-	-

Subtotals Cr2,744 (Cr2,195 with 20% production model discount)



SCOOTER



TL9, Cr889, 150vl. A small, one-person cycle for short-range commuting. The performance is unimpressive with a cruising speed of 15kph, a top speed of 30kph and a cargo capacity of 32 kg. The battery pack gives an hour's worth of driving. These light and inexpensive scooters are found on many worlds as private commuter vehicles.

The battery powered YC-4750, shown here, is designed for orbital habitats and ground starports where travel distances are no longer than a really long walk and recharging outlets are never far away. The lightweight aluminum frame, carbon fiber reinforced wheels, and the powerful air-gel battery give the scooter a curb weight of 18 kg. The scooter disassembles into a convenient, small package using only a single, included tool. Soft saddle bags or a cargo box are a frequent addition.

There are variants that use a small internal combustion or a fuel cell engine for better performance and longer range. With the performance enhancements available for scooters, the line between the high end scooters and the low end motorcycles becomes blurred.

Design Specifications

Installed Components	Size	Cost	EP
150 vl Chassis	-150	150	-
Controls	110	275	-
Wheeled Drivetrain (2)	4.95	11.25	-0.45
Battery	2.7	675	-
Cargo	32.35	-	-

Subtotals Cr1,111 (Cr889 with 20% production model discount)

MOTORCYCLE

TL8, Cr807, 215vl. A two person personal wheeled transport, the driver and passenger sit on open saddle seats. Motorcycles have little or no cargo space and generally only carry one passenger. The cruising speed of 75kph and a 5.5 hour duration fuel tank gives the bike a 425km range. Not generally designed for off road travel, the bike can make a respectable 15kph.

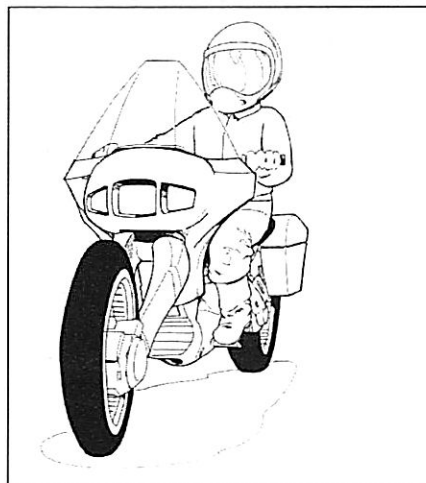
The Titanstorm Knight represents the middle range of cruisers; motorcycles designed for longer ranged travel. The heavy chassis and powerful engine are customary for this style of bike, and many reviewers feel the Knight offers the best handling, winning design awards for more than 200 years. The hard saddle bags are spacious and easy to access. Titanstorm, never a firm to crimp on luxuries, offers a variety of windscreens, from the low cut for the wind-in-your-face feeling to a complete bubble to keep out all the elements while still enjoying the riding experience. The integrated personal intercom, stereo, and cellular phone system allow driver and passenger to keep in touch.

The Titanstorm Emperor is even larger and more powerful, with more than 30vl of cargo space. There is an entire class economy or commuter bikes, which are smaller, lighter, and shorter range, designed for the stop and go style of driving in an urban environment. Two rarely-seen additions are small trailers for more cargo capacity and sidecars with a small passenger seat.

Design Specifications

Installed Components	Size	Cost	EP
215 vl Chassis	-215	215	-
Controls	110	275	-
Wheeled Drive train (2)	35.475	80,625	-3.225
Internal Combustion engine	26.325	263.25	+5.265
Fuel	15	-	-
Passenger saddle (1)	10	25	-
Two way radio	1	150	0.04
Cargo	17.2	-	-

Subtotals Cr1009 (Cr807 with 20% production model discount)



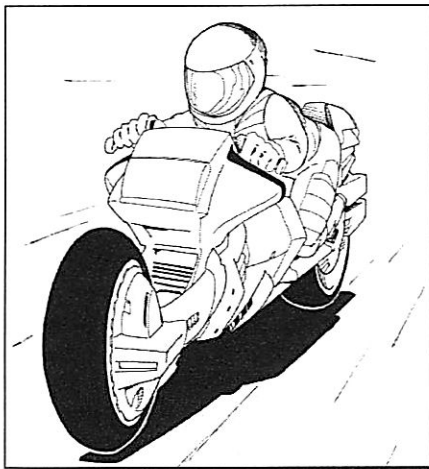
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PERFORMANCE MOTORCYCLE

TL7, Cr937, 245vl. A performance motorcycle designed for speed and agility. A single operator sits on an open saddle seat. With a top speed of 300kph, but with no capacity for cargo or additional passengers, the motorcycle design is for speed of transport. The small fuel tank only allows a 235km range at cruising speed, but can make that distance in under an hour.

For as long as people have been making vehicles go, there have been those who like to see how fast they will go. The TransInnovations Blur is a classic example. Tuning the lightweight ceramic engine to use one of any number of different hydrocarbon fuel sources is a simple task, and add-on kits for more exotic fuels are easily available. The simple aerodynamic fairings are an established layout and never seem to go out of style. The balance of pure speed and handling for the Blur are a standard to which all other performance cycles are measured. TransInnovations has been selling the "Blur" design since the days of the Sylean federation, and it goes to show the combination of high power and good looks always find a market, even after a thousand years.

The most frequent alteration to the Blur is the addition of a larger fuel tank to give the motorcycle a longer range. Other designs trade agility for more speed, with some racing bikes capable of 400kph or more. Other designs prefer agility, pushing the limits of the driver to keep the cycle on the road. The more powerful bikes are frequently heavily restricted or banned altogether because their excessive speed and the reckless nature of their riders poses a hazard to other drivers on the road.

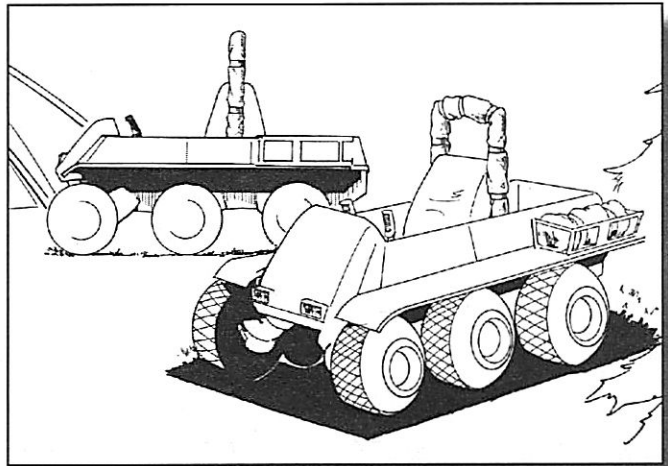


Design Specifications

Installed Components	Size	Cost	EP
245 vl Chassis	-245	245	-
Controls	110	275	-
Wheeled Drivetrain (2)	80.85	183.75	-7.35
Internal Combustion	46.75	467.5	+9.35
Fuel	7.4	-	-

Subtotals Cr1,171 (Cr937 with 20% production model discount)

PERSONAL ATV - WHEELED



TL9, Cr1652, 400vl. A small, two person open topped cross-country vehicle designed only for light, mostly recreational, duties. The small ATV has a cruising speed of 30kph, and the six wheel design moves at 16kph off-road. A 24.5-hour fuel tank can carry the vehicle 735km. The external cargo strap down can hold up to 137vl.

Irekaraar's Akikhe, based upon a TransInnovations design, is another old but still well regarded vehicle. The handlebar steering system and all hand controls make the Akikhe drive like a motorbike. With an all-wheel electric motor drive and the instant start fuel cell, the large-capacity fuel tank can last a week or more. The completely silent fuel cell and the almost silent drive system make the Akikhe a favorite of hunters trying to quietly approach prey. The older fuel cell design is finicky about fuel changes, but used with an approved fuel purification system the manufacturer offers a 50-year warranty. The added heavy-duty winch makes the Akikhe ideal for the gentleman farmer who may undertake some occasional medium-heavy clearing work.

These light ATV's are frequently used by hunters for quick travel through brush or prairie country. Slightly larger ATVs, sometimes armed, are adopted by mid-tech armies for light scout duties or as fast assault vehicles. Low-tech armies frequently purchase them as messenger carriers, as larger vehicles are too expensive to purchase or support, but the small, light, and inexpensive vehicles are ideal.

Design Specifications

Installed Components	Size	Cost	EP
400 vl Chassis	-400	400	-
Controls	110	275	-
Wheeled Drivetrain (6)	31.2	180	-2.4
Fuel Cell power plant	5.4	810	+2.7
Fuel	10	-	-
Winch, St: 30	6	300	0.3
Passengers (1)	100	100	-
Cargo	137.4	-	-

Subtotals Cr2,065 (Cr1,652 with 20% production model discount)

SNOWMOBILE



TL7, Cr720, 300vl. A small, two person tracked ATV, even more specialized than the wheeled ATV, suitable for terrain like snow and sand, where wheeled ATVs can become bogged down. These half-track designs are capable of cruising at 30kph or making 20kph off-road. The 9vl fuel tanks lasts for six hours at cruising speed, allowing a range of 270km. In addition to the driver, a typical snowmobile can carry a single passenger on an open seat, or alternatively up to 36vl of cargo.

Another one of TransInnovations' very old and well-established designs, the Snow Owl snowmobile is specifically designed for the ice and snow. The electric starting system for the titanium block engine means starting the engine on the coldest days is a snap. A lack of cargo space and the light duty tracks restricts the Snow Owl to recreation duties, and serious snowmobile reviews complain the sled is under-powered and difficult to handle. The low price and easy maintenance make it favorite of the day trip snowmobilers. Like all of TransInnovations designs, the engine is multi-fuel capable with only a few adjustments, and while not as fuel efficient as specific built engines, the ability to move the Snow Owl from world to world makes it a favorite with interstellar tourists.

Variants include both larger and smaller models. Like the wheeled ATV's, these are occasional adapted by specialized units of armed forces or mercenaries looking for an efficient mode of travel. Most working snowmobiles have larger engines, but rely upon towed sleds for hauling cargo.

Design Specifications

Installed Components	Size	Cost	EP
300 vl Chassis	-300	300	-
Controls	110	275	-
Halftrack drivetrain	30	75	-3
Internal Combustion	15	150	+3
Fuel	9	-	-
Passengers (1)	100	100	-
Cargo	36	-	-

Subtotals Cr900 (Cr720 with 20% production model discount)

JEEP

TL 5, Cr2720, 1000 vl. This is an open-topped general-purpose ground vehicle, used for both passengers and light cargo. Designed for ease of construction and maintenance, it lacks all comforts. Jeeps are widely adapted by mid-tech armies as a light support vehicle, scout, ambulance, and just about every other duty.

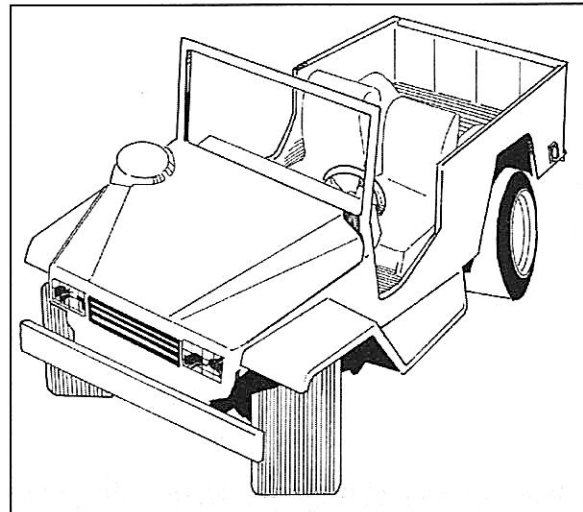
The Statakii jeep is typical of these vehicles; simple, tough vehicles without regard for driver or passenger comfort. The Statakii has a number of features that have attracted the attention of enthusiasts, including a manual self-jacking system for fast wheel changes and a multi fuel system allowing the use of different hydrocarbon fuels without any expensive refits. A major "innovation" is the inclusion of a roll cage. Statakii advertises it as a basic pintle mounting, but it is sturdy enough to support the jeep when rolled over. With a high ground clearance, the jeep makes good speed off-road, and the four-wheel drive system rarely get stuck even in the most inhospitable terrain.

Planetary armies frequently sell surplus jeeps on to hunters, survivalists, and others looking for simple but rugged transportation. A frequent modification is to remove the rear 2 passenger seats, adding 200vl of cargo space. Jeeps sold directly to civilians come with a canvas or nylon tops to keep out the weather. Several manufacturers sell upgraded version of the jeep with better seats, a roll cage, a real top, and other comforts.

Design Specifications

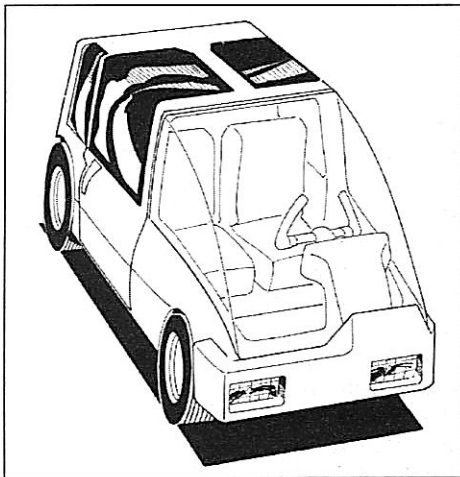
Installed Components	Size	Cost	EP
1000 vl Chassis	-1000	1,000	-
Controls	200	500	-
Wheeled Drive train	144	600	-12
Internal Combustion engine	100	1,000	+20
Fuel	100	-	-
Passenger Seats (3)	300	300	-
Cargo	156	-	-

Subtotals 3,400 (Cr2,720 with 20% production model discount)



1

GROUND CAR



TL 5, Cr5120, 2000 vl. An ordinary self-powered wheeled vehicle suitable for local use in civilized areas or on roads. Typically, a ground car has a cruising range of 750 km at a speed of 75 kph, and has a maximum speed of 150 kph. If capable of off-road travel at all, speed is generally limited to 20 kph. Fuel for a ground car depends on local tech level and fuel sources; it is usually chemical fuel (hydrocarbons or hydrogen), or electric battery. A car can carry four additional passengers plus luggage (140vl). Ground cars are mass production items manufactured for a specific world; they will tend to malfunction when transferred to a world not similar to their world of origin.

Our example here, the YC-4482, is a generic five-person car design. The design goal for this car was simplicity of manufacture and maintenance. The oversized engine compartment tolerates a variety of different engines. Many consider the body design to be dull and uninspired, but it allows quick access to the cargo and for the passengers. Despite the upturned noses by vehicle experts, this inexpensive ground car found throughout the Imperium and the worlds beyond continues to be the transport of choice.

Variations on this vehicle abound. Below are four: a sport car, a limousine, a pickup truck and a van. Other changes include different engine types, better styling, more cargo space and additional passengers. While few cars (outside of the sports cars) are turbine powered, either batteries for short distance commuting or fuel cells for the more modern cars are common.

Design Specifications

Installed Components	Size	Cost	EP
2000 vl Chassis	-2,000	2,000	-
Controls	400	1,000	-
Wheeled Drivetrain (4)	360	1,500	-30
Internal Combustion engine	150	1,500	+30
Fuel	150	-	-
Passenger Seats (4)	800	400	-
Cargo	140	-	-

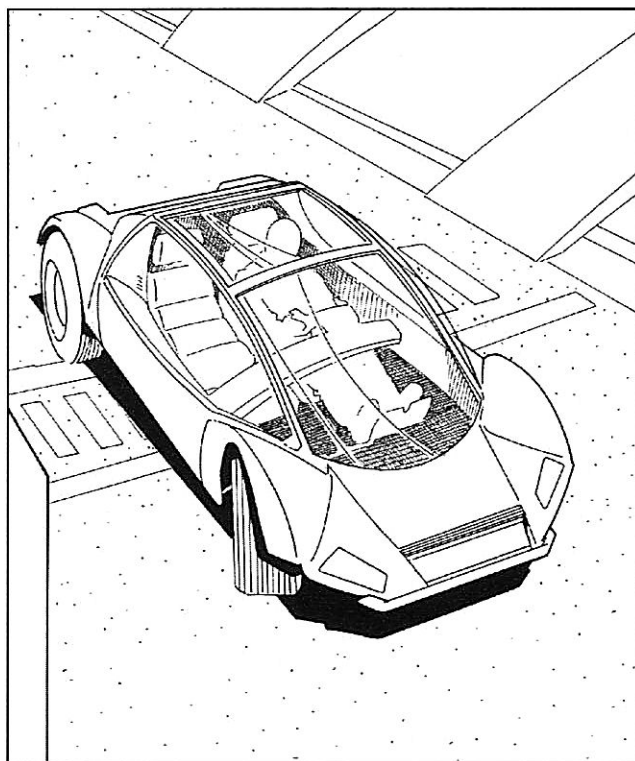
Subtotals Cr6,400 (Cr5,120 with 20% production model discount)

SPORTS CAR

TL8, Cr25050, 2000vl. A two-person high performance ground car. The cruising speed of 242kph is faster than the top speeds of most ground vehicles, and the top speed of 484kph can outrun anything except airplanes and Grav vehicles. The fuel tank holds enough fuel for four hours, giving a range of almost 1000km. A single passenger and no cargo ensure this vehicle is purely for showing off.

Sports cars, like the performance motorcycles, are an expression of the owner. While ground cars have gone out of fashion with much of the Imperium, there are followers of the style. The Ruribiniikikhe Ruribin, a Justovian Custom Wheels design, is a prime example. The turbine power plant gives this car jet powered performance. With the highly tuned and active suspension offering superb handling, it becomes a driver's dream. The streamlined chassis and computerized adaptive aerodynamics eliminates the usual wing spoilers, but still gives a 0.045 drag coefficient and 1.8G downward force at speed, sticking the car to the road and making sure it stays there. Sleek styling makes the Ruribin look like it's moving at Mach speed even while sitting at the curb, attracting the eye of every single sophont who passes by. The distinctive whine of the Justovian turbine, one of the company's signatures, draws a crowd whenever one drives by.

Most sports cars are either turbine powered or use an internal combustion engine. Enthusiasts disdain fuel cells or fusion engines, feeling that a performance vehicle should be loud as well as fast and agile. Like the performance motorcycles, governments usually heavily restrict or ban these



vehicles as being a danger to themselves or others. Individuals who have the wherewithal to purchase, fuel and maintain a Ruribin usually have capital to build private racetracks to appreciate the car's capabilities.

Design Specifications

Installed Components	Size	Cost	EP
2,000 vl Chassis	-2,000	2,000	-
Streamlined Chassis	-	4,000	-
Controls	400	1,000	-
Wheeled Drivetrain (4)	1056	4,400	-88
Improved Suspension	-	2,200	-
Turbine Engine	224	11,200	+112
Fuel	112	-	-
Passenger Seats (1)	200	100	-
Two way radio	1	150	-0.04
Cargo	7	-	-

Subtotals Cr25,050 (Cr5,120 with 20% production model discount)

LIMOUSINE

TL7, Cr15880, 5000vl. A large and luxurious passenger vehicle. The driver sits in a compartment separated from the passenger space, which gives the vehicle's four passengers privacy with extra room to stretch, plus a wet bar and a complete entertainment system. A cruising speed of 75kph allows the limousine to make good time, and it has a top speed of 150kph. The 5-hour duration fuel tank gives a 375km range. Many of the rich and powerful feel a need to express their wealth through display; automobiles are a traditional means.

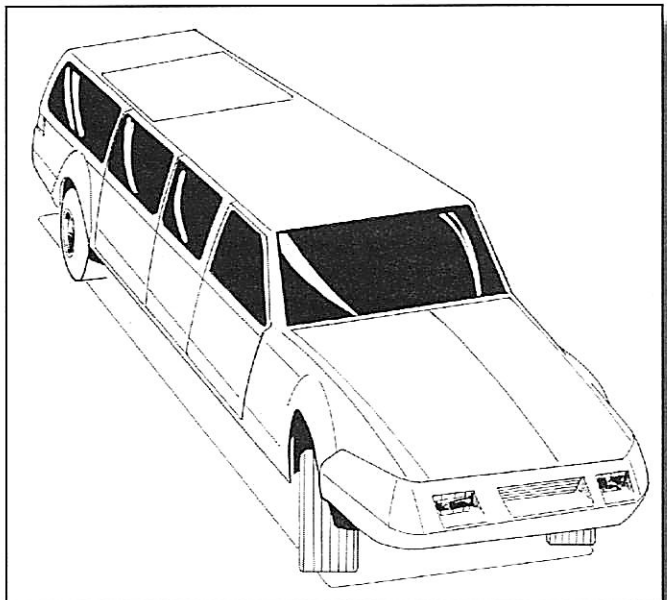
The Titanstorm R5000 is an outstanding example of limousine style. Passengers relax in sumptuous surroundings while being efficiently whisked to their destination. The soundproofing is almost total, ensuring distractions will not intrude. A wet bar is ingeniously hidden throughout the side panels, and the addition of a folding table in the center floor is a brilliant touch.

The Titanstorm R6000 is an upgraded version for the corporate security market, adding armor all the way around, a larger engine, a front mounted ram plate and an improved suspension. For approved customers, Titanstorm offers an interesting array of defensive weaponry.

Design Specifications

Installed Components	Size	Cost	EP
5000 vl Chassis	-5,000	5,000	-
Controls	1,000	2,500	-
Wheeled Drivetrain (4)	1,200	5,000	-100
Internal Combustion	500	5,000	+100
Fuel	250	-	-
Passenger seats (4x2)	1,600	1,200	-
Galley	250	1,000	-
Two way radio	1	150	-0.04
Cargo	199	-	-

Subtotals Cr19,850 (Cr15,880 with 20% production model discount)



1

PICKUP TRUCK

TL5, Cr7280, 3000vl. A very light cargo truck, with seating for only the driver and one passenger, and an open cargo bed. Like a ground car, a pickup is used for personal transportation and hauling small loads about. The truck has a top speed of 150kph, a cruising speed of 75kph, and a range of 750km on a 10-hour fuel tank. The advantage of the open cargo space is you can overload it; the disadvantage is the cargo is exposed to the elements.

The Statakii light cargo truck is an excellent example of the baseline pickup truck. A tailgate offers access to an open cargo bay, and the vehicle has a closed cab. Characteristic of Statakii, seating is utilitarian and controls are minimal but functional. The cargo space is larger than most other trucks, and the impressive 1,300kg cargo capacity make this otherwise ugly vehicle useful.

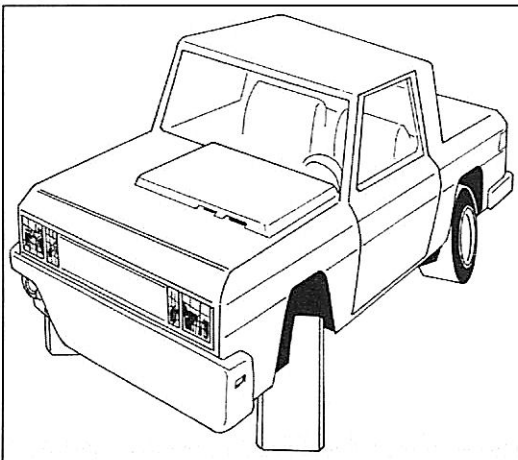
Statakii doesn't offer many options for their pickup truck, but other manufacturers have a long list of upgrades. Most frequent are driver comforts, including better seating, climate controls, and entertainment systems. Most trucks are smaller, with a corresponding reduction in cargo capacity.

Titanstorm Mobile builds a variety of pickup truck accessories for the cargo space. The most basic is a hard shell cover for protecting the contents of the cargo space. Others include lockable toolboxes and equipment mounting racks. Irekaraar dealers sell a camper; a large box containing a sleeping space for two or three and a small galley, which will fit into the cargo space of most pickups.

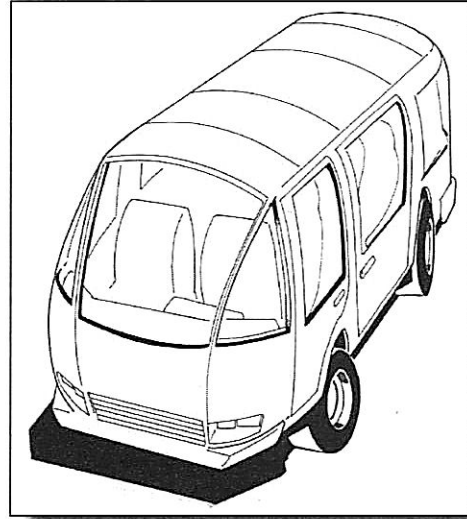
Design Specifications

Installed Components	Size	Cost	EP
3,000 vl Chassis	-3,000	3,000	-
Controls	600	1,500	-
Wheeled Drivetrain (4)	540	2,250	-45
Internal Combustion engine	225	2,250	+45
Fuel	225	-	-
Passenger Seats (1)	200	100	-
Cargo	1,300	-	-

Subtotals Cr9,100 (Cr7,280 with 20% production model discount)



VAN



TL7, Cr7760, 3000vl. A larger ground car designed for hauling passengers, the van holds seven passengers but only a little cargo. Operators can remove van seats, improving cargo capacity at the cost of passenger seating. Vans, like ground cars, have only moderate performance with a top speed of 150kph and a cruising speed of 75kph. The 10-hour fuel supply will take a van an average of 750km.

The Titanstorm D250 is a good example of a Van. Designed as a small school bus, the access to the interior is through small steps. The seats are comfortable and each has a safety harnesses adjustable for children. The padded and soundproofed interior protects youngsters in cases of accidents, even if they are not where they are supposed to be. Titanstorm offers the D250 in a bright reflective color scheme and many bright flashing running lights, all of which can be supplemented to meet local regulations for child transportation.

Titanstorm also offers the DX250, for the more security conscious market. Layers of ballistic cloth armor hidden in the side and floor panels offer all around protection. A reinforced front end acts as a ram plate for driving through the unexpected roadblocks.

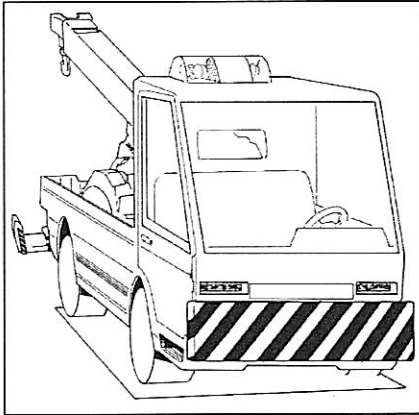
In addition to options offered by Titanstorm, dealers can also customize the van. A frequent change is to strip the interior to convert it to a light duty delivery vehicle. Another favorite conversion is to replace the seats with a sleeping area for two and a small galley.

Design Specifications

Installed Components	Size	Cost	EP
3,000 vl Chassis	-3,000	3,000	-
Controls	600	1,500	-
Wheeled Drivetrain (4)	540	2,250	-45
Internal Combustion engine	225	2,250	+45
Fuel	225	-	-
Passenger Seats (7)	1,400	700	-
Cargo	100	-	-

Subtotals Cr9,700 (Cr7,760 with 20% production model discount)

TOW TRUCK



TL5, Cr19336, 7000vl. A large truck designed to assist with broken down ground vehicles. It mounts a small rear crane for partly lifting a variety of vehicles up to 5,000 vl. The truck supports a normal towing capacity of up to 3,200 vl, with a top speed of 120kph and a cruising speed of 60kph. With a full 5,000vl load, the top speed drops to 95kph and cruising at 48kph. The 10-hour fuel tank gives a normal range of 600km.

Dakaan Emergency designed the FC class tow trucks for servicing the private car market. The tow hook uses a better-regarded front wheel gripping system rather than a frame attachment chain hook, which has been known to damage the chassis of the towed vehicle. The extra long cable for the winch and higher ground clearance mean that the FC class is easily able to assist drivers who have wandered a little too far from the road. Dakaan uses a tuned internal combustion engine, giving better overall performance and larger towing capacity. The FC's passenger space is unusual, but Dakaan explains that allowing the tow truck operator to provide a safe and comfortable ride for the distressed driver makes a positive impression.

A common variant is to have a winch to haul the disabled vehicle onto a hydraulically tilted bed, moving the disabled vehicle without having to haul it along the ground. Larger tow trucks exist for assisting larger vehicles, though only a few trucks are smaller. The Dakaan Emergency NC class Tow Truck includes a vehicle shop to fix the ground vehicle on the spot.

Design Specifications

Installed Components	Size	Cost	EP
7000 vl Chassis	-7,000	7,000	-
Controls	1,400	3,500	-
Wheeled Drivetrain (6)	1,092	6,300	-84
Internal Combustion	420	4,200	+84
Fuel	420	-	-
Passenger Seats (2)	400	200	-
5,000 vl Tow Hook	23.5	2,350	4.7
Winch Str: 47	9.4	470	-0.47
Two way radio	1	150	-0.04
Cargo	34.1	-	-
Towing Capacity	3,200	-	-

Subtotals Cr24,170 (Cr19,336 with 20% production model discount)

AMBULANCE

TL9, Cr107560, 3000vl. An emergency response vehicle for transporting injured sophonts from the scene of a disaster to a medical care facility. The onboard sickbay can treat even the most serious injuries en route to the hospital. With a top speed of 200kph, the ambulance can make good time both to and from the scene of an accident. The 10-hour fuel supply gives a range of 1000km.

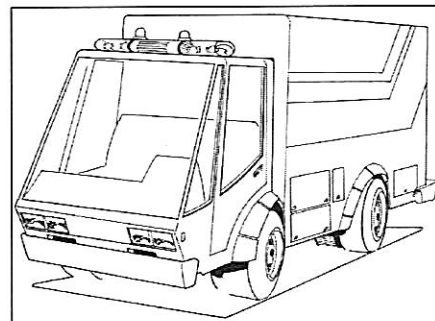
Made by LowDrag LongWheels, the Angel of Mercy ambulance shows why the company's designs are so highly regarded. The layout of the medical bay leaves all the supplies within arm's reach of the technician, without making the space seem crowded. The small medical diagnosis computer is top notch and integrated with the communications system, automatically downloading patient status information and ambulance ETA to local hospitals. The computer also communicates with the local traffic network and displays the best route to medical facilities. The active suspension system isolates the patient and technician from dangerous road conditions; the driver concentrates upon getting to the hospital without worrying too much about affecting his charges.

The Angel of Mercy works best for civilized locations where only a few patients need medical care at one time. Less expensive ambulances don't include the large medical sick bay, providing only space for one or two stretchers and a few supplies. For more dangerous areas, ambulances are either larger, to accommodate more patients at one time, or are smaller and with fewer supplies to allow more of them to be deployed. Ambulances that are more expensive replace the Sickbay with an autodoc, guaranteeing the patient's arrival at the hospital.

Design Specifications

Installed Components	Size	Cost	EP
3,000 vl Chassis	-3,000	3,000	-
Controls	600	1,500	-
Wheeled Drivetrain (6)	780	4,500	-60
Fuel Cell Power plant	168	25,200	+84
Fuel	126	-	-
Passenger Seats (1)	200	100	-
Sick Bay	1,000	100,000	-
Two way radio	1	150	-0.04
Cargo	125	-	-

Subtotals Cr134,450 (Cr107,650 with 20% production model discount)



FIRE TRUCK - PUMPER

TL12, Cr67136, 14000vl. The most common fire and emergency response vehicles. The onboard tank holds 6,000 liters of water, specialized fire-retardant foam, or an absorption material for chemical spills. The cargo space holds 100 meters of hose to connect the onboard pumps to a water supply and supply up to 6 hose teams. With a top speed of 200kph and a cruising speed of 100kph, the Pumper has a range of 1000km.

The Dakaan Emergency Flying Grebe is found in many larger starports throughout Ley sector. The advanced fuel cells use the same hydrogen source as starships to reduce operating costs. Crew layout is standard, driver with two passengers in the front, four partly open seats along the sides, and additional handholds for up to six more in the rear. The Sternmetal induction pumps handle a variety of fire fighting materials and the internal plumbing makes on-site mixing of a retardant as simple as punching a button.

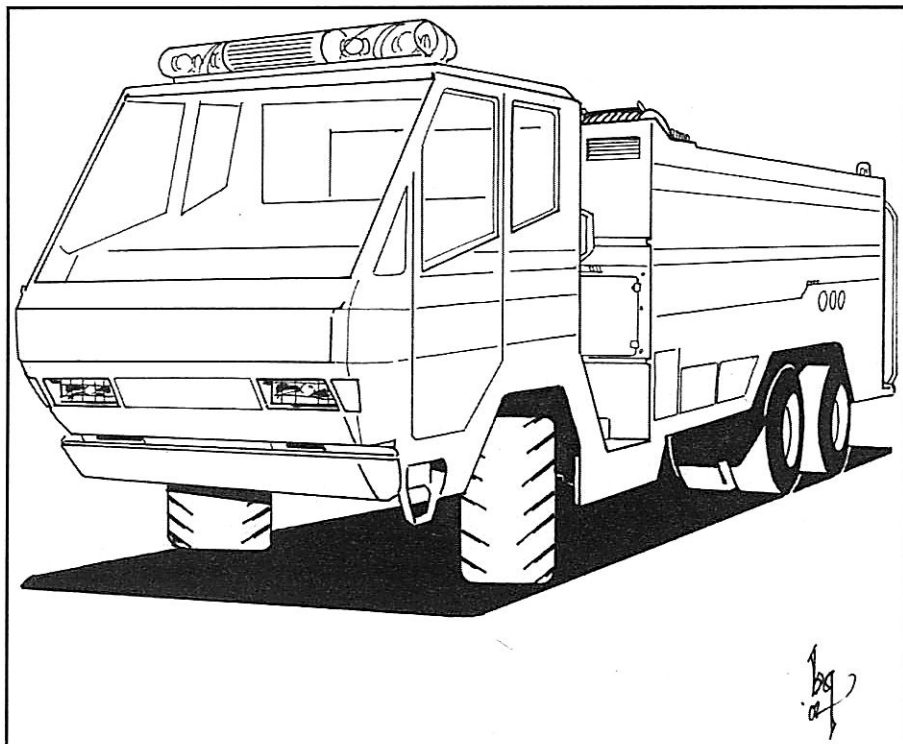
The most dangerous aspect of a starship accident is the potential fuel-air bomb from the boiling liquid hydrogen. Dakaan manufactures the Flying Grebe to avoid sparking the volatile hydrogen; all surfaces are non-sparking, the entire electrical system is sealed and components are not grounded through the frame.

The Flying Grebe's tank holds enough water for five minutes at full pump output, enough to either put out the fire or make a start while the truck is hooked up to a larger water source. Variants of the pump trucks change the size of the included water tank. For rural areas lacking a municipal water supply, trucks will have larger tanks. For urban environments with a more reliable source of water, the tank would be smaller or non-existent.

Design Specifications

Installed Components	Size	Cost	EP
14,000 vl Chassis	14,000	14,000	-
Controls	2,800	7,000	-
Wheeled Drivetrain (6)	3,640	21,000	-280
Adv. Fuel cell	588	39,200	+392
Fuel	196	-	-
Passenger Seats (2+4)	800	600	-
Winch Str: 47	9.4	470	-0.47
High Pressure Pump (6)	24	1500	-2.5
Two way radio	1	150	-0.04
Water Tank	6,000	-	-
Hose Storage	500	-	-
Cargo	441.6	-	-

Subtotals Cr83,290 (Cr67,136 with 20% production model discount)



FIRE TRUCK - LADDER

TL12, Cr21776, 4000vl. A fire and emergency response vehicle. The ladder truck holds a powered ladder for fast access to the upper levels or roof of a structure or starship. With a top speed of 200kph and a cruising speed of 100kph, the Ladder has a range of 1000km.

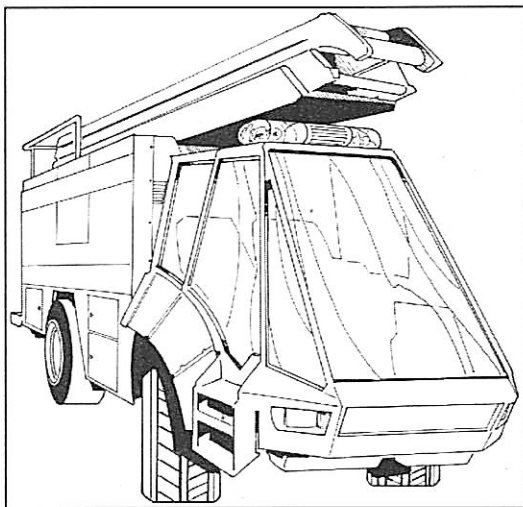
Dakaan Emergency has optimized the Long Armed Arcebean ladder truck for work in a starport environment. Like the Flying Grebe, the Arcebean uses non-sparking materials and a sealed electrical system to avoid the possibility of setting off the volatile hydrogen. The 20-meter ladder is short for urban fire fighting, in the starport it is more than sufficient to allow crews to get over the top of most landed (or crashed) spaceships. The Arcebean is another favorite for starport emergency crews, who often refer to the lightweight, fast and agile trucks as ladder-rockets.

With the advent of Grav vehicles, the ladder trucks become particularly anachronistic; a mobile flying platform is more useful. However, in some of the poorer worlds beyond the Imperial trailing border, ladder trucks are still used and loved by their crews. Ladders are 50 meters or more, with several ingenious methods of folding and mounting them to allow the trucks to pass through narrow city streets.

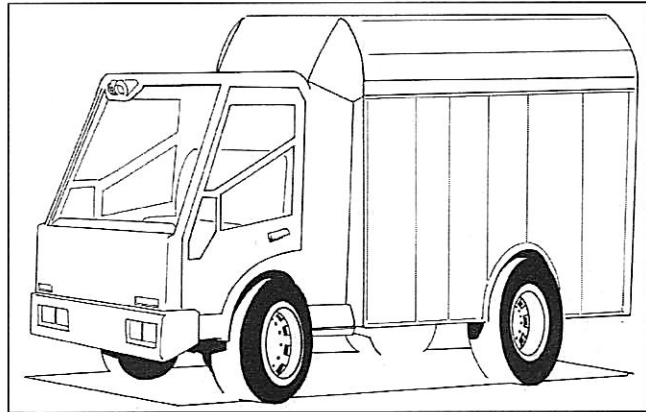
Design Specifications

Installed Components	Size	Cost	EP
4,000 vl Chassis	-4,000	4,000	-
Controls	800	2,000	-
Wheeled Drivetrain (6)	1,040	6,000	-80
Adv. Fuel cell	168	11,200	+112
Fuel	56	-	-
Passenger Seats (2+4)	800	600	-
Winch Str: 47	9.4	470	-0.47
Two way radio	1	150	-0.04
20 Meter Power Ladder	600	2,800	-3.6
Hose Storage	500	-	-
Cargo	23.6	-	-

Subtotals Cr27,220 (Cr21,776 with 20% production model discount)



LIGHT CARGO TRUCK



TL5, Cr12080, 5000 vl. A typical, no-frills commercial delivery/cargo truck with a 2,500 kg cargo capacity. The truck only has room for one passenger other than the driver. These cargo trucks have an average speed of 60kph and are capable of top speeds reaching 120kph. At cruising speed, a cargo truck has a range of 440km.

El Jerarquía Heavy Haulers' newest entry in the interstellar truck market, the ATN class, has received mixed reviews. El Jerarquía copied the controls from their very successful larger trucks, but on these smaller vehicles they feel stiff and unresponsive. Range is unimpressive and by some standards is too short to be useful. A low cargo deck is a plus and a simple to use loading ramp makes access to the interior cargo box quick and easy. Despite its shortcomings, the truck is inexpensive and has firmly established itself in the market as a cheap vehicle for the "last 10km" delivery routes found in so many cities. El Jerarquía offers a variety of options for replacing the simple box cargo space, including a flatbed and small crane for construction supplies, a refrigeration option for temperature-sensitive cargo, a large tank for delivery of fuel or other liquids, and three different configurations of cargo access doors.

Design Specifications

Installed Components	Size	Cost	EP
5000 vl Chassis	-5,000	5,000	-
Controls	1,000	2,500	-
Wheeled Drivetrain (6)	780	4,500	-60
Internal Combustion engine	300	3,000	+60
Fuel	220	-	-
Passenger Seats (1)	200	100	-
Cargo	2,500	-	-

Subtotals Cr15,100 (Cr12,080 with 20% production model discount)

1

ARMORED CAR

TL5, Cr25240, 5000vl. A light cargo truck with enough armor to resist the effects personal weapons. These vehicles haul currency or other extremely valuable cargo. While seldom armed, the armor has sufficient gun ports to allow the well-armed guards to fight off almost any attack. The armored car cruises at 60kph, with a top speed of 120kph, but moves at only 22kph off road. A 10-hour fuel tank gives the armored car a 600 km range.

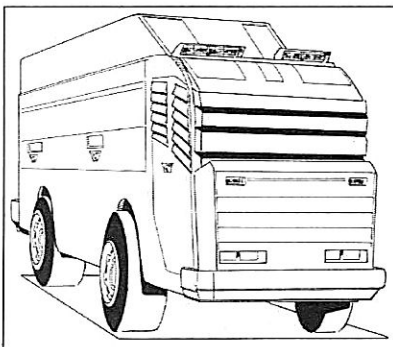
LowDrag LongWheels Rolling Safe design is an introductory level truck. Armor meets Interstellar Mercenary Review Board's recommendation for Level One threat protection, stopping all civilian small arms fire. The adjustable heavy suspension offers moderate agility, but an impressive cargo capacity. The rear-mounted ramp allows for faster loading and unloading of precious cargo. Standard options include the automatic door locks, public address system, a sealed engine compartment and armored fuel tanks. Lowdrag also offers a variety of upgrades including hidden gun ports, high security alarm, multiple battery powered radio communicators, reinforced ram plates and an electro-shock system. A frequent modification is adjusting the armor; removing some armor improves cargo capacity for light threat areas or adding armor for heavy threat areas. Lowdrag's armoring options include replacing the armor with a lightweight composite to achieve an IMRB Level Two threat protection (AR:5) or the advanced crystaliron to achieve IMRB Level Three threat protection (AR: 8).

Armored cars frequently find a secondary use with mercenary companies looking for inexpensive armored personnel carriers. Although not as mobile (particularly off road) or as well armed as real APCs, they are significantly cheaper.

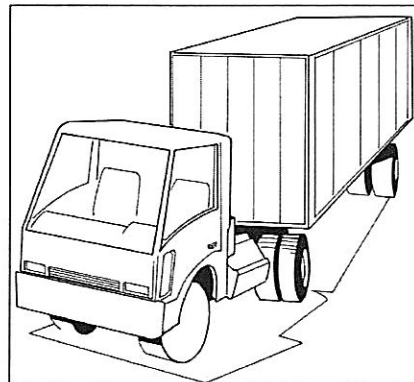
Design Specifications

Installed Components	Size	Cost	EP
5000 vl Chassis	-5,000	5,000	-
Controls	1,000	2,500	-
Armor (AR:3)	800	10,200	-
Wheeled Drivetrain (6)	780	4,500	-60
Internal Combustion engine	300	3,000	+60
Fuel	300	-	-
Passenger Seats (1)	200	100	-
Cargo	1,620	-	-

Subtotals Cr25,300 (Cr20,240 with 20% production model discount)



CARGO TRUCK, HEAVY



TL13, Cr604770, 49000vl. This large heavy-duty cargo truck is designed for long distance hauling of large cargo loads. These trucks allow modern cities survive and grow. The six-wheeled tractor hauls a 4-wheeled trailer at up to 175kph with a cruising speed of 88kph.

The El Jerarquía FXZ class heavy cargo truck is the top of the line. El Jerarquía imports the Sternmetal vehicular fusion plants, adds a 41-day fuel supply, onboard galley, fresher, and sleeping area, all of which allow a team of two or three to drive non-stop for almost unlimited range. Drivers new to the El Jerarquía designs are nervous about the fusion power plant sitting right in front of them. Truckers who have driven the FXZ love them for their ease of handling and comfortable control systems. The open frame trailer has multiple hitches for attachment of the Imperial standard 8-ton cargo containers. The ability to load cargo directly from starship to truck saves time and costs for shippers, and El Jerarquía open frame trailer design is widely adapted throughout Ley sector, even if it's not their tractors hauling them.

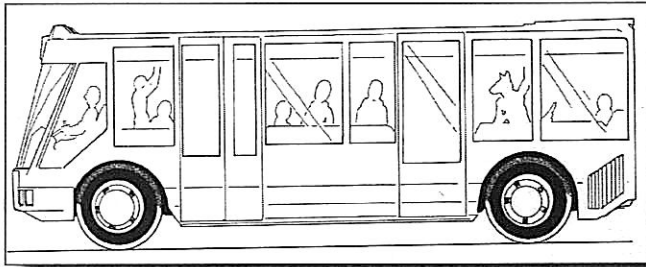
Most heavy cargo trucks use a more conventional fuel cell plant, which has a shorter range and is much less expensive. El Jerarquía EXZ class tractors use a fuel cell with a range of 1200km, and cost Cr349,890. Omitting the galley and fresher make the tractor a touch smaller as well, though long haul trucks always include the bunk space for the driver to sleep.

Design Specifications

Installed Components	Size	Cost	EP
49,000 vl Chassis	-49,000	49,000	-
Controls	9,800	24,500	-
Wheeled Drivetrain (6)	11,148	64,313	-857.5
Modern Fusion	2,655	584,100	+885
Fuel	1,810	-	-
Passenger Seats (1)	200	100	-
Passenger Bunk (1)	150	250	-
Galley	200	1000	-
Fresher	200	750	-
Climate Control	266	6,650	26.6
Auto-pilot (1)	50	25,000	2
Two way radio (long Range)	2	300	0.08
Cargo	119	-	-
Towing Capacity	22,400	-	-

Subtotals Cr755,963 (Cr604,770 with 20% production model discount)

PUBLIC BUS



TL14, Cr551315, 7500vl. A large, short-range passenger vehicle. Many cities use a system of public buses, like these, to reduce congestion on the roadways. Buses travel a fixed route connecting the residential areas with shopping and industrial areas. With a top speed of 75kph and a cruising speed of 37kph, the four hour duration on the batteries allow a range of 150km. Other commuter buses use a small internal combustion engine or fuel cell, for both lower cost and longer range.

Naasirka designs and builds this commuter bus, originally for their own internal company use to transport their employees from company housing to workplace or manufacturing facilities. As a true zero emissions vehicle, it is ideally suited for environmentally sealed habitats. The fast recharger on the batteries can recharge a partially discharged cell in an hour, with a full deep cycle recharge in five hours. Many purchasers feel the battery powered bus is overpriced, largely due to the cost of the batteries. However, Naasirka's use of advanced power cell designs, magnetically supported electric drive, and drive by wire control system all require virtually no maintenance, reducing total cost of ownership. If you purchase the Naasirka maintenance package, the warrantee extends indefinitely with customer testimonials showing examples still running smoothly after 300 years.

Design Specifications

Installed Components	Size	Cost	EP
7,500 vl Chassis	-7,500	7,500	-
Controls	1,500	3,750	-
Wheeled Drivetrain (4)	675	2,813	-56.25
Advanced Batteries	135	675,000	+56.25
Passenger Stands (50)	5,040	80	-
Cargo	150	-	-

Subtotals Cr689,143 (Cr551,315 with 20% production model discount)

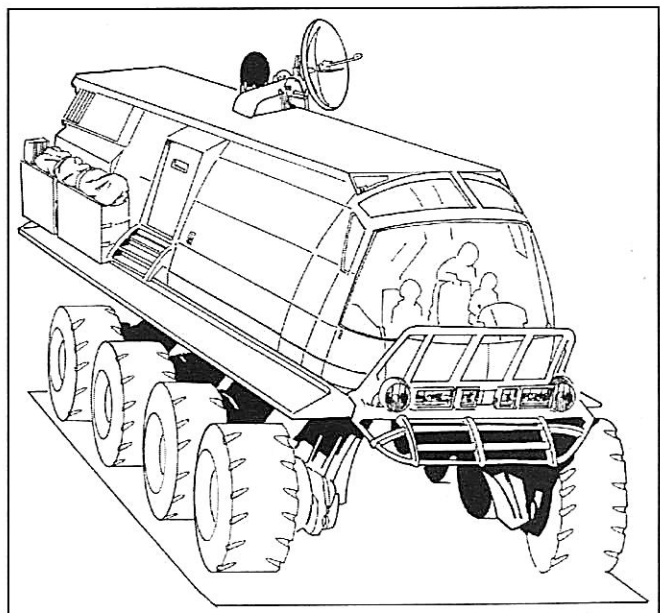
WHEELED ALL TERRAIN VEHICLE

TL12, Cr57, 960, 10,000vl. [TAS1]An 8-wheeled vehicle intended for world surface exploration or for transport across undeveloped areas. An all terrain vehicle (abbreviated ATV) has a range of 2160 km, cruises on roads at 60kph, and can achieve a maximum speed of 120kph. Off roads, speed depends on terrain; on open plain, it will approach normal road performance while in difficult terrain, average speed will be 27kph or less. This ATV uses hydrogen for fuel, recharged from a ship's power plant. Other ATV designs use batteries or a small fusion pack. The ATV designs serve admirably on many different worlds under widely varying conditions, including vacuum and insidious atmospheres, and high or low gravity. An ATV requires one driver, and may carry up to 16 passengers for fairly short periods. The fully pressurized interior contains complete (though cramped) longer-term eating, sleeping, and travel facilities for eight.

Design Specifications

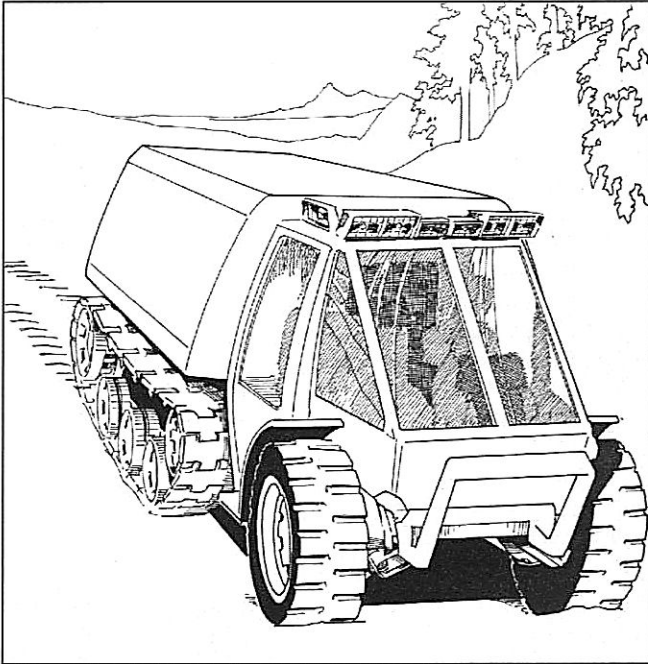
Installed Components	Size	Cost	EP
10,000vl Chassis	-10,000	10,000	-
Controls	2,000	5,000	-
Wheeled Drivetrain (8)	1,680	12,000	-120
Adv. Fuel Cells	375	25,000	+250
Fuel	450	-	-
Pressurized Interior	500	12,500	-125
Passenger Seats (8)	1,600	800	-
Passenger Bunks (8)	1,200	2,000	-
Galley (4)	1,000	4,000	-
Fresher/Shower	350	850	-
Long Range Radio	2	300	-0.08
Cargo	843	-	-

Subtotals Cr72,450 (Cr57,960 with 20% production model discount)



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TRACKED ALL TERRAIN VEHICLE



TL12, Cr54960, 10000vl. [TAS2]The tracked ATV is a somewhat slower version of the wheeled ATV, but with better off-road speed and handling. An all terrain vehicle (abbreviated ATV) has a range of 1620 km, cruises on roads at 45kph, and can achieve a maximum speed of 90kph. Off roads, speed depends on terrain; on open plain, it will approach normal road performance, while in difficult terrain, average speed will be 20kph or less. The ATV's fuel cell uses hydrogen for fuel, recharged from a ship's power plant. Other ATV designs use batteries, or a small fusion pack. The ATV designs to serve admirably on many different worlds under widely varying conditions, including vacuum and insidious atmospheres, and high or low gravity. A tracked ATV requires one driver, and may carry up to 16 passengers for fairly short durations. The fully pressurized interior contains complete (though cramped) longer-term eating, sleeping, and travel facilities for eight.

Design Specifications

Installed Components	Size	Cost	EP
10,000vl Chassis	-10,000	10,000	-
Controls	2,000	5,000	-
Tracked Drivetrain (2)	1620	2,250	-180
Adv. Fuel Cells	465	31,000	+310
Fuel	558	-	-
Pressurized Interior	500	12,500	-12
Passenger Seats (8)	1,600	800	-
Passenger Bunks (8)	1,200	2,000	-
Galley (4)	1,000	4,000	-
Fresher/Shower	350	850	-
Long Range Radio	2	300	-0.08
Cargo	843	-	-

Subtotals Cr68,700 (Cr54,960 with 20% production model discount)

RECREATIONAL VEHICLE

TL8, Cr22040, 7000vl. Similar to the ATVs, the Recreational Vehicles carry a small group of passengers with all the comforts of home. Unlike an ATV, the RV is strictly for on road use, exploring the wilds where others have already cut a trail. An RV has a range of 600 km, cruises on roads at 60kph, and can achieve a maximum speed of 120kph. RV's rely upon external hookups for electrical power, fresh water and sewage disposal when stopped. Most RVs have a water/sewage capacity for two or three days, and electrical power for as long as the engine fuel lasts.

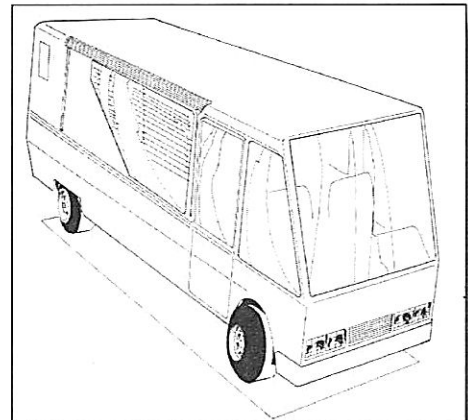
The recently upgraded Titanstorm Mobile MV950 shows why the company keeps receiving accolades from the motor press associations. The MV950 has almost every single luxury imagined by the consumer. The onboard entertainment system matches most home entertainment systems. An active suspension system and drive by wire control system make control smooth and easy, even on bad roads or in poor driving conditions. The all around automatic awning and electronic pest control system allow comfortable relaxation at the destination.

The MV950 is a moderate sized RV, with some models handling up to eight sleeping spaces. Another option for RV living is a conversion kit for larger ground vehicles like vans or pick up trucks, adding sleeping space for two to four and a small galley space.

Design Specifications

Installed Components	Size	Cost	EP
7,000 vl Chassis	-7,000	7,000	-
Controls	1,400	3,500	-
Wheeled Drivetrain (4)	1008	4,200	-84
Internal Combustion	455	4,550	+91
Fuel	455	-	-
Climate Control	70	1,750	-7
Passenger Seats (4)	800	400	-
Passenger Bunks (4)	600	1,000	-
Galley (2)	1,000	4,000	-
Fresher/Shower	350	850	-
Long Range Radio	2	300	-0.08
Cargo	860	-	-

Subtotals Cr27,550 (Cr22,040 with 20% production model discount)





GRAV VEHICLES

The Yiam Caardee Design Bureau catalog presents a mélange of Grav vehicles to demonstrate the variety of available designs. This is merely a teaser to spark interest. Specialized catalogs for each category of Grav vehicle are available if the example design presented doesn't quite meet your requirements.

We have divided the vehicles in this catalog into four sections. First section covers purely civilian Grav vehicles that are on many worlds. The second section describes lower tech military Grav vehicles used as the backbone of planetary defense and mercenary forces throughout Ley sector. The third section covers the current state of the art military Grav vehicles used by the Imperial armed forces. The fourth section presents two new, cutting-edge Grav tanks under developed for the Imperial Army.

GRAV BELT



TL12, Cr9,192, 100vl. A personal anti-gravity transportation system uses a single null-gravity module and a personal harness to transport a single person and a small amount of cargo. The advanced fuel cell, rechargeable from a ship's power plant, powers the harness for four weeks. The cruising speed of 60kph and a 672-hour duration fuel tank give the Grav belt a 40,000-km range. Because many people find the Grav Belt harness uncomfortable or the manner of flight unnerving, Grav belts are not as ubiquitous as the air/raft.

Ling-Standard Products Grav belt is the best known Grav Belt throughout the Imperium. Fast, reliable and safe, the Grav Belt makes and is excellent for short-range exploration or commuting. LSP's latest model uses a more seat like approach for the harness with a new "Auto-Strap" system. Balistica Maximas produces the AMV Grav belt, designed with a larger cargo capacity to support a soldier with a full kit, allowing better mobility for ground troops. Elite strike force teams on several worlds have adopted the stealthy and low-emissions AMV Grav Belt.

Design Specifications

Installed Components	Size	Cost	EP
200 vl Chassis	-200	200	-
Controls	20	50	-
Grav Drivetrain	0.96	11,040	-0.24
Adv. Fuel Cell	1.5	100	1
Fuel	33.6	-	-
Crew	110	100	-
Cargo	33.94	-	-

Subtotals Cr11,490 (Cr9,192 with 20% production model discount)

GRAV BIKE

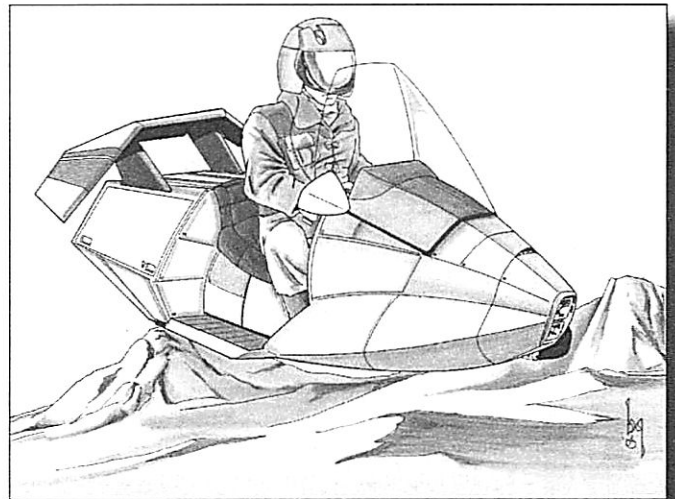
TL12, Cr38,188, 130vl. A two-person grav transport, the driver and passenger sit on open saddle seats. Grav bikes have little or no cargo space and generally only carry one passenger. The cruising speed of 300kph and a 504-hour (three-week) duration fuel tank gives the bike a 150,000 km range.

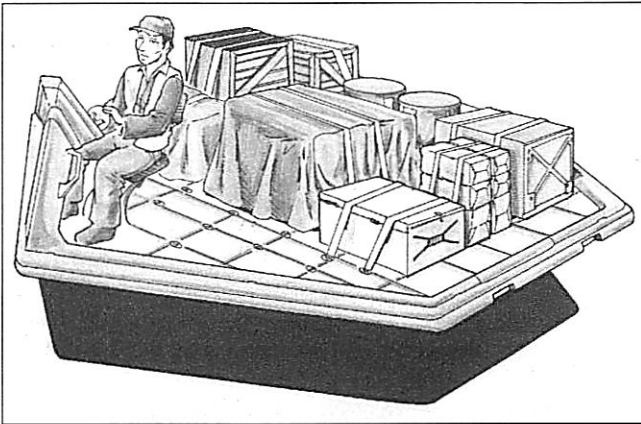
Hagajaya Sarana manufactures the LightFlit, and like their other bikes, designs it for ease of use by the first time rider. All of the controls are brightly backlit, easy to find, and simple to use. The center display has a user-friendly help system that can be voice activated through the intercom system. Safety features included by the LightFlit are safety harnesses for driver and passenger, a powerful inertial gyroscope, and computerized performance limitation options. Hagajaya's safety record with the LightFlit is outstanding, and the LightFlit has received highest recommendation marks from independent reviewers throughout Ley sector.

Design Specifications

Installed Components	Size	Cost	EP
330vl Chassis	-330	330	-
Controls	33	165	-
Grav Drivetrain	3.96	45,540	-0.99
Adv. Fuel Cells	7.575	1,515	+5.05
Fuel	42.42	-	-
Passenger Saddle (2)	220	25	-
Headlight (6m beam)	0.4	10	-0.02
Two way Radio	1	150	-0.04
Cargo	21.645	-	-

Subtotals Cr47,735 (Cr38,188 with 20% production model discount)





HIVER FLOATER

TL 15, Cr50,368, 1,500vl. The floater is a large square, rectangular, or hexagonal platform with a control column on one side and a number of cargo tie down points around the top surface. Hiver's use this simple floating platform where Imperial citizens would use an air/raft, as a light duty passenger or cargo craft. The Floater can cruise at 37kph and has a top speed of 75kph.

Nova Bright-Star Nest manufactures a number of Floater models. This floater, called "One", is for one person and can haul 1,000vl of cargo. Nova Bright-Star also produces the "Six," a six-person carrier platform and a larger cargo platform called "Twelve".

Our review team was very impressed with this vehicle. The dynamic control system contains a biometric sensor that reconfigures to your personal settings, or for an unknown person to a layout designed for their species. The Autopilot is responsive and configured to understand all of the most common planetary navigation nets in the Imperium. An advanced micro-fusion plant with an impressive one year fuel supply redefines "unlimited range".

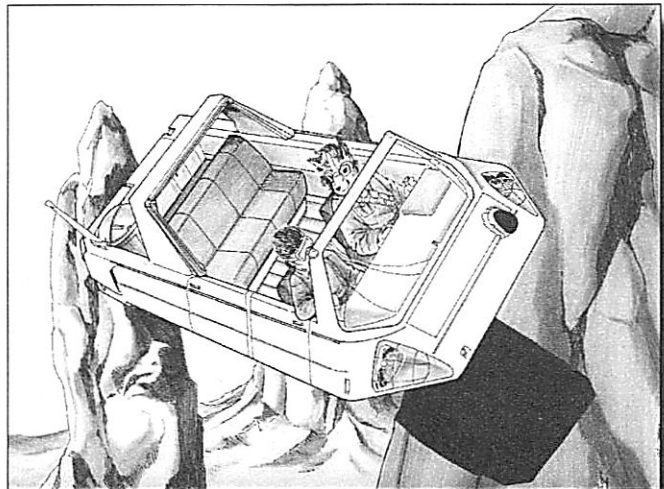
Design Specifications

Installed Components	Size	Cost	EP
1,500 vl Chassis	-1,500	1,500	-
Controls	300	750	-
Grav Drivetrain	4.5	51,750	-1.125
Advanced Fusion	3	660	+2
Fuel	36	-	-
NavComp-3	8.1	6,000	-0.72
Dynamic Control Panel	1.35	2,000	-
Long Range Radio	2	300	-0.08
Cargo	1,145	-	-
Subtotals		Cr62,960 (Cr50,368 with 20% production model discount)	

AIR/RAFT

TL 8 Cr265,920, 6,000vl. A light Grav vehicle using null-gravity modules to counter act gravity for lift and propulsion to carry a few passengers and their cargo. An air/raft can cruise at 60 kph and reach a maximum of 120 kph. An air/raft can reach orbit in a number of hours equal to the planet's UWP, but passengers must wear vacc suits. Interplanetary travel is impossible in an air/raft. The craft can carry a driver and 3 passengers plus over 4000 vl of cargo. Air/rafts come in a variety of configurations at various tech levels. The example here is the lowest tech level model with a gas-turbine engine, open-topped and unpressurized. Higher tech versions often have fuel cell or fusion engines with longer ranges and better agility.

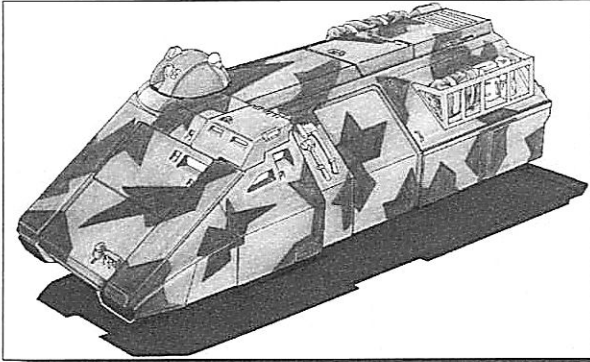
This design is from the Ling-Standard Products catalog. LSP has been manufacturing these craft throughout its entire history, and the air/raft has been copied so extensively the term air/raft has become a generic term for a light Grav vehicle throughout Charted Space. LSP continues to make minor modifications to the air/raft but the basic design has remained unchanged for almost a thousand years.



Design Specifications

Installed Components	Size	Cost	EP
6,000 vl Chassis	-6,000	6,000	-
Controls	1,200	3,000	-
Grav Drive Train	28	322,000	-7
Turbine Power Plant	16	800	+8
Fuel	336	-	-
Passenger Seats (3)	300	300	-
2-way radio (long range)	2	300	-0.8
Cargo	4118	-	-
Subtotals		Cr332,400 (Cr265,920 with 20% production model discount)	

GCARRIER



TL8, Cr576,432, 10,000vl. An enclosed military or quasi-military grav vehicle. The GCarrier is an armored air/raft intended originally for troop carrier duties. Performance is similar to that of the air/raft, but the vehicle generally has a gun mount and is armored. It requires a crew of one (with driving skill and the Vessel/grav feat), plus a gunner for the craft's weapon, if any. It can carry 14 persons (including the driver and gunner), plus roughly half a metric ton of cargo.

Like the air/raft, the Grav Carrier as a light armored personnel carrier has become a generic term and applied to a wide range of very similar craft. Ballistica Maximus markets the Armatura Volucer, a classic example of a Gcarrier, to planetary security forces. The armor will stop most small arms fire and the turreted rapid pulse 2.8Mw laser canon will quickly disable most civilian vehicles with minimal collateral damage. Military designers consider the Armatura Volucer to be slow and undergunned, but it has a combination of armor, speed, and cost the GCarriers's users prefer.

Ballistica Maximus produces an array of weaponry that will fit within the Armatura Volucer's turret, including more powerful laser weapon systems or light autocannons depending upon requirements. One popular variant replaces the passenger seats with a sickbay, for an armed ambulance.

Design Specifications

Installed Components	Size	Cost	EP
10,000 vl Chassis	-10,000	10,000	-
Controls	2,000	5,000	-
TL8 Armor (AR 6)	2,800	28,200	-
Grav Drive Train	48	552,000	-12
Turbine Power Plant	84	4,200	+42
Fuel	1764	-	-
Climate Control	100	5,000	-1
Pressurized Interior	500	12,500	-12.5
Passenger Seats (14)	1540	1400	-
4km visual sensor+LI	40	24,500	-12
2-way radio (long range)	2	300	-0.8
Fire Control Computer	22.95	17,000	-1.53
Lights (2 beam, 2 area)	2	40	-0.08
Standard Turret	540	5,400	-0.54
Pulse Laser-2.8,ROF 5	(450)	55,000	-1.5
Cargo	557.05	-	-

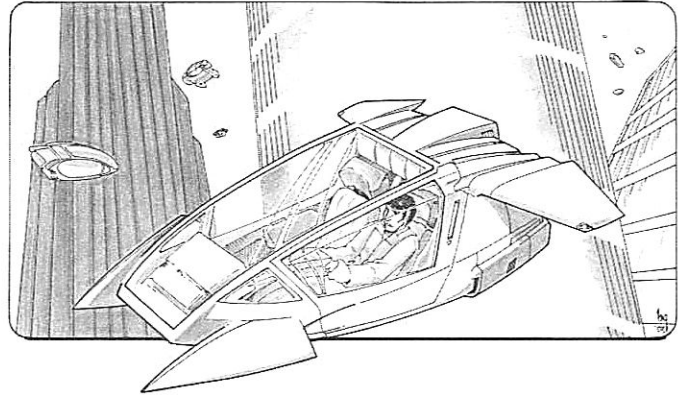
Subtotals Cr720,540 (Cr576,432 with 20% production model discount)

SPEEDER

TL10, Cr629,728, 2,000vl. A small four-person Grav vehicle, sealed against the weather. Speeders are for high-speed travel around a planet, and while the speeder can make it to orbital height, the air-breathing engine is not designed to allow flight outside the atmosphere. The Speeder has a cruising speed of 500kph and a top speed of 1,000kph, hence its name. The 26-hour fuel tank gives the Speeder a 15,600km range.

The speeder, like the Hrovean Eagle imported by Raakugaageniram Adiikhak, is a category of Grav vehicles that has been around a long time and with many variants. The Hrovean Eagle is more agile than most speeders, thanks to its innovative use of aerodynamic styling. Most designers consider the use of wings to be redundant on a Grav vehicle, but the Hrovean Eagle has a full set of canard wings. These small wings allow the Hrovean Eagle to maintain stability and improve maneuverability while reducing stress on the Grav modules.

Speeders are some of the most expensive personal Grav vehicles generally available, making them infrequently seen. Planetary governments discourage their citizens from flying a Mach speed capable craft, particularly within urban areas. Speeders are most popular on less inhabited planets or uninhabited areas of worlds where there are long distances and little traffic.



Design Specifications

Installed Components	Size	Cost	EP
2,000 vl Chassis	-2,000	2,000	-
Controls	400	1,000	-
Airframe chassis	-	6,000	-
Grav Drive Train	66.64	766,360	-16.66
Fuel Cell Power Plant	68	10,200	+34
Fuel	132.6	-	-
Climate Control	20	1,000	-0.2
Passenger Seats (3)	300	300	-
2-way radio (long range)	2	300	-0.8
Lights (2 beam, 2 area)	2	40	-0.08
Video+LI	4.1	5500	-0.14
Cargo	1004	-	-

Subtotals Cr787,160 (Cr629,728 with 20% production model discount)

SUB-ORBITAL TRANSPORT

TL13, Mcr8.45, 20,000vl. A large grav transport for high-speed long-range transport. The transport carries ten passengers in roomy comfort plus 1,300 vl of cargo. The craft has a top speed of 1,200 kph, with a 2-month fuel supply for the fusion power plant. The transport requires a crew of two; a pilot and a navigator.

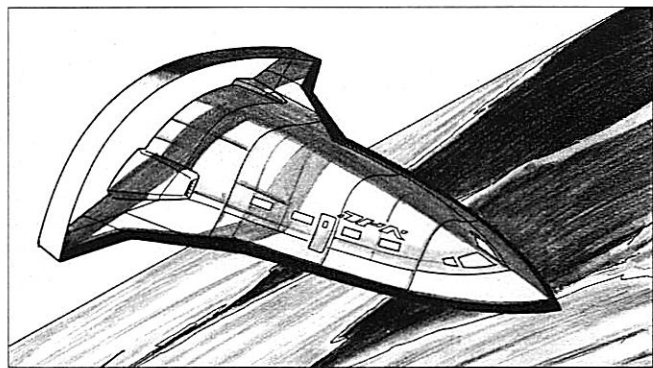
The TopSail is an orbit capable Grav vehicle manufactured by Hagajaya Sarana. The outer hull meets the Imperial Starship Design Review (ISDR) standards for micrometeorite and radiation resistance. The TopSail is capable of reaching orbital height in less than an hour, but takes 5 hours or more to reach orbital velocity. The ISDR does not recommend using the TopSail for interplanetary voyages. The life support system of the TopSail is not designed to maintain passengers for the days or weeks such a journey would take and the communications and sensor systems are not up to ISDR standards. Still, the TopSail has found a market with travel companies providing quick trips from one side of a planet to another.

Hagajaya Sarana has several configurations of the TopSail, the two most popular are an all cargo variant with a 10,000 vl cargo hold and large loading door and a 25 passenger short hop carrier.

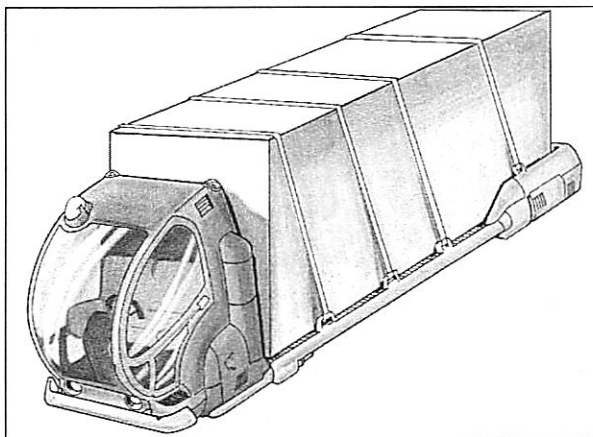
Design Specifications

Installed Components	Size	Cost	EP
20,000 vl Chassis	-20,000	20,000	-
Controls	4,000	10,000	-
Airframe Chassis	-	60,000	-
Armor -5	2,400	24,600	-
Grav Drive Train	800	9,200,000	-200
Modern Fusion Power Plant	930	204,600	+310
Fuel	930	-	-
Climate Control	200	10,000	-2
Pressurized Interior	1,000	25,000	-25
Navigator	200	100	-
Passenger Seats (10 roomy)	8,000	4,000	-
Fresher	200	750	-
2-way radio (long range)	2	300	-0.8
Radar (Long Range)	20	1,000,000	-1
AutoPilot/3 (Synaptic)	6	4,500	-0.405
Cargo	1,312	-	-

Subtotals Cr10,563,850 (Mcr8.45 with 20% production model discount)



CARGO HAULER, LIGHT



TL9, Cr657,040, 7,000vl. The light cargo hauler is for short range hauling of break bulk (small boxes or loose items) cargo. The cargo hauler can hold up to 5,000vl of cargo. It has a top speed of 250kph, and a cruising speed of 125kph. The 46-hour duration fuel tank gives the Grav truck a 5,750-km range. The Grav truck requires a crew of 1, the pilot, although there is space for a single passenger.

The 25 series manufactured by Finmeccanica is a prime example of a short range Grav powered cargo hauler. The hydraulically powered large rear door gives quick access to the cargo space and acts as an access ramp. The controls, done over with an ergonomic fine toothed comb, are comfortable, well laid out, and ideally suited for the short range delivery of small packages and light cargo. Many of 25 series are adapted for mobile repair duties, the cargo space filled with tools and materials, for use in rural areas.

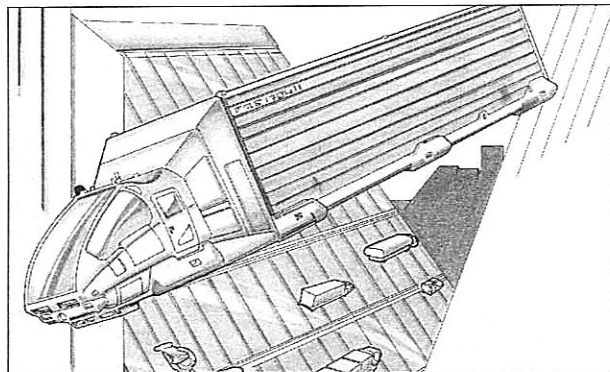
Finmeccanica offers the 25 series with a variety of cargo space options. The standard climate control system included with the base model is capable of providing moderate cooling for cargo. As optional equipment, Finmeccanica can outfit the 25 series with a large tank, a freezer cargo space, or a flatbed with cargo tie down points.

Design Specifications

Installed Components	Size	Cost	EP
7,000 vl Chassis	-7,000	7,000	-
Controls	1,400	3,500	-
Climate Control	70	3,500	0.7
Grav Drive Train	70	805,000	-17.5
Turbine Power Plant	38	1,900	+19
Fuel	218	-	-
Passenger Seats (1)	200	100	-
2-way radio (long range)	2	300	-0.8
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	5,000	-	-

Subtotals Cr821,340 (Cr657,072 with 20% production model discount)

CARGO HAULER, HEAVY



TL9, Mcr 7.2, 31,500vl. A large cargo hauling truck designed for high-speed delivery of large cargo loads. The cargo hauler has a cruising speed of 300kph and a top speed of 600kph. The liquid hydrogen fuel supply for the early fusion plant lasts a month. The large cargo space can hold up to 22,400 vl of cargo or passengers.

The Finmeccanica 112 series is a prime example of how cargo hauling has evolved from wheeled trucks. The 112 series provides a high-speed delivery option over moderate distances. Responsive control systems on the 112 series give the large truck much more agility and allow moving cargo directly from shipboard to destination. The 112 series is for larger worlds where shipping companies do not use the starport customs warehouse as a final distribution point. The autopilot and communications systems allow the 112 series to work with ground traffic control, a big selling point for worlds where the costs for using space traffic control may be much higher.

Finmeccanica manufactures a wide range of options for the cargo space on the 112 series. The 112-A is an open frame with attachment points for standard size shipping containers. The 112-B has a permanently attached large cargo box, with optional refrigeration or heating systems. The 112-G replaces the large box with a 34,500-liter tank capable of hauling water, Lhyd fuel, or just about any other liquid.

Design Specifications

Installed Components	Size	Cost	EP
31,500 vl Chassis	-31,500	31,500	-
Controls	6,300	15,750	-
Partly Streamlining	-	31,500	-
Climate Control	315	15,750	3.15
Grav Drive Train	756	8,694,000	189
Early Fusion Power Plant	900	200,000	+200
Fuel	300	-	-
Passenger Seats (2)	400	200	-
2-way radio (long range)	2	300	-0.8
Autopilot/0	5.06	3,750	-0.45
Video + LI	4.1	5,500	-0.14
Lights (2 beam, 2 area)	2	40	-0.08
Cabin Space	115.84	-	-
Cargo	22,400	-	-

Subtotals Cr8,998,290 (Mcr7.2 with 20% production model discount)

AMBULANCE

TL9, Mcr 1.13, 5,000vl. A vehicle designed to transport the sick or injured. The Ambulance has room for two patients, plus two doctors to monitor the patient condition and 156 vl of cargo for emergency medical supplies. The ambulance has a cruising speed of 250kph and a top speed of 500kph.

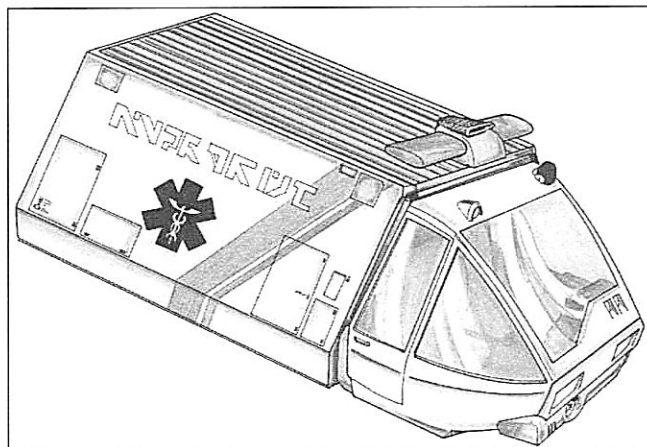
Dinabarb manufactures the Ambulance Type II, a top of the line model designed for starport emergency services. The Type II has a separately grounded electrical system and a coating on all surfaces to prevent sparking. Interior construction of the Type II from high-grade lightweight materials to meet or exceed every medical care organization design recommendations. Dinabarb's marketing department makes frequent reference to the Type II as one of the fastest and certainly the most agile production ambulance, a fact that seems to attract the daredevil ambulance pilots.

The Type II has become a big favorite with a number of mercenary companies throughout Ley sector. The quick and agile Type II is ideal for battlefield extraction of casualties. A field modification seen occasionally is the addition of several layers of armor plate over the passenger compartment.

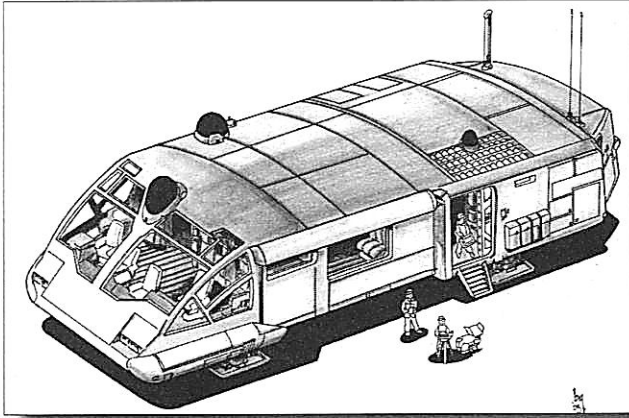
Design Specifications

Installed Components	Size	Cost	EP
5,000 vl Chassis	-5,000	5,000	-
Controls	1,000	2,500	-
Partial streamlining	-	5,000	-
Climate Control	50	2,500	-0.5
Grav Drive Train	100	1,150,000	-25
Fuel Cell Power Plant	180	27,000	+90
Fuel	1296	-	-
Passenger Seats (1)	200	100	-
2-way radio (long range)	2	300	-0.8
Autopilot/0	5.06	3,750	-0.45
Medical Computer (+1)	4.9	8,750	-0.045
Video + LI	4.1	5,500	-0.14
Lights (2 beam, 2 area)	2	40	-0.08
2 Sickbays	2,000	200,000	-
Cargo	156	-	-

Subtotals Cr1,410,440 (Mcr1.13 with 20% production model discount)



GRAV ATV



TL14, Mcr1.16, 10,000vl. The Grav All Terrain Vehicle is a Grav powered counterpart to the wheeled and tracked ATVs. The GATV has passenger and sleeping space for 8, including galley space for food and a fresher. The GATV can reach speeds of 400kph, with a normal cruising speed of 200kph. The modern fusion plant has a 3-month fuel supply.

Hagajaya Sarana's LongSearch is a rugged vehicle designed to carry a load of passengers and gear into the remotest location on the roughest planet in comfort. For less hospitable worlds, the large two-person air lock allows quick access for the passengers and the large rear cargo space is sealed and pressurized separately from the crew compartment. On hospitable worlds, the large side doors allow roll-on access to both the crew and cargo compartment. Borrowing from Hagajaya's very successful line of recreational vehicles, the LongSearch has four extendable tent sides creating a large protected space around the vehicle for crew and passengers. In addition to vacuum testing, the LongSearch has been tested at up to seven atmospheres or 50m depth making it ideal for shallow water exploration.

Design Specifications

Installed Components	Size	Cost	EP
10,000 vl Chassis	-10,000	10,000	-
Controls	2,000	5,000	-
Partial streamlining	-	10,000	-
Armor: AR2	300	5,700	-
Climate Control	100	5,000	-1
Pressurized Interior	500	12,500	-12.5
Grav Drive Train	160	1,840,000	-40
Fusion Power Plant	285	62,700	+95
Fuel	427.5	-	-
Passenger Seats (8)	1600	800	-
Passenger Bunks (8)	1200	2,000	-
Galley (2)	500	2,000	-
Fresher/shower	350	850	-
2-way radio (long range)	2	300	-0.8
Autopilot/0	5.06	3,750	-0.45
Video + LI	4.1	5,500	-0.14
Lights (2 beam, 2 area)	2	40	-0.08
Laboratory	800	50,000	-
Cargo	1764.4	-	-

Subtotals Cr2,016,140 (Mcr1.61 with 20% production model discount)

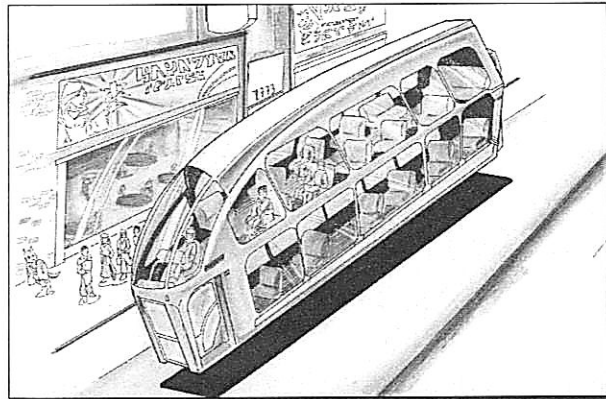
GRAV BUS

TL12, Mcr1.14, 10,000vl. A large vehicle designed for transporting commuters over short to medium distances. The bus is capable of a top speed of 300kph, and a cruising speed of 150kph. The 1-week fuel supply for the advanced fuel cell power plant gives a range 25,200km.

The Arurack, named for a large beast of burden found on a number of worlds in the Gateway sector, is Raakugaageniram Adikhak short-range commuter bus designed to serve both urban bus routes and replace light rail passenger service. Ergonomic passenger seating and corrosion resistant oversized hand railings make an attractive interior. The Arurack's overpowered internal grav compensation system ensures no flailing passengers even at maximum acceleration. The RA designs and markets the Arurack for more inhospitable worlds, giving the bus a sealed air system and irisng air-lock door with an adaptable attachment system for most habitats.

RA's guarantees a 100-year operating life span for the Arurack, making it an attractive investment. In addition, many of the components are modular, requiring no maintenance and module replacements require only a few tools. An example is the change box, the Arurack can accept cash, credit, or identity cards, identify passengers with a radio id tag or biometric sensor, and usually in some combination.

On poor worlds, one of the first markets for many grav vehicles is mass transit. The only agencies that can afford expensive Grav vehicles are governments or large industries and can do so by spreading the cost over a large number of people.

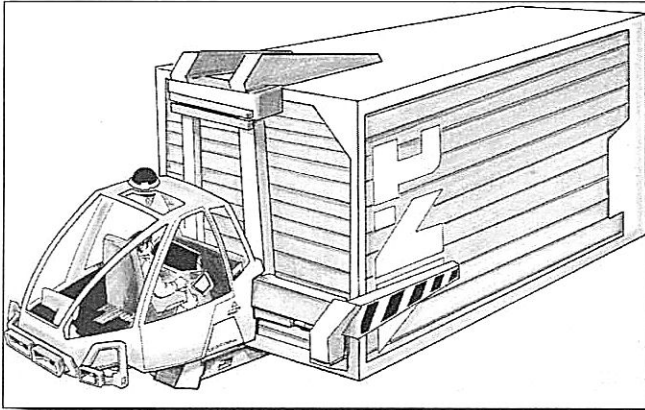


Design Specifications

Installed Components	Size	Cost	EP
10,000 vl Chassis	-10,000	10,000	-
Controls	2,000	5,000	-
Climate Control	100	5,000	-1
Pressurized Interior	500	12,500	-12.5
Grav Drive Train	120	1,380,000	-30
Adv Fuel Cell Power Plant	66	4,400	+44
Fuel	370	-	-
Passenger Seats (20)	4000	2000	-
Passenger Stands (4/24)	2420	44	-
2-way radio (long range)	1	150	-0.4
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	421	-	-

Subtotals Cr1,419,134 (Mcr1.14 with 20% production model discount)

CARGO LIFTER



TL9, Mcr0.73, 7,600vl. A large Grav drive cargo lifter, for loading and unloading starships both on the ground and in orbit. Sealed life support systems allows working in either a shirtsleeve or a hostile environment.

Finmeccanica manufactures the FC-112, a standard cargo box carrier for starport use. Unlike ground based forklifts, the FC-112 has no lift capability, relying upon the Grav drive to provide lift. Instead the adaptable grabbling system and variable center-of-gravity drive system allows the craft to move the standard 8-dton cargo containers with ease. The exterior of the craft, other than the grappling system, is smaller than the cargo containers it hauls about, allowing it quick access to the cramped cargo spaces of most freighters.

Versions of these cargo lifters are found at every single starport throughout the Imperium.

Design Specifications

Installed Components	Size	Cost	EP
30,000 vl Chassis	-30,000	30,000	-
Controls	6,000	15,000	-
Climate Control	76	3,800	-0.76
Pressurized Interior	380	9,500	-9.5
Grav Drive Train	72	828,000	-18
Fuel Cell Power Plant	84	12,600	+42
Fuel	605	-	-
Passenger Seats (1)	200	100	-
Arms (2/112 tons: Str 64)	64	12,800	-12.8
2-way radio (long range)	1	150	-0.4
Lights (2 beam, 2 area)	2	40	-0.08
Towing Volume	22,400	-	-
Cargo	116	-	-

Subtotals Cr911,990 (Mcr0.73 with 20% production model discount)

LIGHT TANK

TL10, Mcr1.34, 7200vl. Interstellar Arms standard light tank MBTLPL (Main Battle Tank, Light, Pulse Laser), a design first created for the Imperial Army in 625 as part of the IA's modernization effort after the end of the Civil War. The Imperial Army rejected the tank, but Interstellar Arms has found a wide market for the Light Tank with numerous planetary armed forces and mercenary groups. The main armament laser

system and Grav drive systems have remained unchanged from the original designs.

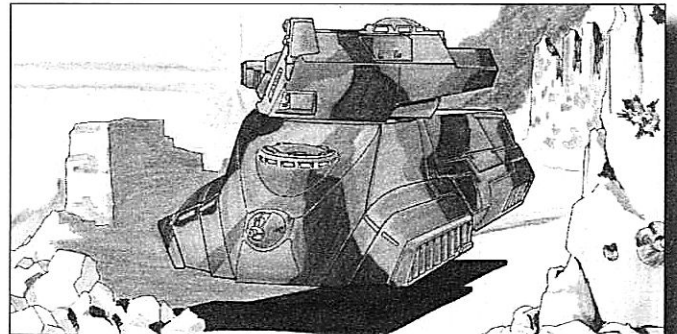
Crew layout is a standard for Interstellar Arms vehicle; pilot sits forward in the main hull with the Electronic Operations Officer (EOO) behind him, the commander is seated on the left side of the turret and the gunner on the right side. Main armament is a 32 Mw single lens pulse laser with an effective atmospheric range of 630km. Secondary armament consists of a single light machine gun mounted in the main hull and fired by the EOO. The main passive sensor array is mounted on the leading edge of the turret, were it performs its primary duty as the targeting array for the gunner. Additional sensor arrays are mounted on the main body front nose and the rear corner of the body.

A common variation is a point defense design, PDSLPL (Point Defense Sled, Light, Pulse Laser) replacing the primary laser weapon with two ROF 10 1.5Mw pulse lasers (Damage: 1d10) and adding a short-range spread-frequency radar targeting system.

Design Specifications

Installed Components	Size	Cost	EP
7,200 vl Chassis	-7,200	7,200	-
Controls	1,440	3,600	-
Partly Streamlined	-	7,200	-
Armor : AR10	2,376	24,384	-
Climate Control	72	3,600	-0.72
Pressurized Interior	360	9,000	-9
Grav Drive Train	115.2	1,324,800	-28.8
Fuel Cell Power Plant	276	41,400	138
Fuel	212	-	-
Heavy Turret	2128	21,280	-4.256
Pulse Laser - 32Mw	(1050)	125,000	-3.2
4km visual sensor+LI+IR	(64)	104,000	-2.8
Crew Seats (2)	(400)	200	-
Fire Control Computer	(2.025)	1,500	-0.18
Cargo	(3.975)	-	-
Crew Seats (1)	200	100	-
Lt Machine Gun/Cupola	6.05	1230	-
200 rnds Ammo	5	240	-
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	3.75	-	-

Subtotals Cr1,675,374 (Mcr1.34 with 20% production model discount)



MEDIUM TANK

TL10, Mcr4.43, 21,500vl. The Interstellar Arms Medium Tank, the MBTMG (Main Battle Tank, Medium, Gauss). Grav tank design using a gauss cannon as a main weapon dates back to the Long Night. Interstellar Arms first produced MBTMG in 821 for clients in the Old Expanses sector and since then has offered the MBTMG as their standard Medium Tank.

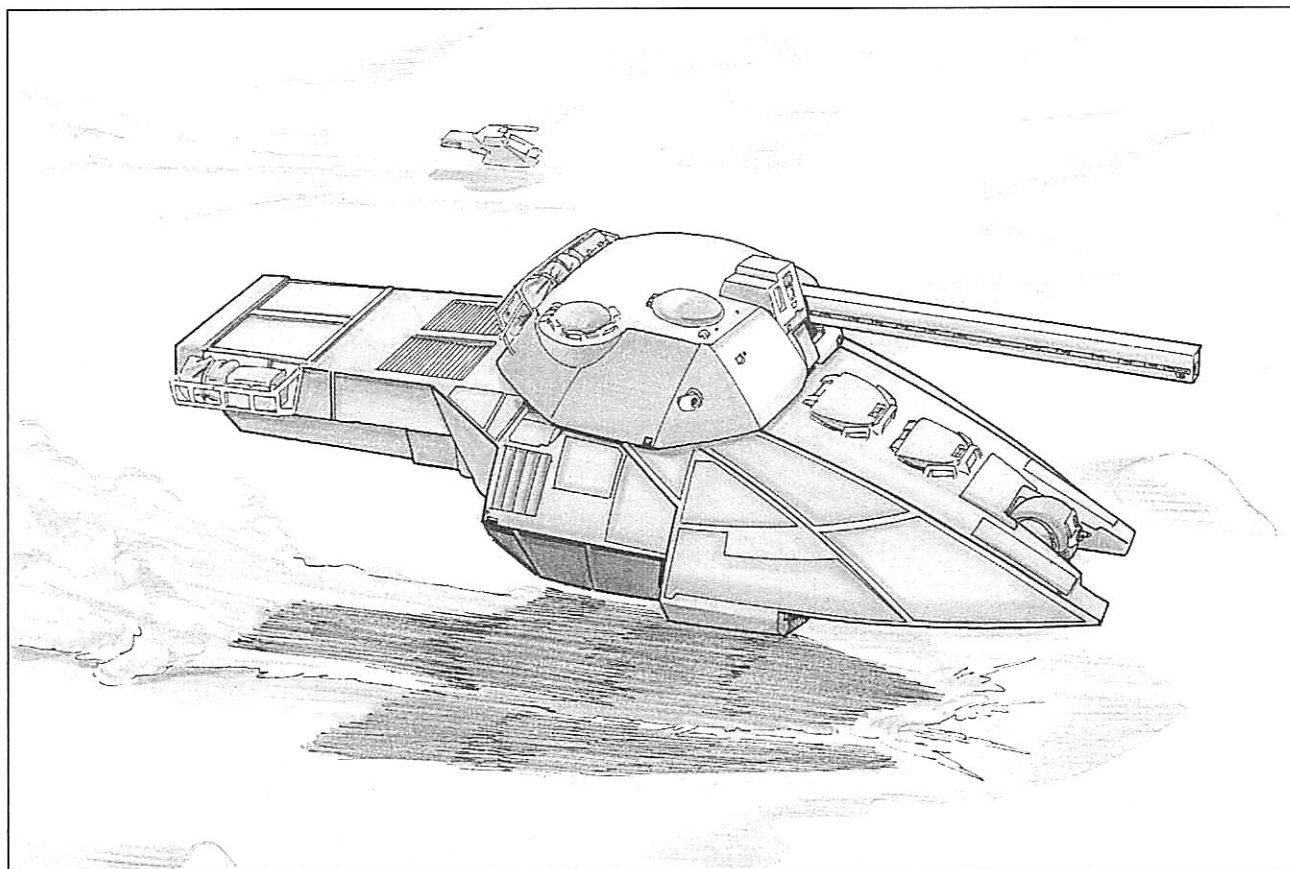
The MBTMGs primary armament is a 65mm mass driver cannon, with a 2,150m/s-muzzle velocity. Ammunition supply is split between the primary supply in the turret and the secondary supply in the body. In order to engage the automatic ammunition handing system to move ammunition from the secondary storage in the hull requires fixing the turret in its forward position. Secondary armament is a single light machinegun, fix mounted on the forward hull. Crew layout places the electronic operations officer behind the pilot in the hull, while the commander and the gunner sit in the turret, on the left and right side respectively.

For clients requesting a tank with less logistical support, Interstellar Arms supplies the MBTML (Main Battle Tank, Medium, Beam Laser) replacing the mass driver cannon with a 67Mw beam laser (Damage: 8d8) and a battery capable of supplying 500 shots. Recharging the drained power cell requires more than 8 hours at full power plant output and is not possible while the tank in operation.

Design Specifications

Installed Components	Size	Cost	EP
21,500 vl Chassis	-21,500	21,500	-
Controls	4,300	10,750	-
Partly Streamlined	-	21,500	-
Armor : AR10	7095	66,855	-
Climate Control	215	10,750	-2.15
Pressurized Interior	1075	26,875	-26.875
Grav Drive Train	430	4,945,000	-107.5
Fuel Cell Power Plant	820	123,000	410
Fuel	1741	-	-
Heavy Turret	5000	50,000	-10
Mass Driver - 5	(2,900)	158,000	-0.8
40 rnds Ammo	(200)	240	-
4km visual sensor+LI+IR	(64)	104,000	-2.8
Crew Seats (2)	(400)	200	-
Fire Control Computer	(2.025)	1,500	-0.18
Cargo	(5.4)	-	-
120 rnds MD Ammo	600	720	-
Crew Seats (1)	200	100	-
Lt Machine Gun/Cupola	6.05	1230	-
200 rnds ammo	5	240	-
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	6.95	-	-

Subtotals Cr5,543,100 (Mcr4.43 with 20% production model discount)



HEAVY TANK

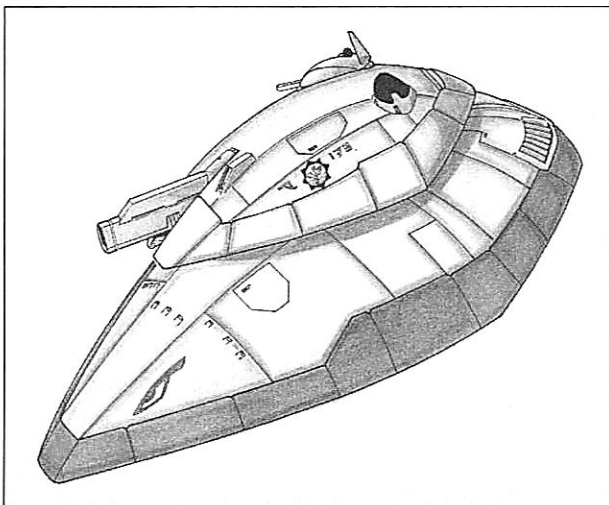
TL12, Mcr6.19, 24,000vi. The Interstellar Arms heavy tank, the MBTHF (Main Battle Tank, Heavy, Fusion). Interstellar Arms has produced fusion armed tanks for many years, but has only recently been able to upgrade their local logistical support network within Ley sector to be able to offer the MBTHF to the general market.

Main armament is a single-pulse 30Mw fusion cannon with an 18km maximum range. Interstellar Arms uses an advanced fuel cell to supply the fusion cannon power system. Secondary armament is a single light machinegun mounted on the forward hull. The MBTHF uses five arrays of passive sensors, two on the turret and three on the main body, to supply both the pilot and gunner with a comprehensive view of the exterior environment.

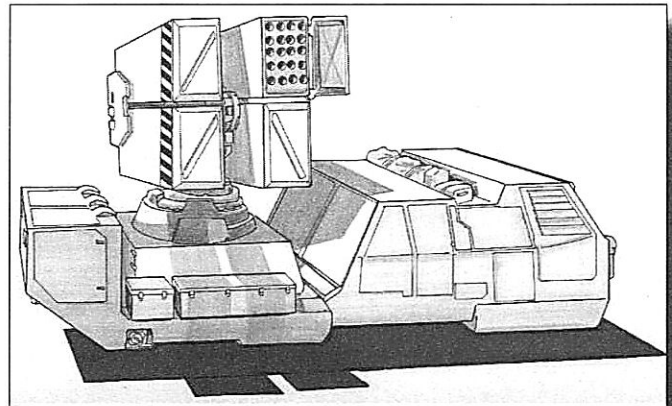
Design Specifications

Installed Components	Size	Cost	EP
24,000 vi Chassis	-24,000	24,000	-
Controls	4,800	12,000	-
Partly Streamlined	-	24,000	-
Armor : AR12	6,240	59,160	-
Climate Control	240	12,000	-2.4
Pressurized Interior	1,200	30,000	-30
Grav Drive Train	480	5,520,000	-120
Adv. Fuel Cell Power Plant	765	51,000	510
Fuel	573.75	-	-
Heavy Turret	9,478	94,780	-18.956
Fusion-4	(6300)	1,800,000	-45
4km visual sensor+LI+IR	(64)	104,000	-2.8
Crew Seats (2)	(400)	200	-
Fire Control Computer	(1.08)	1,600	-0.72
Cargo	(4.92)	-	-
Crew Seats (1)	200	100	-
Lt Machine Gun/Cupola	6.05	1230	-
200 rnds	5	240	-
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	6.2	-	-

Subtotals Cr7,734,710 (Mcr6.19 with 20% production model discount)



MISSILE ARTILLERY SLED



TL10, Cr732,674, 4600vi. The Telum Tormentum is manufactured by Ballistica Maximas and has been in production since 950. Ballistica produces the Telum Tormentum strictly for the export market and Ballistica continues to manufacture more than 100 examples per year. Ballistica Maximus licenses production of the missiles to a number of smaller firms to ensure the ammunition supply to their customers.

Armament consists of 100 launch rails grouped into four sets of 25 rails. Ammunition is factory packaged in to a cassette of 25 rockets. The rockets are then loaded onto the individual rails by an automated handling system. As long as ammunition carriers can reload the cassettes, the Telum Tormentum is capable of maintaining a 25 round per minute barrage. There have been complaints about the robotic arms used in loading systems failing under some particularly harsh environmental conditions.

Design Specifications

Installed Components	Size	Cost	EP
4,600 vi Chassis	-4,600	4,600	-
Controls	920	2,300	-
Partly Streamlined	-	4,600	-
Armor : AR 5	828	10,452	-
Climate Control	46	2,300	-0.46
Pressurized Interior	210	5,250	-5.25
Grav Drive Train	73.6	846,400	-18.4
Fuel Cell Power Plant	172	25,800	86
Fuel	310	-	-
Heavy MLR/ Fixed mount	1100	5100	-
Crew (2)	400	200	-
Loading Arm (ST7) (4)	14	2800	-2.8
Fire Control Computer	2.025	1,500	-0.18
2-way radio (long range)	4	600	-1.6
Laser communication	2	2400	-0.1
Lights (2 beam, 2 area)	2	40	-0.08
Ammo Storage	500	1500	-
Cargo	16.375	-	-

Subtotals Cr915,842 (Cr732,674 with 20% production model discount)

ARTILLERY SLED

TL12, Mcr2.0, 12,750vl. The Ferreus Tormentum, manufactured by Ballistica Maximas and was first produced in 975 as the primary artillery weapon for the Huangfeng planetary armed forces. The Halucan Raiders, a mercenary company placed an order for 12 Ferreus Termentum's in 977 and reported excellent results under fire. These reports have prompted a number of additional orders and Ballistica Maximas has been producing 30 Ferreus Tormentus sleds per year.

Armament is a fix mounted 12cm ETC cannon with a high speed automatic loading system. Ammunition is stored in eight ten-round hoppers. The gunner selects individual rounds from each hopper to match fire mission requirements. Each hopper has an exterior airlock door allowing ammunition to be loaded into the sled even while the weapon is firing. The Ferreus Tormentum requires a crew of three, the pilot and gunner sit in the front right and left respectively. The commander sits behind and above the pilot.

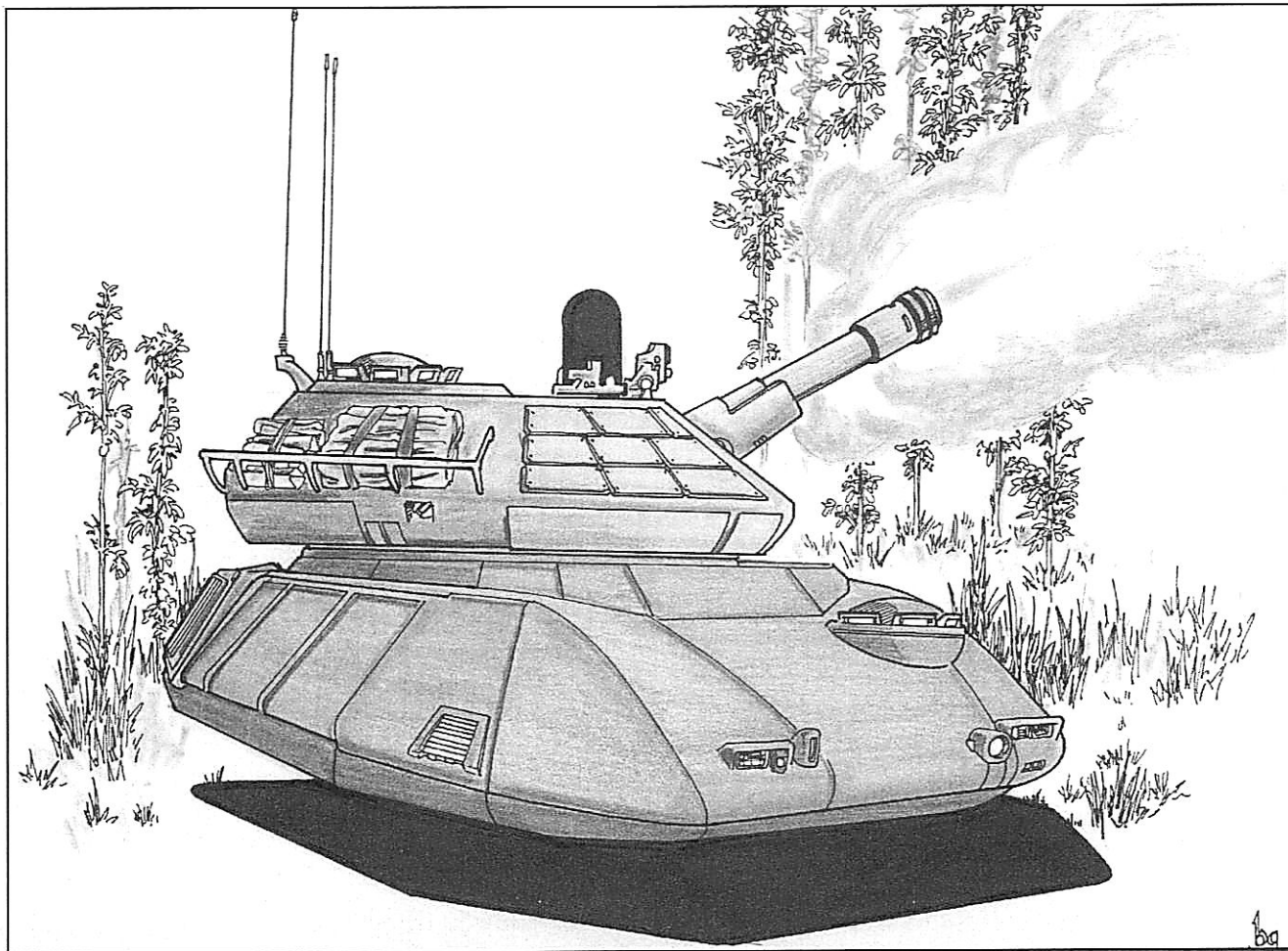
The Ferreus Tormentum-B design is for direct fire assaults on heavily armored targets. A 102EP power plant upgrade and increased fuel supply (allowing a +3 agility) make the sled more mobile. The power plant expansion fits into the space for one of the ammunition hoppers, and reducing ammunition capacity to 70 rounds.

Design Specifications

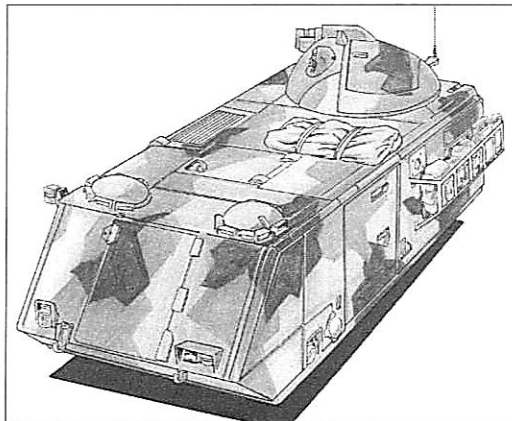
Installed Components	Size	Cost	EP
12,750 vl Chassis	-12,750	12,750	-
Controls	2,550	6,375	-
Partly Streamlined	-	12,750	-
Armor : AR 5	1,530	16,770	-
Climate Control	127.5	6,375	-1.275
Pressurized Interior	637.5	15,937	-15.94
Grav Drive Train	204	2,246,000	-51
Adv Fuel Cell Power Plant	183	12,200	122
Fuel	292.8	-	-
12cm Autocannon/Cupola	1,386	157,869	-
Ammo	5,360	12,800	-
Crew (2)	400	200	-
Fire Control Computer	1.08	1,600	-0.72
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Laser communication	2	2400	-0.1
Cargo	70.12	-	-

Subtotals

Cr2,504,666 (Mcr2.0 with 20% production model discount)



ARMORED PERSONNEL CARRIER (APC)



TL12, Mcr1.24, 8500vl. Ballistica Maximas first manufactured the Octocopiae in 975 as part of the Huangfeng armed forces modernization effort. Ballistica Maximas delivered the initial order of 50 units within two years. Ballistica Maximas continues to manufacture small orders of the Octocopiae for selected external clients.

A large rear door gives access to the cargo area with two inward facing benches to carry eight fully equipped troops. Each seat is equipped with a six point quick-release harnesses for trooper safety during transit. Pilot and commander sit side by side in a forward isolated compartment. A gunner sits in the large rear mounted turret, which can be isolated from the passenger compartment. The Octocopiae is armed with a single 12 Mw variable frequency beam laser with an atmospheric range of 58.5 km.

The large rear compartment also has mounting points for stretchers, converting the Octocopiae into an ambulance with a capacity of up to ten patients. By removing the seats, the Octocopiae becomes an armed lightweight cargo sled.

Design Specifications

Installed Components	Size	Cost	EP
8,500vl Chassis	-8,500	8,500	-
Controls	1,700	4,250	-
Partly Streamlined	-	8,500	-
Armor : AR8	1,530	16,770	-
Climate Control	85	3,600	-0.72
Pressurized Interior	360	9,000	-9
Grav Drive Train	115.2	1,324,800	-28.8
Adv. Fuel Cell Power Plant	219	14,600	146
Fuel	153.3	-	-
Heavy Turret	924	9,240	-1.848
Beam Laser-12mw	(393)	47,600	-1.2
4km visual sensor+LI+IR	(64)	104,000	-2.8
Crew Seats (1)	(200)	100	-
Fire Control Computer	(1.08)	1,600	-0.72
Cargo	(1.92)	-	-
Crew Seats (1)	200	100	-
Passengers(8)	3200	800	-
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	7.5	-	-

Subtotals Cr1,554,100 (Mcr1.24 with 20% production model discount)

ARMORED RECOVERY SLED

TL12, Mcr5.45, 20,000vl. A recovery sled is a large armored, though rarely armed, sled designed for rescue and recovery of downed vehicles on a battlefield. Dinabarib manufactures the AGR, which is a slightly modified DGR, a civilian recovery sled also produced by Dinabarib.

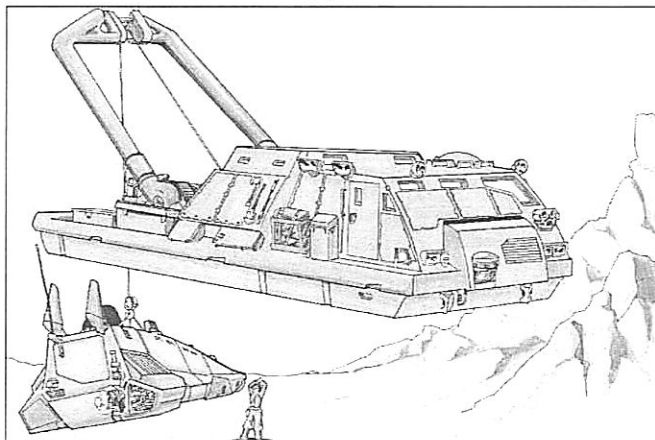
A pilot and commander sit in a forward compartment, while the electronics operator and three technical specialists sit in the rear compartment. Main access to the vehicle is through a large bottom hatch. The winch with a maximum lift capacity of 10,000kg contains a 60m cable and feeds through the bottom hatch. The six-meter lift arms each have a maximum lift capacity of 15,000kg. The Dinabarib built the Grav drive on AGR to expect these loads and the AGR provides a total lift capacity of 15 tons. The AGR is outfitted with a tool set and spare parts set designed to match the other vehicles in the armed forces.

Dinabarib's DGR lacks the heavy armor of the AGR. The DGR also replaces some of the available tools and spare parts to add additional seating for repair personnel and transporting injured members of the downed craft.

Design Specifications

Installed Components	Size	Cost	EP
35,000vl Chassis	-35,000	35,000	-
Controls	7,000	17,500	-
Partly Streamlined	-	35,000	-
Armor : AR6	2,800	28,200	-
Climate Control	200	10,000	-2
Pressurized Interior	1,000	25,000	-10
Grav Drive Train	560	6,440,000	-140
Adv Fuel Cell Power Plant	690	46,000	460
Fuel	1104	-	-
Crew (5)	2,000	500	-
Engineering Shop (3)	3,000	60,000	-
Winch (ST 52)	10.4	520	-0.52
Lift Arms (St 55, DX;0, x2)	55	11,000	-11
4km visual sensor+LI+IR	64	104,000	-2.8
Lights (2 beam, 2 area)	2	40	-0.08
2-way radio (long range)	4	600	-1.6
Cargo	1510.6	-	-
Towing Capacity	15,000	-	-

Subtotals Cr6,813,360 (Mcr5.45 with 20% production model discount)



ARMORED ENGINEERING SLED

TL10, Mcr2.73, 8,000vl. The Agsaggai-A designed and built by Intergrav Logictics. One of the first designs produced by Intergrav, the Agasggai-A has become the standard engineering sled for the Imperial Army. The Agasggai design is one of the few vehicles Intergrav sells to clients other than the Imperial Army and is a part of the engineering companies on more than 100 worlds throughout the Gateway domain.

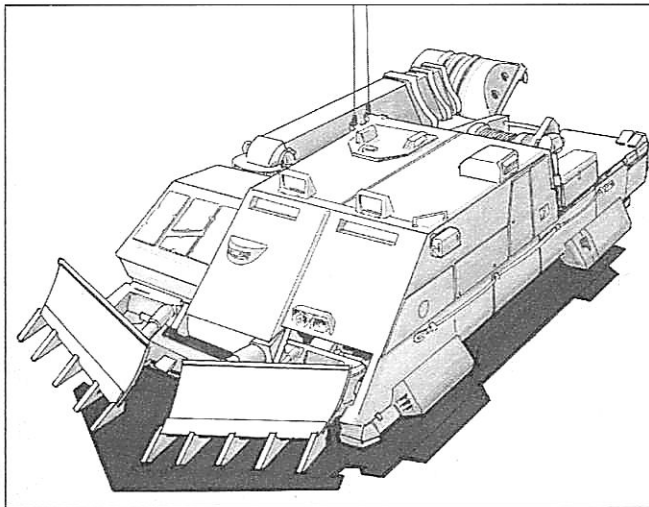
The Agasggai is intended to operate along with the front line units. The front mounted bulldozer blade allows the quick digging of hull defilade positions for armor and infantry and construction of berms and strong points. The added winch is to assist in armor recover operations and for hauling debris.

Ling Standard Products has several versions of the unarmored engineering sled for civilian construction use. The most popular is the LSP ES3, which has a 3,000kg capacity.

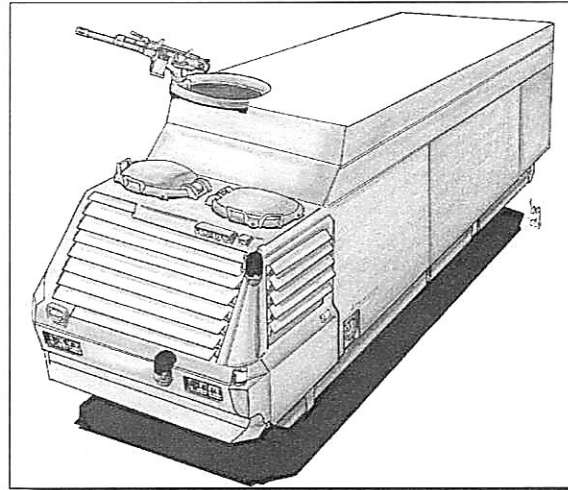
Design Specifications

Installed Components	Size	Cost	EP
18,000vl Chassis	-18,000	18,000	-
Controls	3,600	9,000	-
Partly Streamlined	-	18,000	-
Armor : AR3	960	11,640	-
Ram Plate	480	7,320	-
Climate Control	80	4,000	-0.8
Grav Drive Train	288	3,312,000	-72
Fuel Cell Power Plant	200	30,000	100
Fuel	360	-	-
Crew (1)	200	100	-
Winch (ST 52)	10.4	520	-0.52
2-way radio (long range)	4	600	-1.6
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	1,815.6	-	-
Towing Capacity	10,000	-	-

Subtotals Cr3,411,220 (Mcr2.73 with 20% production model discount)



ARMORED TRUCK



TL10, Mcr2.9, 19,000vl. The Finmeccanica 50A series armored trucks have been in production since 930. The 50A series is an upgrade from the older 40A series, with a larger cargo capacity and a longer range. In addition to mercenary companies throughout Ley sector, the 50A has also been sold to a number of civilian agencies.

The layout of the 50A series is standard to anyone familiar with Grav Truck design. The front cab contains the driver and space for two passengers. The Fuel cell power plant and fuel tank is mounted underneath the front cab. The large rear cargo space is accessed through a pair of swinging doors. As an upgrade from the 40A series, the cargo space is sealed and pressurized, allowing the 50A to transport environmentally sensitive cargo.

Unlike most trucks designed for armed forces use, the 50A has a hard, armored top over the cargo space. The addition of a roof hatch on the forward edge of the cargo space with a pintle mount for a machine gun or light laser allows the 50A to be used as a troop carrier. A variant, the 50AT, replaces the armored cargo space with an armored 50,000-liter tank for hauling fuel or water.

Design Specifications

Installed Components	Size	Cost	EP
19,000 vl Chassis	-19,000	19,000	-
Controls	3,800	9,500	-
Armor: AR3	2,280	23,520	-
Partial Streamlining	-	19,000	-
Climate Control	190	9,500	-1.9
Pressurized	950	23,750	-23.75
Grav Drive Train	304	3,496,000	-76
Fuel Cell Power Plant	260	30,900	+103
Fuel	741.6	-	-
Passenger Seats (2)	400	200	-
2-way radio (long range)	2	300	-0.8
Lights (2 beam, 2 area)	2	40	-0.08
Pintle Mount	215	1400	-
Cargo	9,856.4	-	-

Subtotals Cr3,633,110 (Mcr2.9 with 20% production model discount)

LIGHT MAIN BATTLE TANK

TL14, Mcr6.59, 14,000vl. Interstellar Arms originally designed the Intruder class light tanks for the Imperial Army starting around 815. The primary supplier for the Intruder class tanks in the Ley sector is Delgato. The tank is an infantry support unit and to provide armored reconnaissance, a role for which it has served admirably.

The crew layout is standard for the Imperial designs, pilot and tank commander sit side by side in the main hull, while the gunner sits on the left side of the turret, just above the commander. Main armament is a single pulse 50Mw fusion gun with an integrated targeting system and a range of 22.5km. A battery holding 100 fire rounds powers the main fusion gun. The fusion power plant can recharge the battery in 14 minutes if the tank is at rest. Secondary armament consists of a single 18mm ETC autocannon in a remote front mount, and fired by any of the three crew. The power source is a damper enhanced low-emission micro-fusion plant.

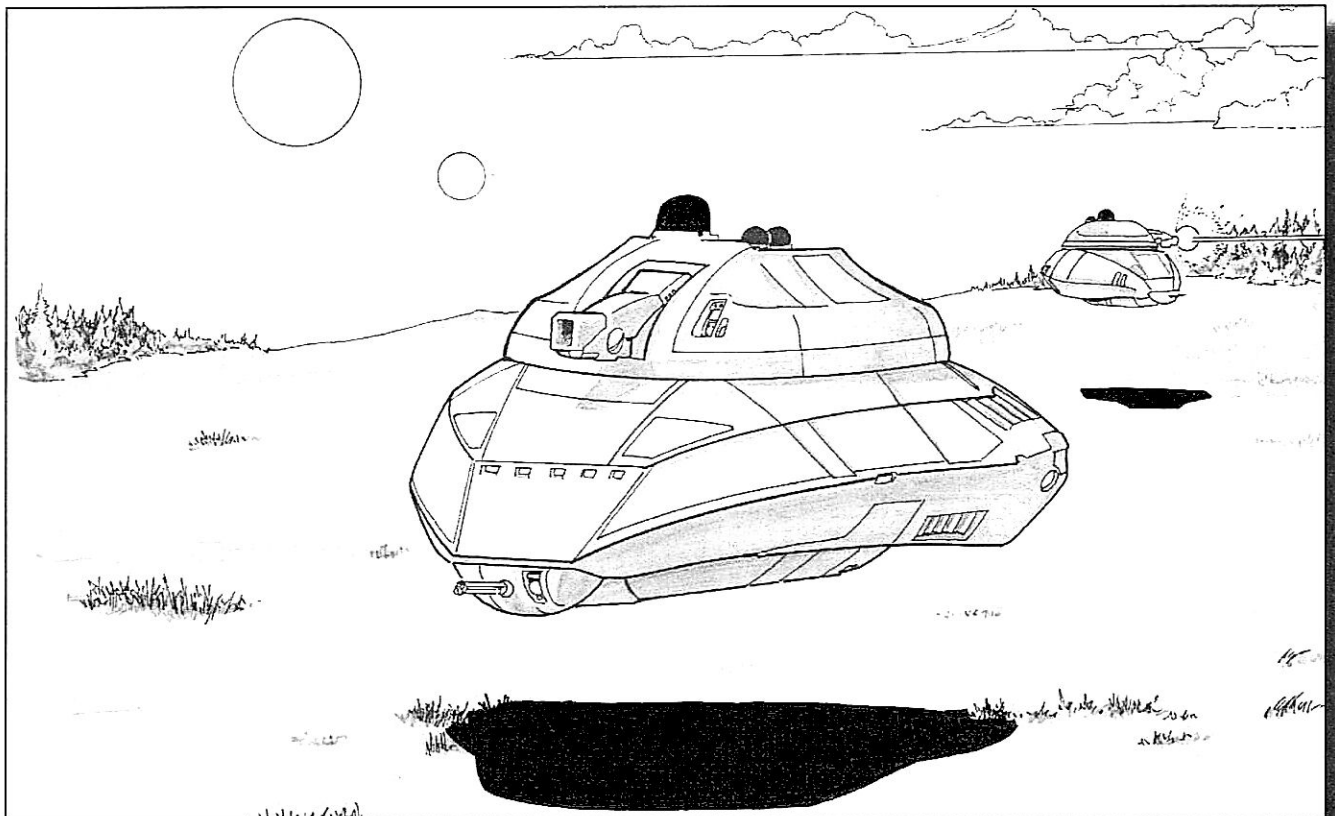
The Imperial Army does not use any variants of this design. Delgato produces an Intruder-P variant, replacing the main fusion gun with a 9.4Mw ten-lens pulse laser (Damage 4d10, ROF 10) for use as a point defense sled.

Design Specifications

Installed Components	Size	Cost	EP
14,000vl Chassis	14,000	14,000	-
Controls	2,800	7,000	-
Partly Streamlined	-	14,000	-
Armor : AR13	1,960	20,640	-
Chameleon Armor	-	700,000	-
Climate Control	140	7,000	-1.4
Pressurized Interior	700	17,500	-17.5
Grav Drive Train	336	3,864,000	-84
Fusion Power Plant	1042.5	229,350	+347.5
Fuel	868.75	-	-
Battery (100 shots fusion)	50	2,500	-
Heavy Turret	5,334	53,340	-10.7
Fusion Gun - 6	(3,500)	3,000,000	-50
4km Holovideo sensor+LI+IR	(108)	160,000	-5.6
Crew Seats (1)	(200)	100	-
Fire Control Computer	(0.8)	1,200	-0.054
HoloDisplay	(0.1)	500	-0.05
Cargo	(1.1)	-	-
Crew Seats (1)	200	100	-
Autocannon/Cupola	330	11,650	-
200 rnds Ammo	100	1,000	-
Fire Control Computer	0.8	1,200	-0.054
2-way radio (long range)	4	600	-1.6
Laser (long Range)	6	7,200	-0.3
Lights (2 beam, 2 area)	2	40	-0.08
Neutrino Sensor (Medium)	8	120,000	-2
Holodisplay (x2)	0.2	1000	-0.1
Cargo	117.75	-	-

Subtotals

Cr8,233,920 (Mcr6.59 with 20% production model discount)



HEAVY MAIN BATTLE TANK

TL14, Mcr10.52, 22000vl. The Zhakirov main battle tank, named after the Emperor Zhakirov, is the backbone of both the Imperial Army and Marine armored forces. The original design of the Zhakirov was in 688 and, after numerous design changes, adapted by the Imperial armed forces in 820. The Zhakirov is beginning to show its age, outmatched by some of the newer Solomani and Zhodani heavy tanks. The current supplier of the Zhakirov tanks within Ley sector is the Delgato Corporation.

The Zhakirov's main armament is an 85-Mw single pulse fusion cannon, with power supplied by a 100 shot quick discharge energy cell. The power plant can recharge the energy cell in 17 minutes while the tank is at rest. The crew layout is standard for the Imperial designs, pilot and tank commander sit side by side in the main hull, while the gunner sits on the left side of the turret, just above the commander. Secondary armament consists of an Imperial standard 18mm ETC autocannon in a remote front mount, and fired by any of the three crew.

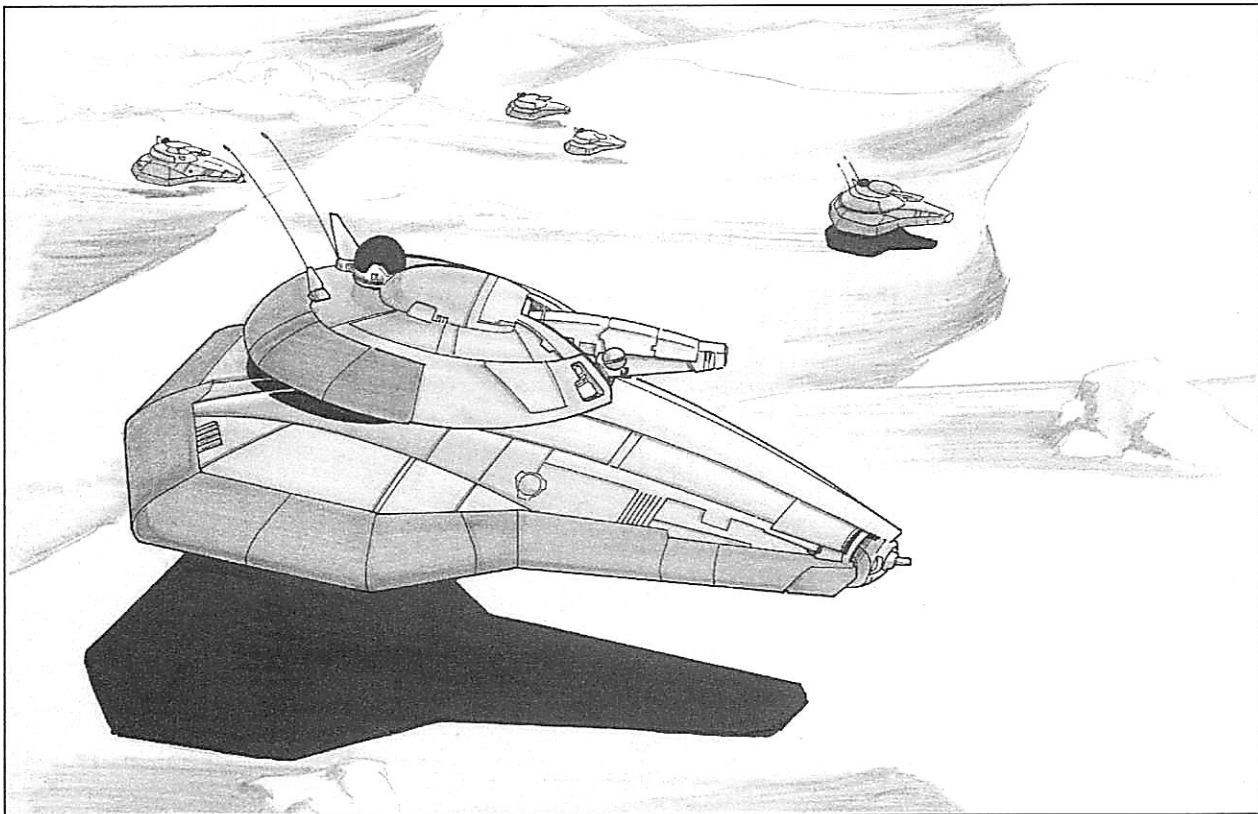
The Imperial Army, in order to cut down on its logistical support requirements, insisted the Zhakirov share as many parts in common as possible with the older Intruder light tank. The resulting equipment fitting makes the interior of the Zhakirov feeling much more cramped than it actually is.

Design Specifications

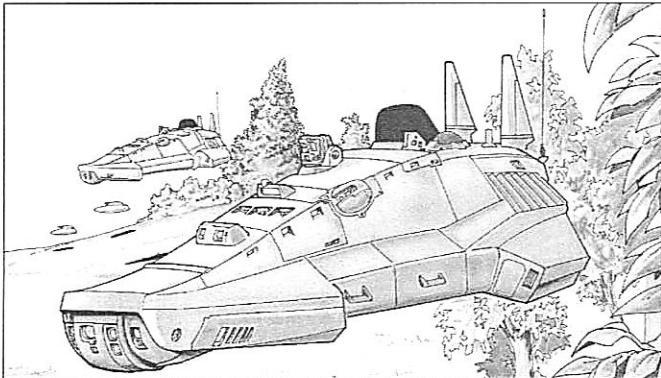
Installed Components	Size	Cost	EP
22,000vl Chassis	22,000	22,000	-
Controls	4,400	11,000	-
Partly Streamlined	-	22,000	-
Armor : AR14	3,300	32,700	-
Chameleon Armor	-	1,100,000	-
Climate Control	220	11,000	-2.2
Pressurized Interior	1,100	27,500	-27.5
Grav Drive Train	528	6,072,000	-132
Fusion Power Plant	1,629	358,580	+543
Fuel	1221.75	-	-
Adv. Battery (100 shots)	85	4,250	-
Heavy Turret	8,764	87,640	-17.528
Fusion Gun - 8	(5,950)	5,100,000	-85
4km Holographic sensor+LI+IR	(108)	160,000	-5.6
Crew Seats (1)	(200)	100	-
Fire Control Computer	(0.8)	1,200	-0.054
HoloDisplay	(0.1)	500	-0.05
Cargo	(1.1)	-	-
Crew Seats (1)	200	100	-
Autocannon/Cupola	330	11,650	-
200 rnds Ammo	100	1,000	-
Fire Control Computer	0.8	1,200	-0.054
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Lights (2 beam, 2 area)	2	40	-0.08
Neutrino Sensor (Medium)	8	120,000	-2
Holodisplay (x2)	0.2	1,000	-0.1
Cargo	101.25	-	-

Subtotals

Cr13,153,260 (Mcr10.52 with 20% production model discount)



FAST ATTACK SLED



TL13, Mcr31.37, 14,000vl. The Ikenovr fast attack sled is a recent addition to the Imperial Marine's armory. Developed and deployed in the Spinward Marches during the Third Frontier War (979 to 986), it proved effective in several battles. Following the war the Imperial Marine supreme command ordered a full deployment for all IM units throughout the Imperium. Intergrav Logistics won the contract for Ley sector manufacturing, began production in 995, and is expected to complete delivery by 1001.

The Ikenovr is a light, high speed raiding unit with enough firepower to destroy or disrupt logistical supply lines. Main armament consists of four 9.4 Mw single lens pulse lasers mounted in a chin mount. The pilot and electronics operation officer sit one behind the other at the center of gravity.

Design Specifications

Installed Components	Size	Cost	EP
14,000vl Chassis	14,000	14,000	-
Controls	2,800	7,000	-
Hypersonic streamlining	700	126,000	-
Armor : AR9	1,400	15,600	-
Chameleon Armor	-	700,000	-
Climate Control	140	7,000	-1.4
Pressurized Interior	700	17,500	-17.5
Grav Drive Train	2,240	25,760,000	-560
Fusion Power Plant	2,790	613,800	930
Fuel	1,395	-	-
Cupola	1,364	6,820	-
Pulse - 9.4Mw x4	(1,240)	151,000	-3.6
4km Holovideo sensor+LI+IR	108	160,000	-5.6
Crew Seats (1)	200	100	-
Fire Control Computer	0.8	1,200	-0.054
HoloDisplay	0.1	500	-0.05
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Radar (Extreme Range)	30	1,500,000	-1.5
Ladar (Long Range)	20	10,000,000	-0.1
Neutrino Sensor (Medium)	8	120,000	-2
Cargo	94.1	-	-
Subtotals		Cr39,208,320 (Mcr31.37 with 20% production model discount)	

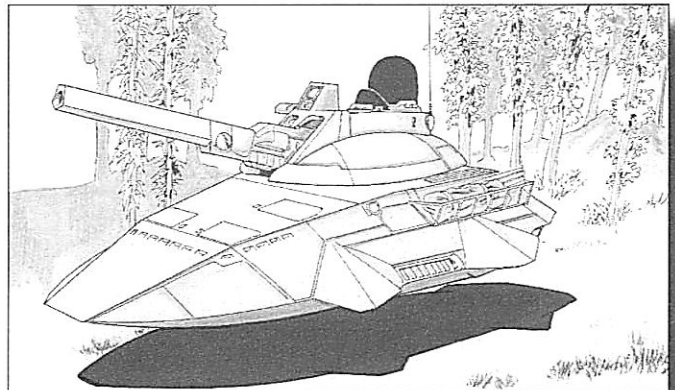
ARTILLERY SLED

TL14, Mcr28.54, 110,000vl. The Solar Wind is the primary artillery piece for the Imperial armed forces. The first Solar Wind sleds were deployed to Imperial forces in 877. The supplier of the Solar Wind for the Ley Sector Imperial army is Intergrav Logistics.

Primary armament is an 18cm mass-driver cannon with an effective range of 200km. The Solar Wind has an internal ammunition supply for 10 fire rounds. Access to the ammunition storage is through a rear deck hatch that allows the reloading of the sled even while the primary weapon is firing. Crew layout matches Imperial standard layout, with the pilot and commander sitting side by side in the forward crew compartment and the gunner sits behind and above the commander.

Design Specifications

Installed Components	Size	Cost	EP
110,000vl Chassis	110,000	110,000	-
Controls	22,000	55,000	-
Partial streamlining	-	110,000	-
Armor : AR7	8,800	82,200	-
Climate Control	1,100	55,000	-11
Pressurized Interior	5,500	137,500	-137.5
Grav Drive Train	2,640	30,360,000	-660
Fusion Power Plant	7,809	1,717,980	+2603
Fuel	6,377.35	-	-
Cupola	49,500	247,500	-
18cm MD	(45,000)	1,000,000	-22.5
Ammunition 100 rnds	5,600	6,800	-
4km Holovideo sensor+LI+IR	108	160,000	-5.6
Crew Seats (2)	400	200	-
Fire Control Computer	0.8	1,200	-0.054
HoloDisplay (3)	0.3	1,500	-0.15
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Radar (Extreme Range)	30	1,500,000	-1.5
Neutrino Sensor (Medium)	8	120,000	-2
Cargo	116.55	-	-
Subtotals		Cr35,672,680 (Mcr28.54 with 20% production model discount)	



ARMORED PERSONNEL CARRIER

TL14, Mcr6.7, 18,400vl. The Astrin APC is one of Interstellar Arms most successful designs. An Interstellar Arms subsidiary within the Core sector originally designed Astrin in 715. Updates to the highly flexible design include advanced armor, a larger and more powerful weapon, and numerous changes to the interior electronics. Still, the basic design remains unchanged and remains in service with the Imperial Armed forces and numerous planetary defense forces throughout the Imperium.

Primary armament is a 30 Mw rapid fire fusion cannon with an effective range of 19.5 km. Power for the fusion cannon is supplied by a 3,500EP power cell, enough power for 40 fire rounds. The fusion power plant can recharge the battery in 9 minutes if the vehicle is at rest. In it primary operation mode, the Astrin carries 10 battledress equipped troops in a large compartment accessed through a large drop door at the rear of the craft.

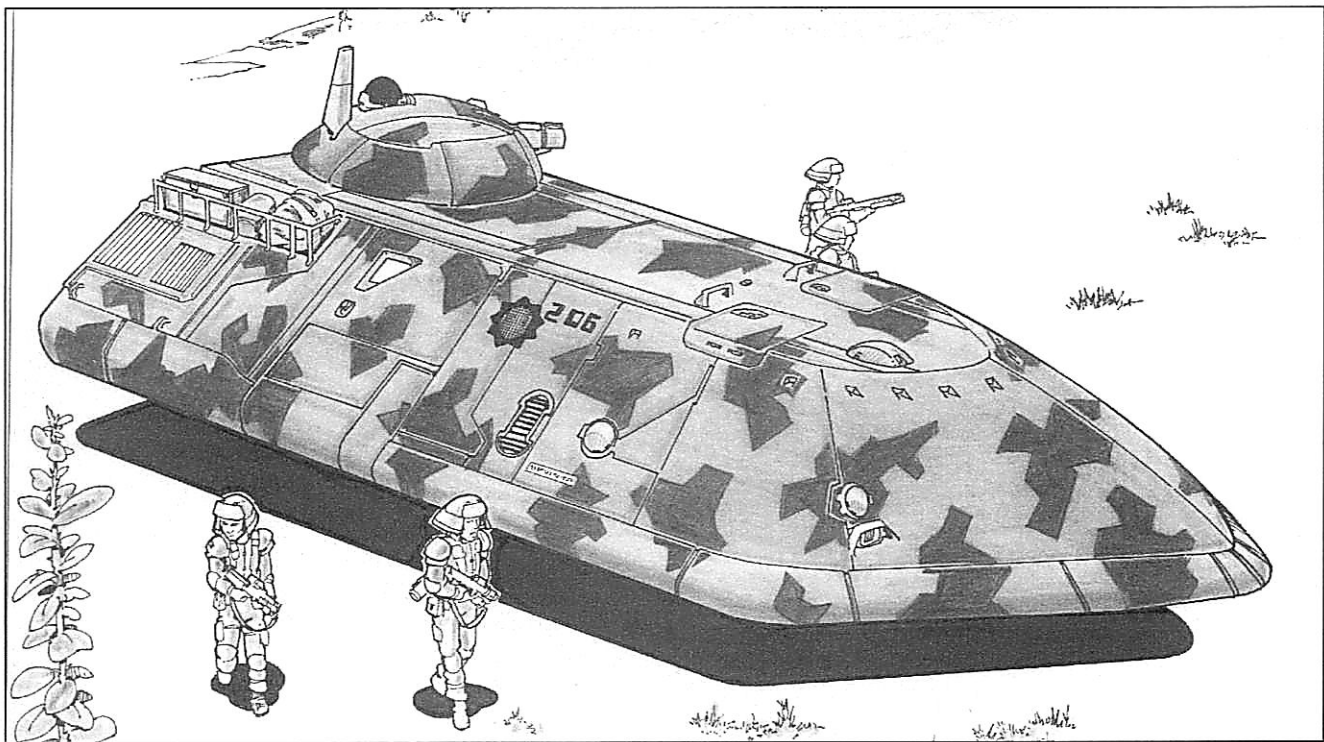
Interstellar Arms produces a number of modular options for the Astrin, allowing for field modifications. A frequent change is removing the turret, which disarms the Astrin, as many of the Astrin's duties do not require a heavy fusion gun. By removing the seats and battledress harnesses, the Astrin can haul up to 6,000kg of cargo. Several manufacturers produce a 6,000-liter collapsible tank designed to fit within the cargo space for carrying fuel, water or other liquid supplies. The ambulance version has space for three medical personnel and their equipment plus thirteen stretchers. The galley version carries a crew of three cooks and the galley space to prepare food for a company. The command version contains roomy seats for 10 crew, plus an enhanced holodisplay unit, a larger map computer, and an array of communications gear.

Design Specifications

Installed Components	Size	Cost	EP
18,400vl Chassis	-18,400	18,400	-
Controls	3,680	9,200	-
Partly Streamlined	-	18,400	-
Armor : AR10	2024	21,216	-
Chameleon Armor	-	920,000	-
Climate Control	184	9,200	-1.84
Pressurized Interior	920	23,000	-23
Grav Drive Train	441.6	5,078,400	-110.4
Fusion Power Plant	1320	290,400	440
Fuel	660	-	-
Adv Battery (3,600EP)	36	1,800	-
Standard Turret	2,892	28,404	-2.84
Fusion -4 (ROF 3)	(2,100)	1,800,000	-90
4km Holovideo sensor+LI+IR	(108)	160,000	-2.8
HoloDisplay	(0.1)	500	-0.05
Crew Seats (1)	(200)	100	-
Fire Control Computer	(0.8)	1,200	-0.054
Cargo	(1.1)	-	-
Crew Seats (1)	200	100	-
Holodisplay (x2)	0.2	1000	-0.1
Passengers (10)	6,000	1,000	-
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	30.2	-	-

Subtotals

Cr8,390,160 (Mcr6.7 with 20% production model discount)



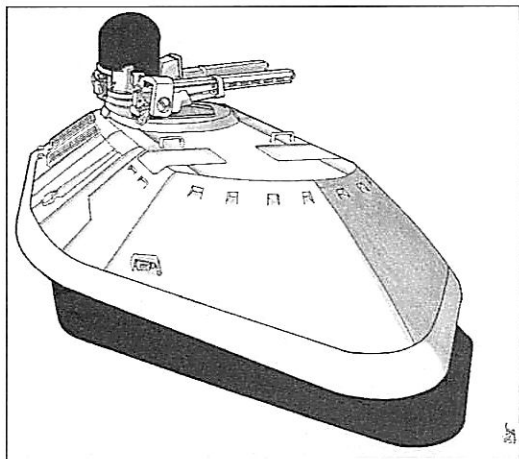
POINT DEFENSE SLED

TL14, Mcr14.3, 18,400vl. The Point Defense Sled is one of the many Astrin variants. The mission of the Point Defense Sled (PDS) is purely defensive. A PDS tracking system and cannon are to shoot down incoming artillery rounds, missiles, or robotic drones. The PDS has the Astrin's fusion gun replaced with two 40mm VRF mass driver cannon. The cannon are slaved to a wide spectrum radar/ladar tracking system. Most of the cost of the upgrade is the high speed tracking system. The large cargo space is dedicated to ammunition storage, with a capacity of 7,500 rounds, which gives the craft 37 fire rounds. Ammunition reloads are in 40 kg, 50 round cassettes.

Design Specifications

Installed Components	Size	Cost	EP
18,400vl Chassis	-18,400	18,400	-
Controls	3,680	9,200	-
Partly Streamlined	-	18,400	-
Armor : AR10	2024	21,216	-
Chameleon Armor	-	920,000	-
Climate Control	184	9,200	-1.84
Pressurized Interior	920	23,000	-23
Grav Drive Train	441.6	5,078,400	-110.4
Fusion Power Plant	1320	290,400	440
Fuel	660	-	-
Adv Battery (3,600EP)	36	1,800	-
Standard Turret	2,892	28,404	-2.84
40mm MD cannon (x2)	(1920)	238,000	-10
4km HoloVideo sensor+LI+IR	(108)	160,000	-2.8
HoloDisplay	(0.1)	500	-0.05
Crew Seats (1)	(200)	100	-
Fire Control Computer	(0.8)	1,200	-0.054
Radar (Long Range)	(20)	1,000,000	-1
Ladar (Long Range)	(20)	10,000,000	-0.1
Cargo	(141.1)	-	-
Crew Seats (1)	200	100	-
Holodisplay (x2)	0.2	1000	-0.1
Ammunition	6,000	11,250	-
2-way radio (long range)	4	600	-1.6
Laser Comm (long range)	6	7,200	-0.3
Lights (2 beam, 2 area)	2	40	-0.08
Cargo	30.2	-	-

Subtotals Cr17,838,410 (Mcr14.3 with 20% production model discount)



ARMORED RECOVERY SLED

TL14, Mcr21.2, 66,000vl. The AGR series II manufactured by Dinabarib is one of the four Armored Recovery sleds used by the Imperial Armed Forces. The AGR series II is a larger and upgraded version of the Dinabarib's AGR Armored Recovery Sled.

The series II utilizes a fusion power plant instead of the fuel cell used by the AGR Series I. The additional power gives the Series II a 25-ton lifting capacity, a two-thirds improvement, and the lift arms strengthened correspondingly. The Series II has three arms for greater holding ability during recovery operations. The interior layout of the AGR Series II is otherwise identical to the AGR Series I, with the primary crew access through a large bottom hatch and the winch, arm controls and tool shops all within a large open bay.

Design Specifications

Installed Components	Size	Cost	EP
91,000vl Chassis	-91,000	91,000	-
Controls	18,200	45,500	-
Partly Streamlined	-	91,000	-
Armor : AR8	3,267	32,403	-
Climate Control	363	18,150	-3.63
Pressurized Interior	1,815	45,375	-45.38
Grav Drive Train	2,184	25,116,000	-546
Fusion Power Plant	3,438	756,360	1146
Fuel	1,719	-	-
Crew (5)	2,000	500	-
Engineering Shop (3)	3,000	60,000	-
Winch (ST 52)	10.4	520	-0.52
Lift Arms (6m, 25ton x3)	29,700	99,000	-
Arm Motors(St 58, DX;0, x3)	87	17,400	-17.4
4km visual sensor+LI+IR	64	104,000	-2.8
Lights (2 beam, 2 area)	2	40	-0.08
2-way radio (long range)	4	600	-1.6
Cargo	146.6	-	-
Towing Capacity	25,000	-	-

Subtotals Cr26,477,848 (Mcr21.18 with 20% production model discount)

HEAVY MAIN BATTLE TANK

TL15, Mcr13.74, 29,250vl. The Intrepid heavy tank is the most recent addition to the Imperial Army arsenal. Using the latest in Imperial Technology and designed to replace the Zhakirov heavy tanks, the Intrepid prototypes elicited alarm from the military designers in both the Solomani Rim and the Zhodani Consulate. Slated for deployment starting in 997, the outbreak of hostilities in the Solomani Rim has moved up the deployment of the Intrepid's in the rimward sectors.

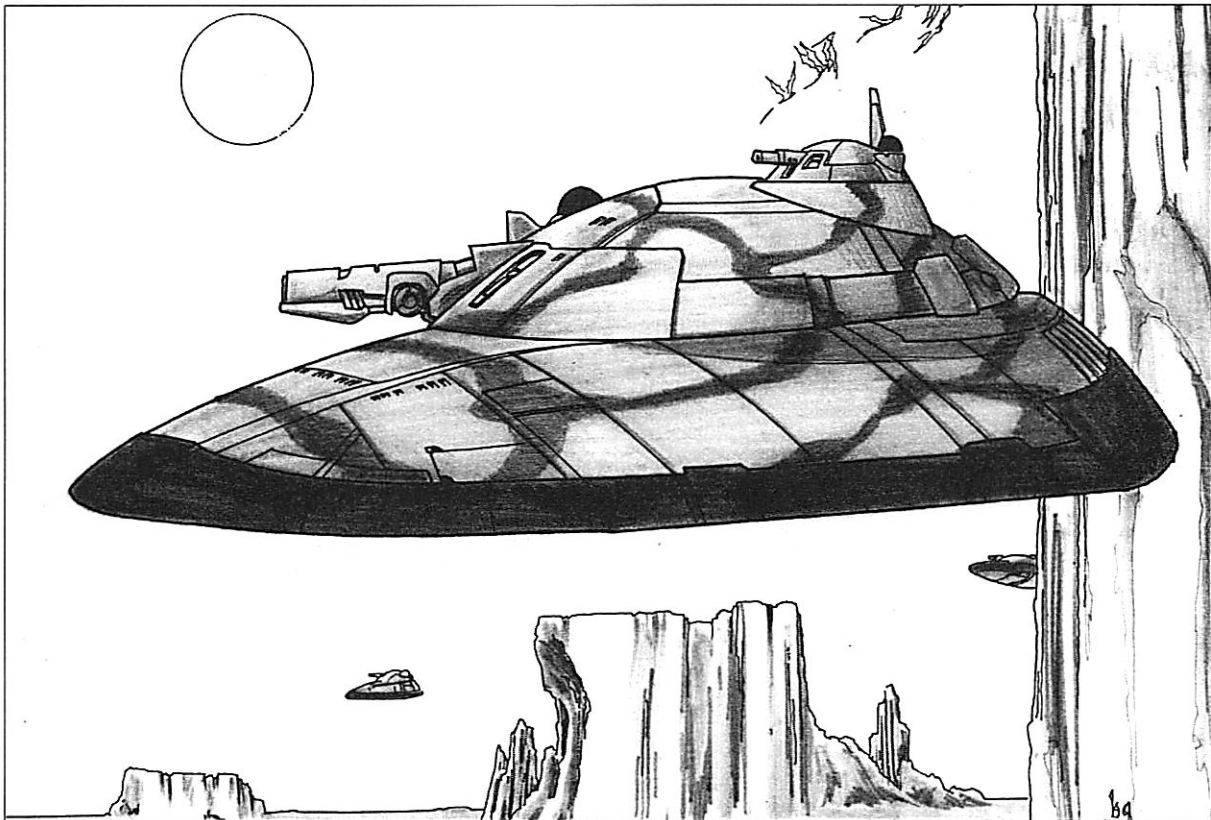
Crew layout is standard for Imperial armored vehicles; pilot and commander sit side by side in the main body and the gunner sits in the turret just behind the commander. Primary armament is a 110 Mw fusion gun with a rapid pulse capability. A quick discharge battery system powers the main fusion gun, and holds 400 shots. In addition to the fusion engine, the fusion gun battery can power Grav drive system for over four hours. While the Intrepid is at rest, the fusion engine can recharge the battery system in 68 minutes. Secondary armament is a VRF Gauss gun with an independent target system for use in anti-personnel, light anti-armor and point defense roles.

Design Specifications

Installed Components	Size	Cost	EP
29,250vl Chassis	29,250	29,250	-
Controls	5,850	14,625	-
Partly Streamlined	-	29,250	-
Armor : AR15	4,680	45,120	-
Chameleon Armor	-	1,462,500	-
Climate Control	292.5	14,625	-2.96
Pressurized Interior	1462.5	36,562.5	-36.56
Grav Drive Train	702	8,073,000	-175.5
Fusion Power Plant	1,074	236,280	+716
Fuel	1,074	-	-
Adv. Battery (400 shots)	440	22,000	-
Heavy Turret	11,214	112,140	-22.424
Fusion Gun - 9	(7,700)	6,600,000	-440
4km Holographic sensor+LI+IR	(108)	160,000	-5.6
Crew Seats (1)	(200)	100	-
Fire Control Computer	(0.8)	1,200	-0.054
HoloDisplay	(0.1)	500	-0.05
Cargo	(1.1)	-	-
Crew Seats (1)	200	100	-
VRF Gauss/Cupola	2200	211,000	-
2000 rnds Ammo	20	400	-
Fire Control Computer	0.8	1,200	-0.054
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Lights (2 beam, 2 area)	2	40	-0.08
Neutrino Sensor (Medium)	8	120,000	-2
Holodisplay (x2)	0.2	1,000	-0.1
Cargo	20	-	-

Subtotals

Cr17,189,493 (Mcr13.74 with 20% production model discount)



MESON ARTILLERY SLED

TL15, MCr51.8, 113,000vi. The YC-9443 is a prototype meson artillery sled submitted to the Imperial Army as a replacement for the aging Solar Wind as a primary artillery weapon. The first functional prototype completed in 995 and demonstrated on the Imperial Army weapons testing ground for the Old Expanses IA command. A number of sector commands, as well as planetary defense forces, have shown an interest in the meson sled.

The YC-9443 Meson Artillery Sled (MAS) armament is a single 250 Mw meson accelerator weapon. Meson weapons, like laser and fusion guns, have the advantage of no ammunition requirements and as a direct fire energy weapon; there are no point defense systems capable of stopping meson weapons fire. Unlike the laser and energy weapons, meson beams can travel through intervening obstacles, requiring no line of sight to the target, making them ideal artillery weapons. The MA-250 weapon, one of the smallest weapons grade meson accelerators ever built, has a direct fire range of 90km and is powered by a quick-discharge battery capable of supplying 10 fire rounds. The fusion plant can recharge the energy cell in 2 minutes while the vehicle is at rest.

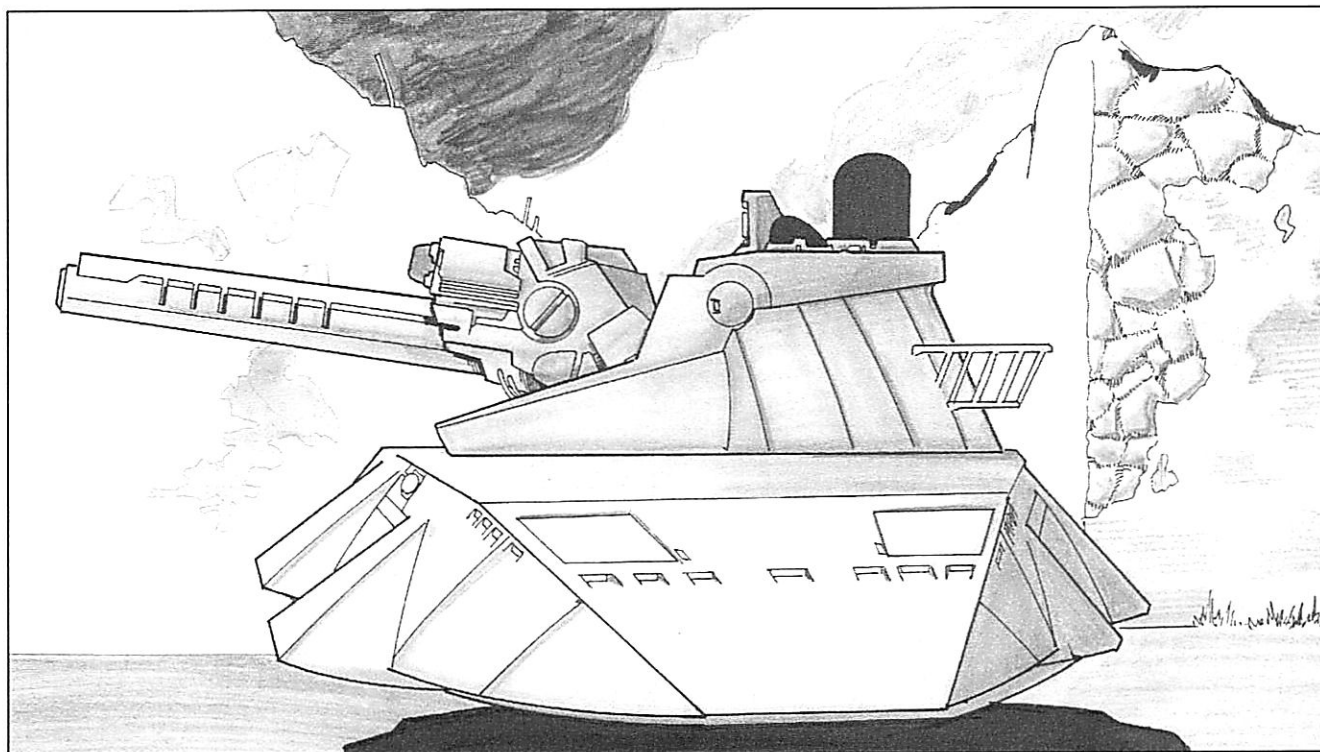
The YC-9443 is built upon the same base frame as the Solar Wind to reduce logistical requirements during deployment. The intention is to have a mixed deployment of artillery, the meson weapon, capable of vast unstoppable destruction, and the Solar Wind to add mission flexibility.

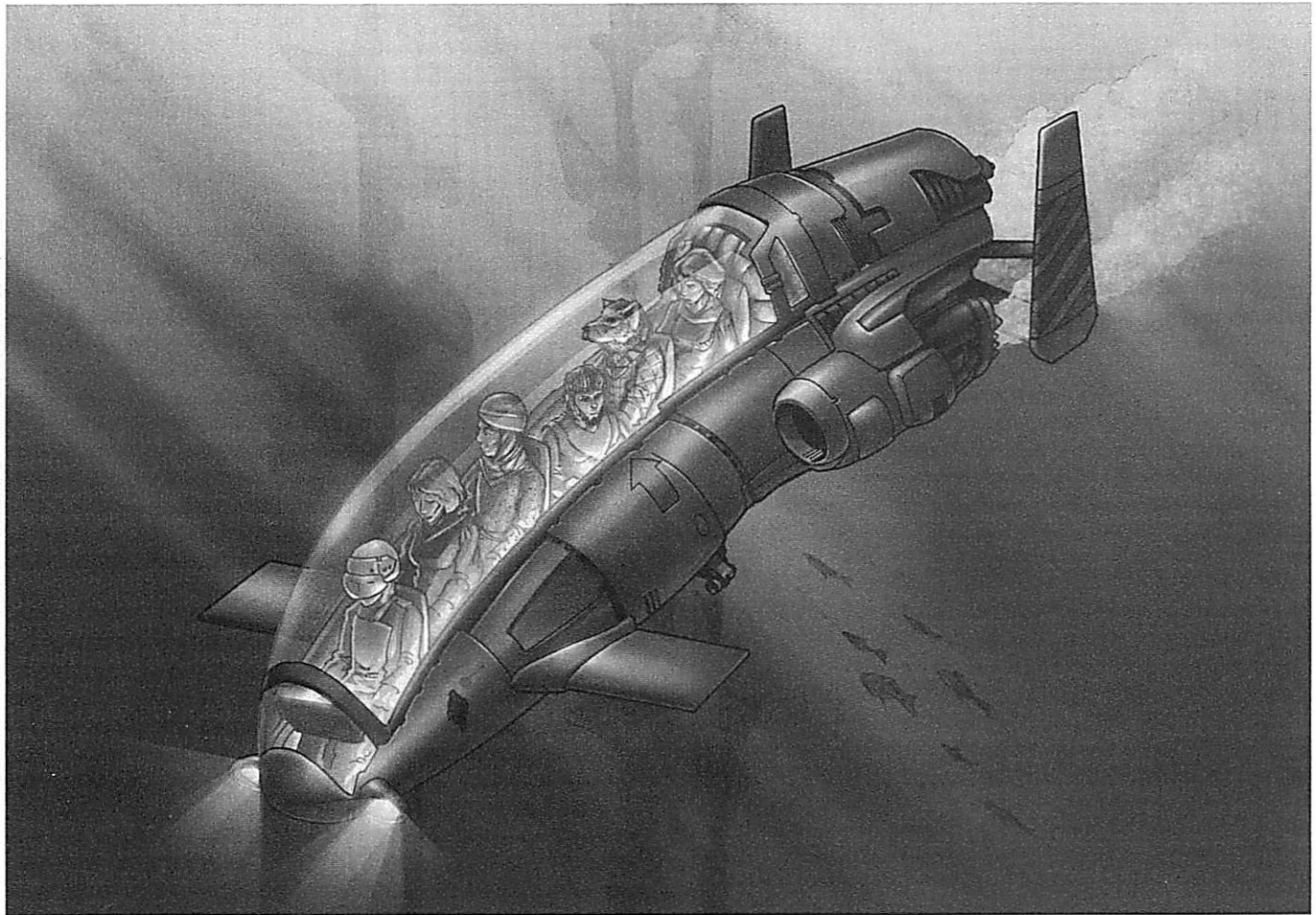
Design Specifications

Installed Components	Size	Cost	EP
113,000vi Chassis	113,000	113,000	-
Controls	22,600	56,500	-
Partial streamlining	-	113,000	-
Armor : AR7	9,040	84,360	-
Climate Control	1,130	56,500	-11.3
Pressurized Interior	5,650	141,250	-141.25
Grav Drive Train	2,712	31,188,000	-678
Fusion Power Plant	2,619	851,400	+1746
Fuel	2,619	-	-
Adv Battery (10 shots)	24	1,200	-
Cupola	66,000	330,000	-
Meson Accelerator	(60,000)	30,000,000	240
4km HoloVideo sensor+LI+IR	108	160,000	-5.6
Crew Seats (2)	400	200	-
Fire Control Computer	0.8	1,200	-0.54
HoloDisplay (3)	0.3	1500	-0.15
2-way radio (long range)	4	600	-1.6
Laser Comm (long Range)	6	7,200	-0.3
Radar (Extreme Range)	30	1,500,000	-1.5
Neutrino Sensor (Medium)	8	120,000	-2
Cargo	48.9	-	-

Subtotals

Cr64,728,910 (Mcr51.8 with 20% production model discount)

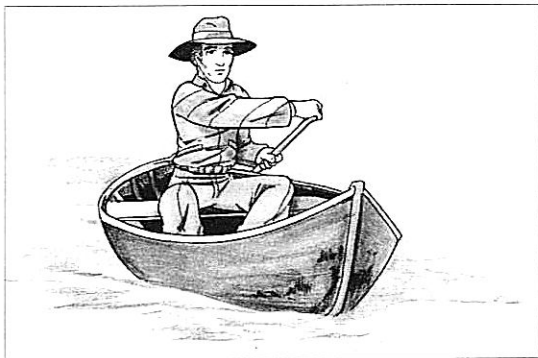




WATERCRAFT

The Yiam Caardee Design Bureau catalog presents a collection of watercraft to demonstrate the variety of available designs. This is merely a teaser to spark interest. Specialized catalogs for each category of watercraft are available if the example design presented doesn't quite meet your requirements

CANOE



TL-6, Cr275, 150vl. A small person- powered boat with a capacity for one or two passengers or up to 200 kg of cargo. The open top makes the canoe suited only for calm water. At 15kg, the boat is lightweight enough a single person can carry it though at 4.5 meters it is unwieldy. Unless heavily loaded the flat-bottomed canoe has a draft of only a few centimeters, making it suited for boating in very shallow waters. The paddle is a single blade similar to a short oar but not attached to the boat. The shallow bottom and detached oar make the canoe very maneuverable.

The canoe is an ancient design, constructed by primitive peoples on many worlds. The primitive design consists of animal skins, tree bark or other flexible raw material stretched over a frame. Examples available on the open market use everything from animal skins and wood to plastics and other modern materials in their construction. Our example, the Froove designed by Greenwater Farsails, uses riveted aluminum making it more resistant to damage caused by rough handling. Ideal for recreational purposes, the Froove carries two people and several days worth of gear. Greenwater also supplies plans for Cannop, a wooden canoe for the home builder to construct.

In addition to the various construction materials and slight variations in length and cargo capacity, another favorite variation is the sea canoe. The larger size and sealed top of the sea canoe allows carrying more cargo through rougher waters without getting the cargo wet.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	150	150	-
Controls	15	74	-
Crew: 2 Saddles	20	50	-
Cargo	115	-	-

Subtotals Cr 275 (Cr 220 with 20% production model discount)

KAYAK

TL-2, Cr110, 75vl. A small self powered boat with a crew of one and a cargo capacity of 55kg. The kayak is covered and the paddler wears a flexible skirt that seals the seating opening. The kayakers use a double-ended paddle, a pole with a paddle blade at either end. The other distinguishing characteristic between a kayak and canoe is the position of the paddlers. In a kayak, the paddler sits with their legs out in front of them, whereas in a canoe the paddler kneels in the bottom of the boat.

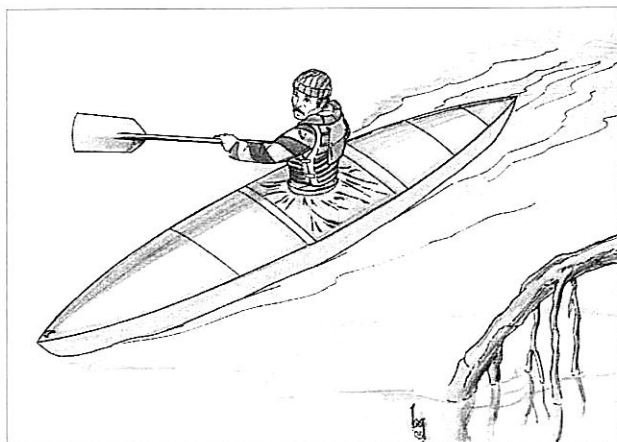
Like canoes, kayaks are an old design watercraft and found on a number of worlds throughout the Imperium. A primitive Kayak consists of animal skins, tree bark or other flexible material stretched over a lashed frame. Because of their covered design with the sealed opening, people use kayaks more frequently on rough water rivers, the open ocean or in colder environments. Modern Kayak construction uses fiberglass or plastics to save weight. Like the canoe, most kayaks are used for recreation or sporting events.

Kuchenwald Water Boat Works provides our example of this type of craft. The Kuchenwald kayak is constructed of laminated wood glued and nailed onto a sagraan bone frame, then sanded and lacquered to a mirror finish. More of a showpiece, the Kuchenwald kayak still is a lightweight and very functional boat.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	75	75	-
Controls	7.5	37.5	-
Crew: 1 Saddles	10	25	-
Cargo	57.5	-	-

Subtotals Cr 137.5 (Cr 110 with 20% production model discount)



DINGHY

TL-7, Cr918, 680vl. A small watercraft capable of being propelled by a single person. The Dinghy can carry up to three passengers or up to 500kg of cargo. The aft of the Dinghy has a reinforced mounting for an outboard motor. An outboard motor rated for this boat would be 30vl, cost Cr140, and be able to propel the boat at up to 30kph. The motor requires an external fuel tank; the standard design is a 30 liter tank which would supply fuel for 14 hours.

The WaveMaster 4500 is a sturdy formed plastic hull manufactured by Sauma Forain Recreational Watercraft. Separating the double layer hull is helium aerogel making the boat very lightweight and serving as a nearly indestructible flotation layer. The metal-ceramic oarlocks are impervious to most corrosion. The oars are the same aerogel filled plastic as the boat hull, making them sturdy and lightweight. Our only complaint about this boat was the plastic in the hull becomes brittle in water temperatures below 10°C.

The WaveMaster 4500 is an average size for a dinghy, most hold between two and six passengers. Dinghies are the smallest of the rowboats, boats propelled by oars rather than paddles or sails. The largest rowboats can reach 20 meters and require a crew of six oarsmen plus a tiller operator.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	680	680	-
Controls	136	340	-
Muscle Engine	2	2	+0.2
Watercraft Drivetrain	5	25	0.2
Crew: 4 Saddles	40	100	
Cargo	500	-	

Subtotals Cr1,147 (Cr918 with 20% production model discount)



INFLATABLE DINGHY



TL-7, Cr1, 788, 1100vl. An eight person watercraft capable of being rowed or propelled by a small engine. Construction of these boats is of reinforced cloth and inflated with pressurized air. The design makes them very lightweight and the deflated boats store easily. The inflatable dinghy can carry up to eight people or up to 800kg of cargo. The externally mounted motor can propel the craft at speeds of up to 40kph, and the 30-liter fuel tank provides a range of 100km. Because of the flexible materials used in the design, the Zodiac handles rough water better than most flat-bottomed boats. Many Solomani firms refer to this type of craft as a Zodiac.

The Island Gypsy Watercraft inflatable dinghy uses QuadraTex, a reinforced ballistic cloth with a self-sealing layer, rendering the hull virtually impervious to cuts and scrapes. The quick release valve system allows deflation and storage of the boat in 5 minutes and the entire boat, minus the engine and fuel tank, stores into 110vl. The manufacturer provides a storage bag for the deflated boat and one or two people can easily handle it. Inflating the boat with the supplied electric air pump takes 20 minutes.

Larger Zodiac style boats feature either an attachable hard keel or an extra inflatable chamber to create a keel to allow the larger boat more stability at higher speeds.

Island Gypsy Watercraft manufactures several sizes of these inflatable dinghies, from the two person harbor runabout to a 24 man party boat. In addition to their use as recreational or minimum storage emergency boats, mid-tech armed forces frequently use them as low profile watercraft for amphibious assaults or covert operations.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	1100	1100	-
Controls	220	550	-
Internal Combustion	11	110	+2.2
Watercraft Drivetrain	55	275	2.2
Crew: 8 Saddles	40	200	
Cargo	768	-	

Subtotals Cr2,235 (Cr1,788 with 20% production model discount)

PERSONAL WATERCRAFT



TL-6, Cr604, 200vl. A powered, sport watercraft, the water rider's equivalent of a motorcycle. Many Solomani firms refer to this craft as a jet ski, though the name is something of a misnomer as there is no jet engine, but the fast and agile craft moves as if it is jet powered. The craft holds one person, the pilot and a small sealed compartment can hold up to 8 kg. With a top speed of 60kph, the three-hour fuel tank gives it a range of 90km.

Sauma Forain manufactures this example, the Daramm Special. This craft is typical of the type, designed for a single person to enjoy themselves with others outside on the water. The smaller engine makes it not as quick off the starting line. The control stick not only changes the rudder, but also adjusts the angle of the keel making the Daramm special much more agile than other models. The FlexKeel system, adapted from designs used in the professional circuit, has become a favorite with enthusiasts. The Daramm special has features found on most watercraft, including an automatic seal for the engine air intake in case the craft gets submerged, electric engine start, and the electronic fuel and velocity gauges.

These watercraft range in power from the beginner models with a top speed of 30kph to the professional racing models with a top speed of 90kph or more. All hold one or two passengers and a few kilos of cargo.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	200	200	-
Controls	20	100	-
Configuration- Partly SL	-	200	-
Drivetrain- Watercraft	15	75	-0.6
Power Plant- IC	13	130	+2.6
Fuel	4	-	-
Crew- 2 Saddle	20	50	-
Cargo	108	-	-

Subtotals Cr755 (Cr604 with 20% production model discount)

SMALL SAILBOAT

TL-2, Cr1, 282, 500vl. A small recreational sailboat capable of carrying only one, the pilot with a small additional cargo space. The large sail area provides speeds up to 6kph in light winds and 18kph in strong winds. Oarlocks for rowing the small boat or a reinforced stern for mounting a small engine are provided but rarely used. The boat accommodates the pilot, one passenger, and 100kg of cargo

The Affallian, manufactured by Kuchenwald Water Boat Works, is a pure pleasure craft. This craft and the larger four person Destllian can be found flitting about the many small lakes and rivers so common to Kuchenwald. The Affallian provides water taxi service for Kuchenwald's many harbors. Several of the companies in the Kuchenwald consortium sell the design of the Affallian and the Destllian. The boats are simple to construct and maintain, and even easier to handle in the water.

Variations on these small boats are endless. The distinction between the Dinghy and a sailboat is the addition of the sail. Many dinghies contain the mounting for a triangular sail and mast, and you can oar most sailboats of this size when the wind is not being co-operative.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	500	500	-
Controls	110	250	-
Sails Drivetrain (30%)	150	750	-
Muscle Engine	2	2	0.2
Crew: 1 Seat	110	100	-
Cargo	128	-	-

Subtotals Cr1, 602 (Cr1282 with 20% production model discount)



LUXURY SAILBOAT

TL-9, Cr43, 410, 7,000vl. A modernized sailboat used for purely recreational purposes. The ship accommodates six passengers with personal effects, but is not otherwise designed for hauling cargo. The fore and aft rigged sails move the boat at 5kph in a light wind and 15kph in a strong wind. An onboard fuel cell and watercraft drivetrain moves the boat at 15kph with a range of 360km. The ship requires a single pilot to handle both navigation and man the sails, though the usual crew compliment is three, plus three passengers.

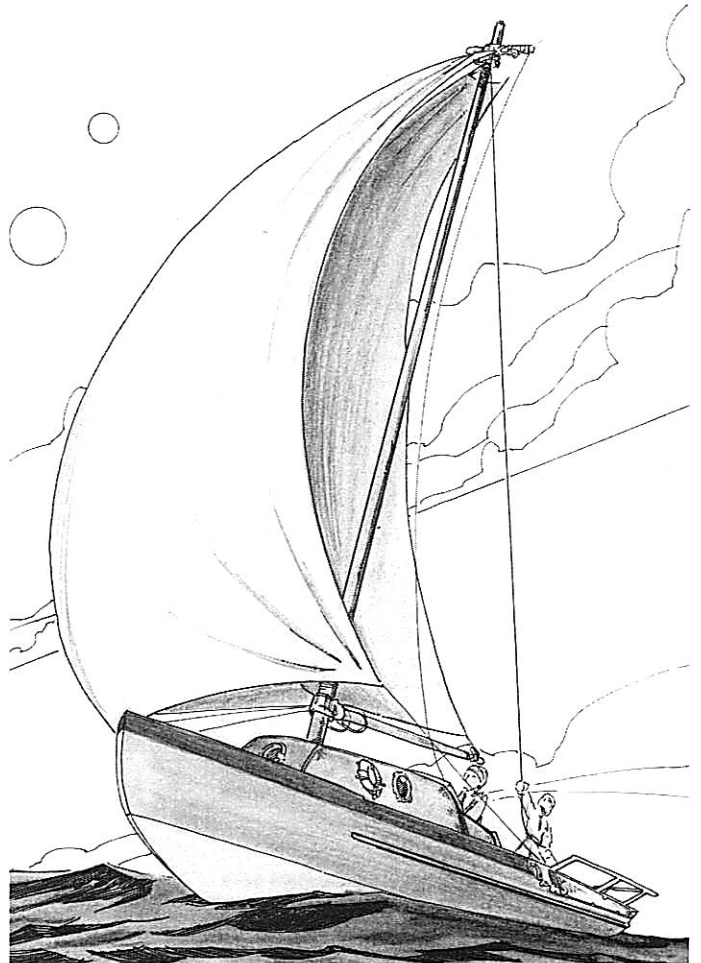
The Island Gypsy Flotilla 15 is a 15-meter luxury sailboat designed to be cruised comfortably or raced successfully. The hull is a corrosion proof reinforced aluminum-ceramic, allowing the Flotilla 15 to be lightweight and durable. The onboard computer control system can handle managing the sails, the liquid high-density ballast, navigation, and has an excellent library of culinary dishes suited for the small galley space. The forward cabin has two stacked bunks for sleeping four passengers or use as cargo storage. An onboard water reclamation and purification system means the Flotilla 15 requires no sewage hookup. Overall, the interior is very well laid out and available in a variety of finishes depending upon the owners preferences.

Using the Flotilla 15 for racing depends upon the world. Sailboat racing clubs are found on almost every world with a hydrosphere capable of supporting sailboats. These associations vary from gentlemen's meeting clubs to serious racing organizations with strict rules about boat and sail design to keep races competitive. Sailboat dealers have contact information for the local racing associations.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	7, 000	7, 000	
Controls	1, 400	3, 500	
Drivetrain- Sails (25%)	1, 750	8, 750	
Watercraft Drivetrain	262.5	1, 312.5	-10.5
Power Plant - Fuel Cell	21	3150	+10.5
Fuel	37.8	-	-
Environmental Controls			
Cubical (6)	3, 000	24, 000	-
Galley	250	1, 000	
Fresher	200	750	
Radio, 2-way	2	300	-0.08
Navi-computer	12.15	4, 500	-0.27
Cargo	64.55		

Subtotals Cr54, 262 (Cr43, 410 with 20% production model discount)



LONGBOAT

TL-1, Cr86, 912, 32Kvl. An archaic boat powered by a combination of sails and oars. Under sail and a strong wind, the longboat can make 21kph. Under oar power by a crew of 32 skilled rowers the ship can maintain a steady 4kph. The ship has little dedicated cargo space, requiring crew to store cargo, personal effects and supplies in space allocated for them. This makes the longboat crowded when sailing with a full cargo load. These light, narrow boats are quick in the water and smaller ones can be ported overland.

The 32-man, 24m Longboat is one of the largest designs supplied by Greenwater Farsails. A wooden boat of this size makes an ambitious construction project for its full crew complement. The design costs Cr250 and Greenwater Farsails can supply a kit for Cr18, 000 shipped from one of several manufacturing partners. Greenwater also supplies plans for a smaller 8-man, 5.3m longboat with similar performance characteristics. The smaller boat does not have the accommodations the larger longboat does, suitable only for day travel, but makes a more manageable project for a small crew to build and enjoy.

Greenwater claims the designs are from pre-space flight Terran designs, and the designs share some characteristic design elements with historically documented Longboats from Terra. Our research has shown the combination of sail and oared open galley has been independently designed on many worlds throughout Charted Space.



Design Specifications

Installed Components	Size	Cost	EP
Chassis	32, 000	32, 000	
Controls	6, 400	16, 000	
Drivetrain: Sails (35%)	11,200	56,000	
Muscle Engine	64	64	+6.4
Watercraft Drivetrain	160	800	-6.4
Crew: 32 seats	3, 520	3, 200	-
Cargo	10, 656	-	-

Subtotals Cr 108, 064 (Cr 86, 451 with 20% production model discount)

TRIREME

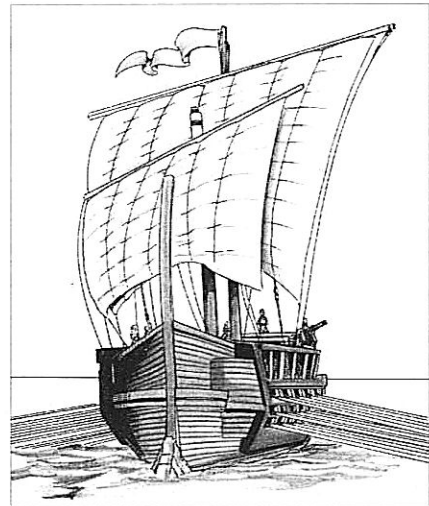
TL-1, Cr275, 992, 70Kvl. The Trireme, named for its three banks of rowers stacked within, is an ancient ship design combining rowers and sails. The earliest Trireme designs from the TransInnovations vehicle database date from the Rule of Man and reference documents from pre-spaceflight Terra and several other worlds. The Trireme is a warship, very cramped and built around the large ram on the front. Under combat conditions, the 170 oarsmen are the sole power source, and tactics revolve around trying to ram and board an enemy vessel. Triremes are not designed for long operations at sea, the ship must land each night to allow the crew space to rest and recuperate. Still, at ramming speed a trireme can make 18kph and under sail in a strong wind can make a similar speed. In addition to the oarsmen, the Trireme carries a crew of 30, consisting of command crew, sailors, and a contingent of armed fighting men to supplement the rowers during boarding actions.

Overall an impressive ship and still in demand on some low tech worlds outside the Imperium. Despite the tri-vids makers showing these types of ships being rowed by slaves, our research, both historical and on several worlds, has shown the only place where slave rowed galley exists is in the tri-vids. In order to row a ship of this type effectively, the oarsmen require strength, training and coordination. On worlds where we have found the Triremes and other oared ships in active use, the rowers are highly paid professionals.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	70, 000	70, 000	
Controls	14, 000	35, 000	-
Ram	5, 600	53, 400	
Drivetrain - Watercraft	850	4, 250	-34
Power Plant-Muscle	340	340	+34
Sails (30%)	21, 000	105, 000	-
Crew - 170 rowers	18, 700	17, 000	-
Crew - 30 (x2)	6, 600	60, 000	-
Cargo	2, 910	-	-

Subtotals Cr 344, 980 (Cr 275, 992 with 20% production model discount)



COASTER

TL-2, Cr270, 600, 120Kvl. An early example of a sail powered ship designed for hauling cargo. With two masts, the ship uses an array of natural cloth sails and can reach sustained speeds of 8kph. There are accommodations for 24 sailors in bunks plus five commanders sharing three cabins. The ship can be sailed for short periods with half crew, but the crew will be overworked and generally unable to handle unexpected situations. Coasters are only rarely armed, unable to outrun or outgun other sailed ships.

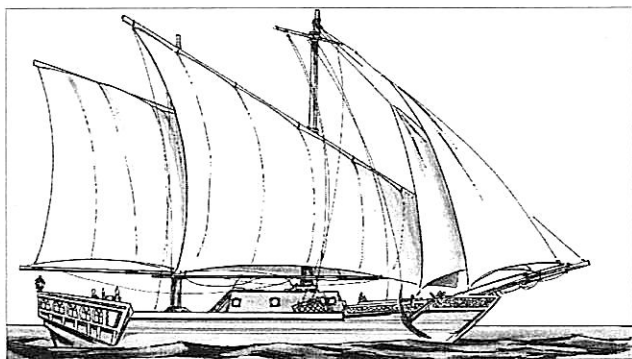
The Coaster, as the name implies, works the coastline of an ocean and rarely ventures out of sight of land. The wide bottom produces a shallow draft, making Coasters ideal for hauling cargo to underdeveloped ports. This same flat bottom makes the craft unstable in the rougher seas further from land. The Kuchenwald consortium produces between two and twenty of these vessels a year for internal use, each handcrafted from local materials. As with all hand-crafted items, no two ships are exactly alike and each is custom constructed to exact client needs.

In addition to the local construction on low-tech worlds, cargo sail craft are on several worlds in the early stages of terraforming and colonization. A sail powered cargo hauler, which requires only a few crewmembers and no fuel or advanced manufacturing for spare parts, is an advantage on a world lacking support infrastructure for more advanced vehicles.

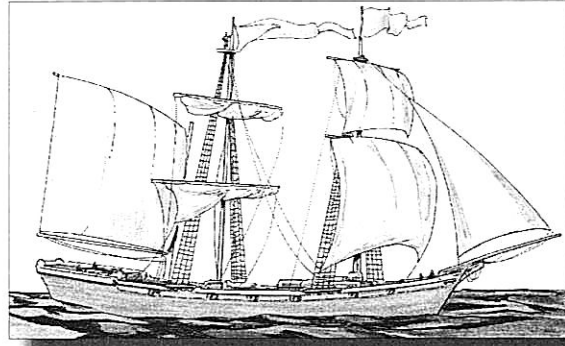
Design Specifications

Installed Components	Size	Cost	EP
Chassis	120,000	120,000	
Controls	24,000	60,000	
Drivetrain - Sails (20%)	24,000	120,000	
Crew - Bunks (25)	3,750	6,250	
Cabins (3)	6,000	24,000	
Galley (8)	1,600	8,000	
Cargo	60,650	-	-

Subtotals Cr338,250 (Cr270,600 with 20% production model discount)



SCHOONER



TL-3, Cr173, 520, 43Kvl. A light sailed powered ship designed for armed conflict. In wet navy sail terminology Schooners occupy about the same position as a patrol cruiser or small escort starship. Schooners discourage the lightly armed merchants from harassing other merchant vessels and patrol the shallow coastal waters and rivers for untoward activity. Commanded by six officers and operated by a crew of 16 sailors, the archaic muzzle loading artillery pieces require an additional crew of 5 each and a minute or more to reload after each shot. Below decks are cramped, with guns mounted amidships, the crew quarters split between the bow and aft spaces. The command cabins are within the aft superstructure and can be isolated in case of a crew mutiny. Schooners carry supplies for a month a sea.

The Schooner is from the TransInnovations vehicle database, and several (wet) naval forces on worlds within the Gateway domain use these ships. Most working examples replace traditional muzzle loading cannon with modern breech loading artillery. The smaller crew requirements for the guns give the ships complement more room.

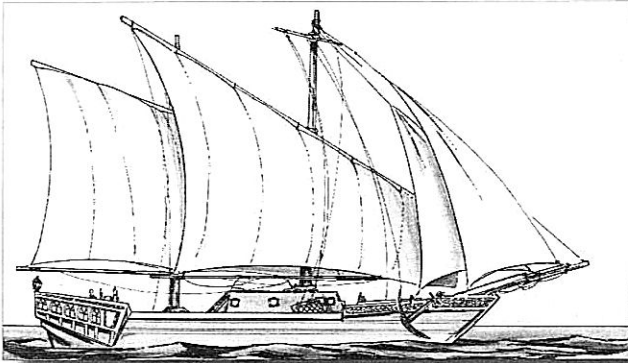
Sailing warships have their own classifications, primarily based upon the number of guns mounted on the ship. Schooners mount six to 12 guns. The smaller Sloops mount two to eight guns. The larger Corvettes mount as many as thirty guns and a frigate may mount up to 50. In addition to their larger gun complement, Frigates and Corvettes carry additional supplies sometimes as much as three years worth, to project naval strength around the world. The largest warships, called ships of the line for their ability to stand in the line of battle, mount as many as 120 guns, and have crews of 800 or more.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	43,000	43,000	
Controls	8,600	21,500	
Drivetrain - Sails (20%)	8,600	43,000	
Crew - Bunks (56)	8,400	14,000	
Small Cabin (4)	8,000	32,000	
Galley (15)	3,750	15,000	
Light Artillery (8)	4,000	40,000	
Fixed Mounts	400	400	
Ammunition	96	8000	
Cargo	290	-	-

Subtotals Cr216900 (Cr 173520 with 20% production model discount)

CLIPPER SHIP



TL-9, Mcr8.8, 840Kvl. A large, very fast cargo vessel, built to compete with steam powered ocean liners. Hauling a cargo of 360 tons and capable of a sustained speed of 36kph, clippers are designed for long distance hauling. The historical design of a clipper ship has four or five masts with the goal to put out as many square meters of sail as possible. Even the lower tech designs are capable of sustained speeds of 30kph or more. Crewed by a force of 50 sailors and 6 commanders, the cramped accommodations and dangerous working conditions can discourage hiring new crew.

Clippers, like most hand crafted vessels, have as almost as many variations as examples. Our example, The Star of the East is the flagship of the Luur Ghisbzu fleet on Luur. The Star of the East uses a set of three large wingsails for propulsion giving the ship a larger cargo capacity and allows for fewer crew. The upgraded ship's systems include modern navigation, communications, and sensor gear. A small fuel cell supplies the power required by the electronics.

Every two years the Luur sailing club holds a race for sailboats around Luur. The Star of the East competes in every race and holds the record in this intensely competitive race. When not sailing around the world, Luur Ghisabzu uses the ship for hauling cargo and important guests between the Luur starport and the corporate shipyard. Luur is home to twelve clipper ships, a source of pride for the shipbuilders.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	840,000	840,000	
Controls	168,000	420,000	
Drivetrain- Wingsail (30%)	252,000	6,300,000	
Power Plant- Fuel Cell	172	25,800	+86
Fuel (10 days)	3,096	-	-
Climate Control	8,400	420,000	84
Cubicles (50)	25,000	200,000	
Cabins (4)	8,000	32,000	
Passengers- Cabins (7)	14,000	56,000	
Galley (16)	4,000	16,000	
Radio 2-Way	3	45	1.2
Radar (Medium)	10	500,000	-0.5
Lights (1.5m area x10)	2	50	-0.1
Cargo	357,317	-	-

Subtotals Cr8, 809, 895 (7,047,916 with 20% production model discount)

STEAM BOAT

TL-4, KCr178, 100Kvl. An early example of a steam powered cargo ship. A pocket passenger ship designed for a fixed route on a navigable river or lake. Eighty passengers are afforded room to move about, but the ship is not designed for overnight travelers. The steam engine requires a crew of 16, plus the captain, first mate, pilot and three steersmen. The fuel bunker holds 10 days worth of coal, giving a range of 3, 840km.

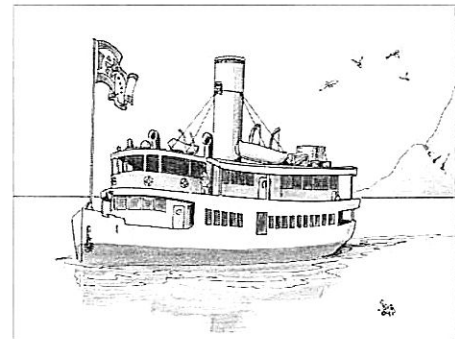
Blohm und Voss AG builds and sells this modular design steam boat, the River Prince. Almost any fuel can power the external combustion engine and BuVAG sells these ships with an installed fuel conversion system. The triple-expansion steam engine powers a feathering stern wheel and a simple induction generator on the main piston provides electrical power for the instruments and onboard lighting. The flat-bottomed hull with less than a two-meter draft is perfect for river travel. A short-range sonar system helps avoid the dangerous sand bars and snags common to many rivers. The engine and cargo storage are on the first deck, with a loading ramp at the bow for quick access to the cargo area. Second deck is passenger space, a large open space used as a dining hall, casino, theater, show hall, or (rarely) simply passenger seating. The roof is re-enforced for passengers, with an enclosed pilothouse for the captain, pilot, and navigation equipment.

A common variation is the addition of passenger cabins, like the BuVAG Tzar (THB pg. 307). The largest river ships accommodate several hundred passengers with entertainment facilities for journeys, which may take a week or more.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	100,000	100,000	
Controls	20,000	50,000	
Drivetrain- Watercraft	4,000	20,000	-160
Steam Engine	4,000	4,000	+160
Fuel	9,600	-	-
Crew Seats (22 x2)	4,840	4,400	
Freshers (4)	1,000	3,000	
Galley (6)	1,500	6,000	
Passengers seats (80 x4)	35,200	32,000	
Sonar (0.2km)	2	2,500	-0.05
Radio, 2-way (50km)	1	150	-0.04
Lights (1.5m area x10)	2	50	-0.1
Cargo	20,000	-	-

Subtotals Cr222, 100 (Cr177, 680 with 20% production model discount)

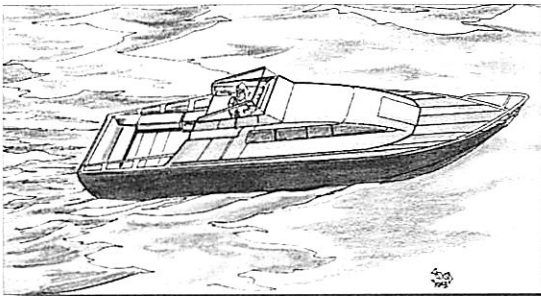


LUXURY POWERBOAT

TL-8, Cr40, 180, 7,000vl. A larger watercraft, primarily used for pleasure cruising. The ship has a crew of two; pilot and navigator control the craft from a flying bridge, and can carry two passengers. The ship carries 504vl of fuel and has a cruising speed of 60kph giving the boat a range of 1,400km.

Our example craft is the Salamah 9500, built by Sauma Forain Recreational Watercraft, is an excellent example of the pleasure cruising craft. The internal combustion engine is easily maintained but noisy and fuel hungry. The larger than normal aft cockpit has reinforced mountings for fishing equipment, diving support equipment, or simply extra space for more guests. Internally the layout is spartan and with an overhead clearance 5cm lower than on other similar models, it feels cramped as well. SFRW hulls, constructed of a lightweight aerogel between two layers of fiber-reinforced plastic, are nearly unsinkable even when holed. Because the Salamah is for a lower cost market, SFRW has put some attention into details, like an induction bilge pump and an air-cooled engine that requires fewer maintenance checks, which a less experienced boat handler may overlook.

In markets where luxury powerboats are sold widely, dealers compete by adding details like fancy wood interiors, better sound systems, custom exterior paint jobs, or additions like deep sea fishing or diving equipment. Boat sizes vary from a day cruiser like the Salamah at about 10m, to huge yachts at 80m or more in length.

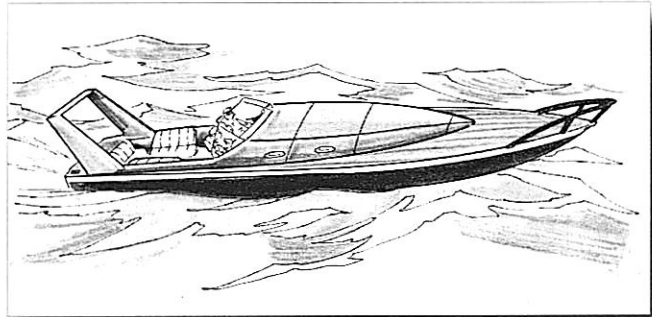


Design Specifications

Installed Components	Size	Cost	EP
Chassis	7,000	7,000	
Controls	1,400	3,500	
Configuration: Partial	-	7,000	
Drivetrain- Watercraft	1,050	5,250	-42
Power Plant- Internal Com	210	2,100	+42
Fuel	504		
Crew (4)	440	200	-
Cubical (4)	2,000	16,000	
Galley	250	1,000	
Fresher/Shower	350	850	
Lights (1.5m area x5)	1	25	-0.05
Radio, 2-way	2	300	-0.08
Sonar (0.2km)	2	2,500	-0.05
Navi-computer	12.15	4,500	-0.27
Cargo	778.85		

Subtotals Cr50, 225 (Cr 40, 180 with 20% production model discount)

PERFORMANCE POWERBOAT



TL-9, Cr58, 020, 4000vl. A medium sized powerboat designed for pure speed. The boat has room only for the two crew plus bunk space for brief stopovers. The top speed of 200kph exceeds the safe operating limits of the craft, requiring an experienced pilot at the helm. An oversized 1300vl fuel tank gives an impressive 16, 800km range.

Luur Ghisabzu sponsors boats in every class of watercraft racing on Luur, the Luur Windsong is a deep ocean racer, designed for the circumnavigation races. The commercially available Wingsong replaces all but two days worth of fuel with a shower for the fresher, a small galley and enlarges the bunks giving a roomier and more comfortable below deck space. The boat loses none of its impressive performance, and the elegant, sweeping lines of the Luriani designs turn heads at every marina.

The difference between the performance powerboats and luxury boats depends upon who is doing the selling. In general, performance boats have smaller accommodations for a similar sized boat. In theory, the smaller passenger space leaves more room for the engine, but with the variety of power plants available, this is only a rough guide. Another indicator would be engine power; generally, boats with a top speed over 120kph are performance boats. As with many vehicles designed for speed, planetary governmental regulators frown on importing these boats, particularly if the boat or engine construction TL exceeds the local TL.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	4000	4,000	
Controls	800	2,000	
Configuration: Partial	-	4000	
Drivetrain: Hydrojet	400	32,000	-40
Power Plant: Fuel Cell	145	21,750	+72.5
Fuel	1827	-	
Crew (2)	220	200	
Freshers	200	750	
Bunks (2)	300	500	
Lights (1.5m area x5)	1	25	-0.05
Radio 2-way	2	300	-0.08
Sonar (0.2km)	2	2,500	-0.05
Navi-computer	12.15	4,500	-0.27
Cargo	90.85		

Subtotals Cr72, 525 (Cr58, 020 with 20% production model discount)

RACING HYDROPLANE

TL-8, Cr5971, 486vl. A one man high speed racing boat, little more than a seat and a turbine strapped to a hydroplane hull. A top speed of 540kph exceeds safe driving limits, requiring a well-trained pilot for the craft. A tiny 5vl fuel tank gives only one hour of driving time, which is usually sufficient for most racing conditions.

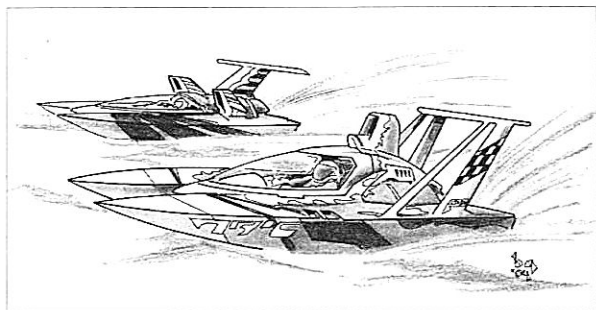
Ling Standard products racing team has named their craft the LSP Aeronautica. Last season the Aeronautica tied the record of four first place finishes and was the leader in the point count on the liruuer circuit, the light racing division. Like most racing vehicles, the engineers have tuned the frame, engine, and control systems to a fine edge, the boat running barely controlled. The Grav thrusters mounted within the craft are a required safety feature. If the onboard, dedicated computer system detects the craft has gone out of control, the grav thrusters are engaged automatically to slow and stabilize the boat, preventing the wildly careening craft from killing the driver or any of the spectators.

LSP, like many vehicle manufacturers, sponsors and builds racing craft as a part of their marketing system, a way to keep their name in the minds of the buying public. The other reason for these craft, a test bed for new technologies, is not seen as frequently in the Imperium but is common on worlds outside the Imperium.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	486	486	
Controls	110	275	
Configuration: Airframe	-	1458	
Drivetrain- Watercraft	328.05	1604.25	-13.122
Grav Drivetrain	0.1944	2, 236	-0.05
Power Plant: Turbine	42.244	2, 112.2	+21.122
Fuel	5.28		
Cargo	0.2311	-	

Subtotals Cr5, 971.45 (Cr4,777 with 20% production model discount)



FISHING BOAT

TL-14, MCr4.9, 1.44 Mvl. A large sized, deep-sea, commercial fishing boat. Utilizing a large net sized for specific marine fauna, the trawler scoops up a large catch, and then processes it in an onboard factory and flash freezes for transport to market. These floating factories are manned by a crew of 50, consisting of six command staff to run the vessel, six engineers to keep the onboard system running for the extended duration at sea, and a working staff of 38. The working staff is divided into three shifts of 12 plus two shift managers. The 100, 000vl fuel tank can keep the onboard fusion power plant running for three months.

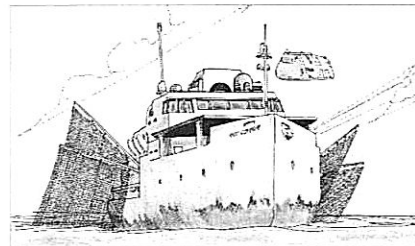
Makhuniim Gisham manufactures the Sea Harvester, one of the larger commercial fishing vessels the firm produces. As much as possible about the ship's operation has been automated, a number of robotic assembly lines performing all of the packaging and final product handling duties. The working staff is required to handle the nets and perform initial catch sorting. The cargo is divided into 150, 000vl of water tanks for keeping catch live, and 750, 000vl quick freeze storage space. The bow of the ship contains a grav vehicle landing pad plus a lift system from the freezer space for quick loading of processed catch. With the optional fuel processor and a regular delivery of supplies, the Sea Harvester can remain at sea almost indefinitely.

Makhuniim custom configures these vessels for the expected catch, from long boom trawlers with an automated line retrieval system, to a purse seine net system for surface fish, to a 5km drift net for wide scale catches.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	1, 440,000	1, 440,000	
Controls	288, 000	720, 000	
Drivetrain: Watercraft	54, 000	270, 000	-2160
Power Plant: Mod Fusion	6, 930	1, 524,600	+2310
Fuel (3 months)	103, 950		
Environmental Controls: C	14, 400	720, 000	-144
Cubicals (38)	19, 000	152, 000	
Cabins (12)	24, 000	96, 000	
Galley (13)	2, 600	13, 000	-
Fresher/Shower (5)	1, 750	4, 250	-
Factory Space (12)	12, 000	120, 000	-
Lights (51m beam x6)	20.4	510	-1.02
Lights (6m area x10)	8	200	-4
Sonar (50km x2)	8	10, 000	-0.1
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way, 500km x2	4	600	-0.16
Cargo	913, 310	-	

Subtotals MCr6.1 (MCr4.9 with 20% production model discount)



LARGE CARGO SHIP

TL-14, MCr82.11, 33Mvl. A large sea going cargo hauler, with a cargo capacity of 8, 312 starship tons and designed to haul the modular containers from a starport loading facility to a seaport. A crew of 40, 8 command officers and 32 engineers, operates the large cargo ship. The ship contains a one-year fuel supply for the large fusion plant, after which time the fusion plant needs an overhaul. With a top speed of 40kph, the ship isn't as fast as other forms of cargo transportation, but few are as inexpensive per ton.

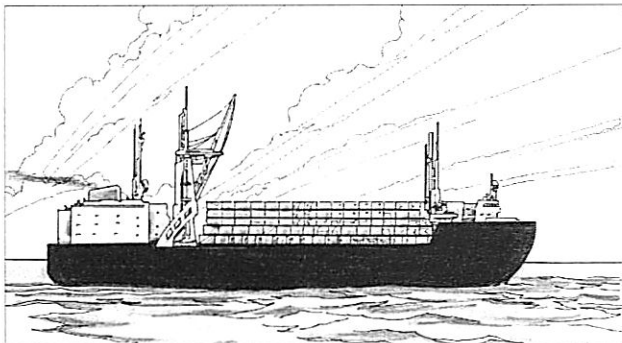
The Kriemhild class modular container cargo ship is the flagship design of Blohm und Voss AG. BuVAG builds the Kriemhild in sections, ships the pieces and then assembles it at the wharf on the delivery world. BuVAG employs a custom designed starship to haul the 3, 400 tons of material for building the ship, which also forms the base of operations and works as the lifting crane. BuVAG construction uses a magnetic induction welding technique on a metal-ceramic compound to form a single seamless hull. This metal fiber reinforced hull is corrosion-proof, lightweight, and flexible enough to resist the damage caused by rough seas. With proper maintenance, the hulls can last indefinitely.

Modular container ships, which haul the same modular containers (THB pg. 351) used in starships, vary in size. Our example is the largest of the container ships. BuVAG can build the Kriemhild as much as half this size without compromising seaworthiness. The smallest container ships are one tenth this size, with a crew of 12. The Helchen class modular ships are bulk liquid carriers, designed and built in a similar manner to the Kriemhild class ships, but can be up to ten times larger.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	33, 000,000	33, 000,000	
Controls	6, 600,000	16, 500,000	
Drivetrain- Watercraft	1, 650,000	8, 250,000	-66, 000
Power Plant- Mod Fusion	198, 000	43, 560,000	+66, 000
Fuel	1, 188,000		
Small Cabin (40)	80, 000	320, 000	
Galley (10)	2, 500	10, 000	-
Lights (6m area x20)	16	400	-0.8
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way (500km x2)	4	600	-0.16
Cargo	23, 281,000	-	

Subtotals MCr102.6 (MCr82.1 with 20% production model discount)

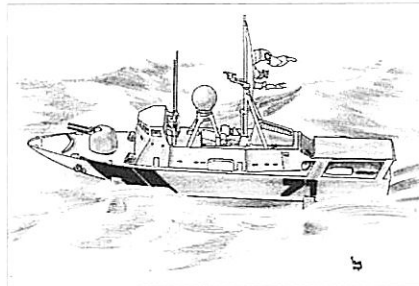


SHORE PATROL SHIP

TL-12, MCr5.32, 600Kvl. The shore patrol ship is a lightly armed ship used for search and rescue efforts, civilian interdictions, and medium range patrols. The four variable pitch propellers can drive the craft on the hydrofoils at 220kph and the onboard fuel supply provides for more than 15 days duration at top speed. The ship has a crew of 37 consisting of eight command officers, three gunners, 20 engineering staff, four medics, and two specialists. The rear deck contains a landing pad and storage space for a helicopter, VTOL jet, or grav vehicle of up to 10, 000vl. The ship also contains an onboard medical suite for emergency victims and a compact machine shop for at sea repairs.

Our example is the Daak Garadanak (Near Sea Defender) produced by Luur Ghisabzu. Originally produced for the Luur search and rescue services, these multi-role sea-going ships are sold to worlds throughout Ley sector. Reports from crews find the Daak Garadanaks are spacious, easy to maintain, and a useful addition to many fleets. While the ship can move at 220kph, the usual mission profile keeps the craft at a more respectable 40kph, which extends its duration at sea to more than 100 days.

The forward turret mounted VRF gauss guns provide a respectable firepower for interdiction and customs work. When clients use the Daak Garadanak for search and rescue work, Luur removes the turreted VRF gauss guns and replaces them with an upgraded sensor and communications suite with a holo-display. Another unarmed variation uses the forward deck for an additional half-sized landing pad.



Design Specifications

Installed Components	Size	Cost	EP
Chassis	600, 000	600, 000	
Controls	120, 000	300, 000	
Armor: AR3	48, 000	435, 000	
Configuration: Streamlined	-	1, 200,000	
Drivetrain: Watercraft	150, 000	750, 000	-6000
Power Plant: Adv Fuel Cell	12, 750	850, 000	+8,500
Fuel	153, 475		
Environmental Controls: C	6, 000	300, 000	-60
Small Cabin (37)	74, 000	296, 000	
Galley (10)	2, 500	10, 000	
Sickbay (4)	4, 000	400, 000	
Vehicle Shop (4)	4, 000	40, 000	
Turret	5, 112	51, 120	-
VRF Gauss Gun x2	(4, 000)	400, 000	
Ammo (6,000 round)	(60)	1, 200	
Gunner Seat	(200)	100	
Landing Pad	10, 000	-	
Lights (6m Area x10)	8	200	-0.4
Lights (51m beam x6)	20.4	510	-1.02
Sonar (50km x2)	8	10, 000	-0.1
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way (500km x2)	4	600	-0.16
Cargo	10, 103	-	

Subtotals

Cr 6, 644,730 (Cr5, 315,784 with 20% production model discount)

ICEBREAKER

TL-14, MCr25.55, 1.8MvI. A large ship designed to keep shipping lanes for watercraft, particularly cargo vessels, free of ice by breaking a path. The ship employs a reinforced bow and a system of grav drive thrusters to shatter the ice. The ship is capable of 60kph on open ocean. The speed through ice depends upon the thickness and composition of the ice and usually rates between 6kph and 10kph. The onboard fusion plant has a one year fuel supply along with the cargo space to haul supplies for the crew. Crew requirements are the 4 command officers, 10 engineers, with additional space for 10 mission specialists.

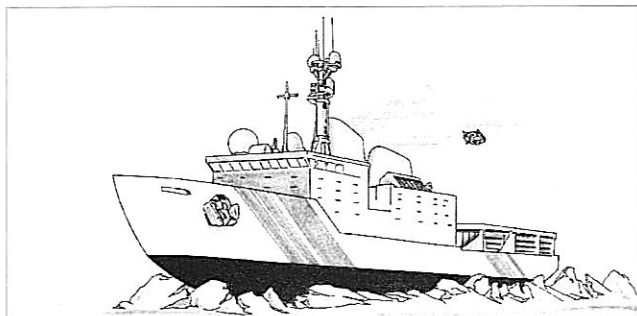
Our catalog vessel is the Maritime Angel, manufactured by Makhuniim. The use of a set of grav thrusters allows the Maritime Angel to omit the usual ballast tanks used in icebreakers. In thinner or fresh ice, the ship runs up to speed and smashed through the ice layer. On thicker ice, the ship bow of the ship runs onto the ice and the ballast shifted forward to use the weight to crack the ice. This process repeats as often as required. The Maritime Angel, using the grav thrusters, can shift the ship's center of gravity in 1/10 the time it takes for moving liquid ballast, giving a much higher rate of travel through an ice field.

Makhuniim manufactures these vessels in two variations, a pure cargo ship and a research vessel. The cargo ship has a large loading crane and a cargo hold capable of hauling 700, 000vI of cargo to remote outposts. The ocean research vessel converts most of the cargo space into laboratory space and additional cabins for the scientific crew.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	1,800,000	1,800,000	
Controls	360,000	900,000	
Armor: AR 3	72,000	651,000	
Ram Plate	36,000	327,000	
Drivetrain: Hydrojet	54,000	4,320,000	-5,400
Drivetrain: Grav	720	8,280,000	-180
Power Plant: Mod. Fusion	60,480	13,305,600	+20,160
Fuel	362,880		
Environmental Controls:C	18,000	900,000	-180
Small Cabin (24)	48,000	192,000	-
Galley (6)	1,200	6,000	-
Sickbay (2)	2,000	200,000	-
Vehicle Shop (4)	4,000	40,000	-
Lights (6m area x10)	8	200	-0.4
Lights (50m beam x6)	20.4	510	1.02
Sonar (50km x2)	8	10,000	-0.1
Radar (50km x2)	20	1,000,000	-1
Radio, 2-way (500km x2)	4	600	-0.16
Hangar Bay	26,000	0	
Cargo	754,660	-	-

Subtotals MCr31.93 (MCr25.55 with 20% production model discount)

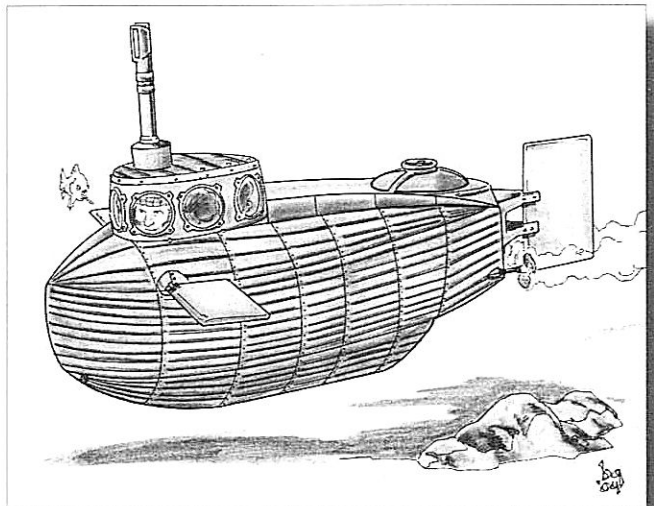


EARLY SUBMARINE

TL-4, Cr1195, 760vI. An archaic design for a muscle powered submarine. Two crew; using hand-cranked propellers attached to a propeller, power the craft. A third person acts as pilot and captain. The construction makes the vehicle as close to neutral buoyancy as possible with depth controlled by mechanical dive planes operated by the pilot. The detail drawing and parts list are available from Greenwater Farsails for Cr60, or as a complete kit for Cr300.

The historically accurate version of the craft uses a wooden hull sealed with wax or petroleum distillates and stone ballast. The captain has a limited view through eight small view ports in the bow. Air supply is limited to the empty spaces within the vehicle, and underwater operations to a few minutes at most. A snorkel allows extended operation at a meter or so of depth. In the historical period, this depth is more than sufficient for a sneak attack or slipping by a blockade under cover of darkness.

The updated design uses glass or other transparent material to replace some or all of the wood, allowing the crew to enjoy the view as well as the captain. The addition of a modern rebreather and oxygen supply extends the underwater duration. The modern version is an ideal transport for viewing sites in shallow water.

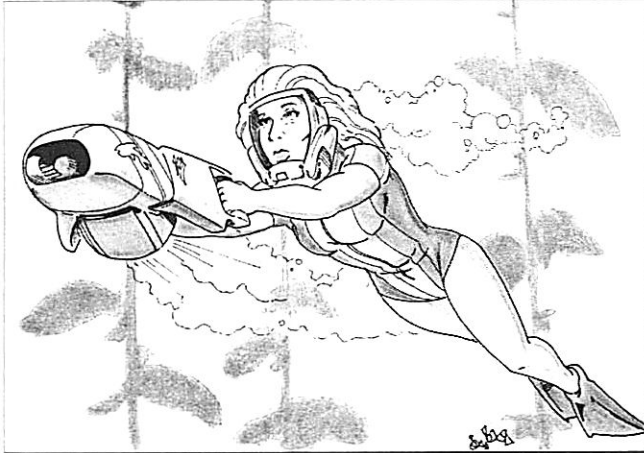


Design Specifications

Installed Components	Size	Cost	EP
Chassis	760	760	
Controls	152	380	
Drivetrain: Subsurface	4	50	-0.4
Power Plant: 2 Muscle	4	4	+0.4
Crew: 3 seats	600	300	

Subtotals Cr 1494 (Cr 1195 with 20% production model discount)

HAND SUB



TL-11, Cr71, 2.7vl. The Hand Sub is a powered propulsion unit for scuba divers or free divers. It provides a battery powered tow at a reasonable speed. Handgrips contain a throttle control, with steering provided by the operator. The onboard battery provides power for eight to ten hours, depending upon use of the headlight. The induction motor hydrojet drive system has only one moving part, making the entire craft extremely reliable.

Built and distributed by Halcom Alien, these small units include a digital readout displaying battery power, dive time, depth, and rise time calculation. Halcom provides an emergency inflation bubble in the craft, capable of hauling two people to the surface and supporting them there. Removing the system leaves a small, sealed, cargo area for samples.

Our favorite variation is a slightly smaller version, sold as children's pool toys, and produced in a variety of bright colors.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	2.7	2.7	
Controls	0.26	1.3	
Armor			
Configuration			
Drivetrain: Subsurface	1	80	-0.1
Power Plant: Battery	0.04	0.3	+1
Light, 6m beam	0.4	5	-0.02
Cargo	1	-	

Subtotals Cr 89.3 (Cr 71 with 20% production model discount)

SHALLOW WATER EXPLORER

TL-9, Cr8, 088, 2100vl. This small craft is for underwater touring. The six passengers sit inline behind the pilot, and a glass canopy covers everyone. The canopy provides excellent viewing for all the passengers while the sealed interior provides a dry and comfortable ride. The submarine runs entirely on battery power, capable of reaching 8kph while submerged and maintaining that speed for up to 10 hours. The ship is capable of dives up to 30 meters.

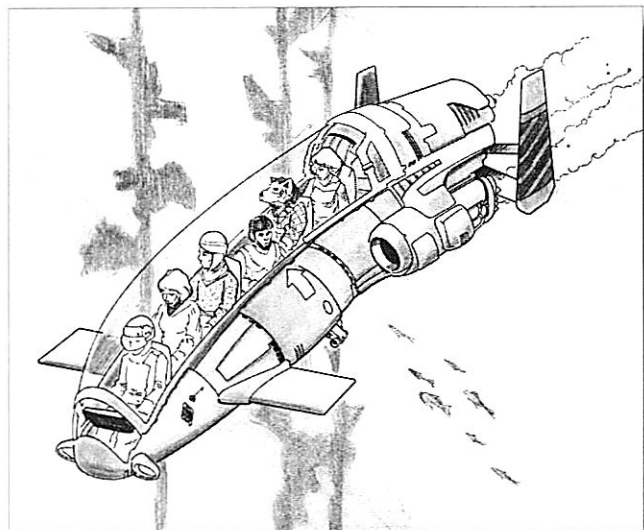
Halcom Alien manufactures the Seahorse. The extremely simple drive-by-wire controls can be explained in a few minutes and have anyone operating it in under half an hour. The Seahorse automatically maintains positive buoyancy; if the engine ever stops, it immediately floats to the surface. In addition, the control system monitors the air quality, battery power remaining and depth, alerting the pilot when conditions go beyond pre-determined limits. The combination of simple controls, comfortable passenger area with high visibility, and minimal operating costs earns the Seahorse high praise from both designers and the tourism industry experts.

A common variant is an unsealed version, which requires the passengers to carry their own air supply. Underwater work crews use these wet crew submarines to extend their working time by letting the move further without tiring.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	2100	2100	
Controls	420	1050	
Drivetrain: Underwater	33.6	420	-3.36
Power Plant; Battery 10h	6	15	+60.55
Environmental Controls: S	105	2625	-2.625
Crew: 1	110	100	
Passengers: 6 Roomy	1320	1200	
Sonar (0.2km)	2	2500	0.025
Lights, 5x 1.5m area	1	25	-0.05
Radio 2-way	0.3	75	-0.02
Cargo	102	-	

Subtotals Cr10,110 (Cr 8, 088 with 20% production model discount)



LUXURY SUBMARINE

TL-12, Cr194, 229, 14,400vl, A large submarine designed for personal use. Two crew, the pilot and engineer, control the craft while underway. The pressure hull holds accommodations for twelve passengers in comfort, including a galley, full bath, sleeping areas and dining area. Powered by a closed environment fuel cell, the craft can make 10kph underwater with a range of 625 km.

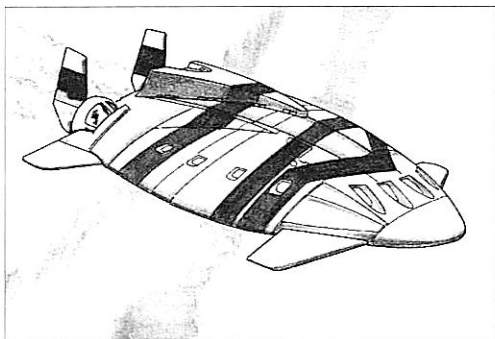
Our example of a broad category is the Island Gypsy Neritic 20. Outfitted for 12 passengers with an executive lounge, the Neritic serves as sea-going transport in privacy and isolation. The broad sweeping views from the forward lounge offer impressive views of the surrounding seascape. Each of the passenger cabins has a large window with an equally impressive external view. The large bank of external lights illuminates the sea for better viewing. Island Gypsy prides itself on their ability to custom outfit their vessels to exacting specifications.

Island Gypsy also produces the Neritic 19, replacing the passenger cabins and lounge with passenger seating for 24, perfect for undersea commuting or short tourist explorations. While surfaced, the Neritic 20 has a configuration similar to surface craft of the same size and can use the same berth and docking facilities. Underwater, the rear docking hatch has a variable adaptation ring for attachment to most habitats.

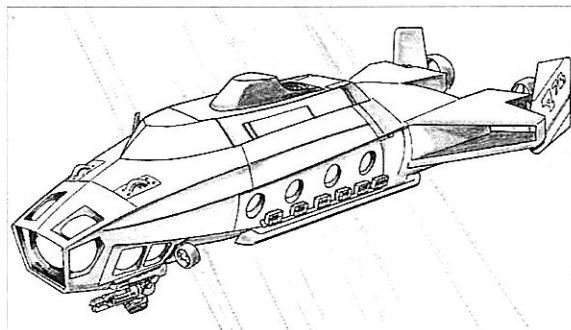
Design Specifications

Installed Components	Size	Cost	EP
Chassis	14, 400	14, 400	
Controls	2, 880	7, 200	
Armor: AR2	864	10, 776	
Configuration: R. Deep	-	28, 800	
Drivetrain: Underwater	288	3, 600	-28.8
Power Plant: Adv Fuel Cell	61.5	4, 100	+41
Fuel: 2.05vl/hr	256.25	-	
Environmental Controls: S	720	18, 000	-18
Crew x2	220	200	
Galley x4	800	4, 000	
Fresher/Shower	350	850	
Cubicle x12	6,000	48, 000	
Common Area	1,600	100, 000	
Lights 12x area	2.4	60	-0.12
Sonar (0.2km)	2	2500	-0.025
Radio 2-way (500km)	2	300	-0.08
Cargo	353.85	-	

Subtotals Cr 242, 786 (Cr 194, 229 with 20% production model discount)



DEEP WATER EXPLORER



TL-14, Cr602, 230, 8,000vl. A deep diving submarine for exploration and scientific study. The craft holds a crew of three, plus an extensive laboratory for on site testing. The fusion plant provides power for three months, and allows for entirely independent operation. A modest top speed of 30kph still allows the craft to chase down most marine life. The craft has a safe diving depth of 15,000 meters, deeper than the oceans on most worlds.

Halcom Alien's Benthic Explorer is an old, well-established design, proven over a hundred years and on worlds throughout the Gateway domain. The four-layer pressure hull isolates components, providing an extra layer of safety. The exterior all-around holo-imaging system and powerful array of lights capture the entire seascape. The sampling basket includes highly dexterous external arms, plus a dedicated holo-imaging and lighting unit.

There are not many variations on the Benthic Explorer, being very specialized type of vehicle, each one is custom built to the requirements of the owner. A frequently seen variation is a deepwater repair sub, used to find and repair broken undersea communication lines.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	8, 000	8, 000	
Controls	1, 600	4, 000	
Armor-AR14	1, 200	13, 800	
Configuration-bathyscaphe	-	24, 000	
Drivetrain- Underwater	480	6, 000	-48
Power Plant- Fusion	186	40, 920	62
Fuel	279	-	
Environmental Controls- P	400	10, 000	-10
Crew: 3	330	300	
Cubical x3	1, 500	12, 000	
Fresher/Shower	350	850	
Galley	200	1000	
Laboratory	800	50, 000	
HoloVideo+IR+LI x8	21.6	32, 000	-1.12
Holodisplay x2	0.2	4, 000	-0.1
Sonar (1km)	4	5000	-0.05
Densitometer	0.5	375, 000	-0.2
Lights x12	2.4	60	-0.12
Radio 2-way (5000km)	2	300	-0.08
Arms, STR10, DEX10 x2	10	20, 000	-2
Cargo	634.3	-	

Subtotals Cr 602, 230 (Cr481,784 with 20% production model discount)

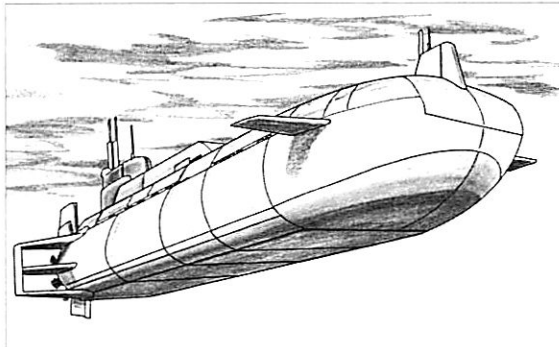
CARGO SUBMARINE

TL-13, MCr19.41, 2 Mvl. Vualdetruda, depth 200m, 40kph. Crew of 26 Engineers, 7 command crew. Cargo space holds 320 starships tons.

Our example is the Vualdetruda class cargo submarine, manufactured by Blohm und Voss AG. BuVAG manufactures the Vualdetruda using their signature modular technique, hauling a partly constructed ship to the customer port and finishing it onsite.

The cargo submarine is a specialized vehicle, attempting to fill the same role as the surface cargo ships like the Kriemhild. What the Vualdetruda class submarines lose in cargo capacity and extra cost, they make up in their transit ability. Where shipping routes pass through ice packs, the submarine can pass under the ice rather than requiring the use of an icebreaker. Another benefit is the ability to through large storms, a significant impediment on some worlds, the cargo protected underwater. Reports from BuVAG indicate a few worlds have converted their entire ocean shipping fleet to submarine vessels, avoiding the problems of surface shipping.

Variations on the cargo submarine include use as an underwater drilling rig or mining operations center. Access to mineral resources on worlds with significant water coverage (90% or more) is a challenge. A large mobile platform providing a normal atmosphere environment is an ideal solution.

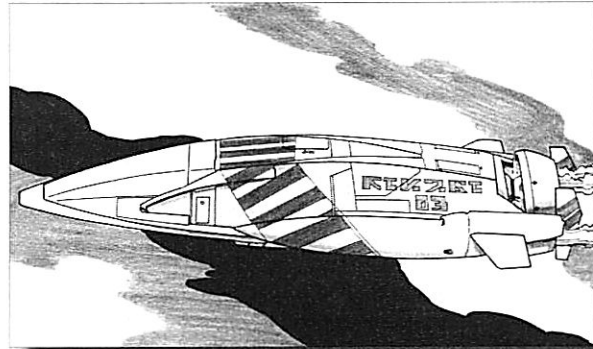


Design Specifications

Installed Components	Size	Cost	EP
Chassis	2,000,000	2,000,000	
Controls	400,000	1,000,000	
Armor: AR 6	280,000	2,523,000	
Configuration: Reinforced	-	4,000,000	
Drivetrain: Underwater	160,000	2,000,000	-16,000
Power Plant: Mod Fusion	55,500	12,210,000	+18,500
Fuel	83,250	-	
Environmental Controls: P	100,000	250,000	-2,500
Privacy Cubicles (28)	14,000	112,000	
Cabin (5)	10,000	40,000	
Galley (13)	2,600	13,000	
Sickbay	1,000	100,000	
Sonar (50km)	8	10,000	-0.1
Radio, 2-way (500km)	2	300	-0.2
Cargo	893,640	-	

Subtotals MCr24.26 (MCr19.41 with 20% production model discount)

SUPERCAVITATION SUBMARINE



TL11, MCr3.31, 12,000vl. The ship is capable of 440kph top speed, and an operational duration of over 24 hours. Manned by a crew of 6 (Captain, 2 sensor operators, 2 engineers, and a medical technician), the vehicle has just enough space remaining after propulsion and other essential systems to carry sufficient supplies to support the crew while on station at sea.

The Makhuniim SAR Guardian is a purpose built submarine for search and rescue work. The high speed craft is capable of responding to an emergency faster than surface ships and as fast as most grav rescue vehicles. The original SAR Guardian class worked as part of the Daramm starport emergency services. Since that time, Makhuniim has updated the design slightly and it is now found on worlds throughout Ley sector.

The addition of the starship airlock docking ring and the large cutting torch make the vessel ideal for downed starship rescue operations. The onboard vehicle shop allows the crew to assist in repairs to the downed vehicle. If repairs are not forthcoming, the SAR Guardian carries up to 17 rescued people. The SAR Guardian has amenities for short term station keeping only, limiting its range for close to home.

Design Specifications

Installed Components	Size	Cost	EP
Chassis	12,000	12,000	
Controls	2,400	6,000	
Armor: AR 3	1,440	15,960	
Configuration: Supercav		84,000	
Drivetrain: Grav Drive	256	3,072,000	-64
Power Plant: Fuel Cells	256	38,400	+128
Fuel (19.2/hr)	691.2	-	
Environmental Controls: P	600	15,000	-15
Seats 6 x2	1,320	1,200	
Fresher	200	750	
Passenger bunks x16	2,400	4,000	
Sickbay (x1)	1,000	100,000	
Vehicle Shop x1	1,000	20,000	
Video+IR+LR x 6	9.6	15,600	-0.42
Video Monitorx6	3	600	-0.12
Sonar (50km)	8	10,000	-0.1
Densitometer	1	750,000	-0.4
Radio, 2-way (500km)	2	300	-0.08
Misc. Equipment			
Cargo		413.2	

Subtotals MCr4.13 (MCr3.31 with 20% production model discount)

LAND SAILER

TL-6, Cr188, 45vl. A one person sail driven land vehicle used for recreation and racing. The craft is capable of reaching speeds of over 35kph over good surfaces.

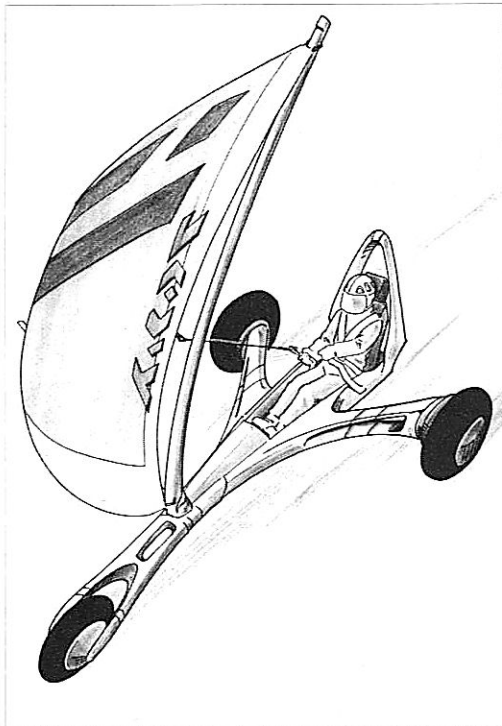
The land sailer is an odd vehicle we see from time to time. It is a marriage of the sea going Yacht and a lightweight ground vehicle. Our example is a light, one person pleasure vehicle. The large tires and suspension system give a smooth ride over open park or open desert. The Transinnovations design permits replacing the wheels with skids, for travel over open ice. The design calls for an aluminum frame and inflated tires, though more modern materials can be substituted.

A variation on the theme is seen by the natives of Gimram (Ley 1215 E542653-1), who use larger vehicles powered by wind for crossing the desert expanses between watering holes. These bus sized vehicles carry the entire tribe and their belongings.

Design Specifications

<i>Installed Components</i>	<i>Size</i>	<i>Cost</i>	<i>EP</i>
Chassis	45	45	
Controls	4.5	22.5	
Drivetrain Sails 60%	27	135	
Wheels (3)	3.3	7.5	
Crew: Saddle	10	25	
Crew	100	-	
Cargo			

Subtotals Cr235 (Cr188 with 20% production model discount)



APPENDIX I: LICENSES AND LAWS

The following legal advice is offered to Travellers intending to make use of ground vehicles in the course of their activities. However, please note that the editors and publishers of the Yarn Caardee Vehicle Catalog are not lawyers, and that individuals are always advised to seek information on local laws from an appropriately qualified sophont before undertaking any journey in an unfamiliar locality.

IMPERIAL VEHICLE OPERATOR LICENSING

Ground vehicles are subject to a range of licensing and operations laws, and these vary greatly from world to world. Within the Imperium, a unified licensing system exists in the hope of ensuring at least a basic competence in drivers.

In order to obtain a basic Imperial Driving License, an individual must demonstrate competence in an approved test, which includes basic road skills, maneuvering and knowledge of basic vehicular courtesies. This test is fairly easy to pass, and almost any character with the appropriate Ground Vehicle feat (or skill in CT) can usually pass it. A driving skill roll at DC 5 is normally necessary (CT: Roll 4+, DM skill). Failure requires a re-test after a few weeks. Tests must be taken for different types of vehicle, as described below.

These licenses are recorded on a character's Imperial ID. They show basic competence to safely operate the vehicle under urban or "tame" conditions. A character who has obtained a basic license may attempt to obtain a more advanced certification. This is often a requirement for driving jobs such as formal racing, bodyguarding, or courier work, and to be allowed to operate military vehicles. A character with advanced driving tags on his or her license is more likely to be hired for a job or trusted with an expensive vehicle than a basic driver. The Referee may award bonuses to attempts to get hired for appropriate tasks at his discretion.

Referee's Note: it is never possible to Take10 or Take20 on a driving test unless the character has the Professional Speciality feat.

ADVANCED VEHICLE TEST CLASSIFICATIONS

ADVANCED VEHICLE LICENSE (AVL)

An AVL is far more involved than a basic license. The user must demonstrate the capability to deal with common hazards such as poor visibility, uneven or slippery surfaces and conditions such as skids and minor collisions. The emphasis is on safety and control, rather than flash or speed. The driver must also undertake a range of intricate maneuvers and demonstrate excellent vehicle control skills. AVL tests are very different from one vehicle to the next – an urban ground car driver may have to control a skid and park in tight spaces, while an ATV driver may have to negotiate inverse-camber slopes in a swamp, at night, in high wind. The tests are demanding, and require a DC 15 Drive roll plus a basic skill level of at least 4 (CT: Vehicle-2 and roll 9+< DM Vehicle skill).

An AVL is required for an EVL, Race, Pursuit or Bodyguard certification. Some localities require an AVL for ownership of more powerful or expensive vehicles, and most require one if a character is driving for paying passengers.

ADVANCED OPERATOR'S CERTIFICATE (AOC)

The character must demonstrate knowledge of the workings of the vehicle, including critical systems such as power train, brakes and steering. Competence at basic maintenance and minor emergency repairs such as tire changes and fuel cell disconnection/reconnection is required. To obtain an AOC, the character must succeed in a DC10 T/Mechanical check or a DC 18 Drive check (CT: Roll 7+, DM Mechanical skill OR roll 9+ DM Vehicle skill). An AOC is required for each of the types of vehicle listed under basic licensing, and must be taken separately. AOCs are not normally required for urban vehicle operation, but many ATV-hire firms insist on seeing one before a vehicle is released. Patrons hiring a driver also often demand AOC for their vehicle, for obvious reasons. AOC is needed for an EVL. Some localities require an AOC for ownership of any vehicle.

EXPERT VEHICLE LICENSE (EVL)

The EVL certificate builds on the skills used for AOC and AVL, and requires the user to hold both. The test is different for each class of vehicle and covers a wide range of extreme situations ranging from high-speed skids and sudden systems failures to rescuing another vehicle from hazardous conditions. EVL tests are usually 3-day affairs requiring the character to succeed in a DC20 Driving roll. A basic skill level of 8 is required, or the character automatically fails. (CT: Roll 10+, DM Vehicle skill. Vehicle Skill 3+ is required.) Holders of an EVL often gain benefits such as cheaper insurance or permission to own high-performance ground cars or cycles.

RACE CERTIFICATION, LOCAL

Reputable racing arenas do not allow just anyone to turn up with a vehicle. A certification is required. For local race meetings, this is a simple demonstration that the character can handle a vehicle at high speed on an empty track (it's better to find out he can't while there aren't other cars and hundreds of spectators about!) and possession of a basic license. The test requires a DC 8 Driving roll (CT: roll 6+, DM Vehicle skill). Typically certification is general; a character who has qualified for an ATV race can enter a motorcycle race without taking a new test, provided she has a license.

RACE CERTIFICATION, REGIONAL

Regional race meetings prefer to keep long shots and other ruffraff off the tracks. They require a specific certification for the vehicle type (and often a sub-division of the type). For example super-towncar racing requires a different license from the Imperium 500 circuit. Regional certification requires an advanced license plus local race certification and a fairly rigorous high-speed test, followed by a group test where appropriate. Passing requires a Drive skill roll at DC 15 (CT roll 9+, DM Vehicle skill).

LICENSES AND LAWS

COURSE COSTS

Roll	Level of Control/Multiplier	Enforcement	Level of Attitude	DC	
5-	None		None	Routinely Disregarded	2
6-9	Minimal	(1)	Trivial part of police duty	Very Lax	5
10-12	Light	(2)	Part of police duty	Lip Service	10
13-15	Normal	(3)	Some Specialist Traffic Police units	Normal	15
16-19	Tight	(5)	Many Specialist Traffic Police units	Rigidly enforced and observe	20
20+	Draconian	(10)	Large specialist Police force	Brutally enforced; obeyed out of fear	25

RACE CERTIFICATION, MAJOR LEAGUE

Major races and organizations have high standards, partly to ensure a good race and plenty of spectators, and partly for the safety of all involved. Obtaining a major league racing license requires an expert vehicle license (EVL), regional certification and a test that few drivers can pass. Full certification is awarded only if the character makes a DC25 Drive skill roll (CT: Roll 11+, DM vehicle skill).

BODYGUARD/SECURITY DRIVER CERTIFICATION

People hiring a driver to protect themselves or their property from attack or ambush want a combination of maneuvering skill, alertness and quick thinking. Tests vary from place to place, but are usually taken at the end of a week-long training course. A bodyguard-driver will learn how to drive on flat tires, crash and evade roadblocks, and to make special maneuvers such as handbrake turns in order to evade danger. He will also learn to quickly determine if his vehicle has been tampered with, and how to spot hazardous situations before they arise. To pass the test, the driver must succeed on all three of the following:

Spot Check, DC 10 (CT: Roll 7+, DM +1 if Int 8+)

Drive Check, DC 15 (CT roll 9+, DM Vehicle skill)

Procedures: Int Check DC 10 (CT: Roll 7+, DM +1 if Int 8+)

Failing any part of the test requires a complete re-sitting. An advanced license is required to sit the test at all.

PURSUIT DRIVING COURSE

Police and security operatives are often trained to pursue other vehicles and if necessary, bring them to a stop (or make them crash). The emphasis is usually on the safety of bystanders and personnel undertaking the stop, though some quite brutal techniques are taught. The course also includes basic concepts such as setting up a roadblock, firing from a vehicle, roadblock or barricade, and use of devices such as spike strips to halt a fleeing vehicle. Military and covert-operations training emphasises destroying vehicles more than stopping them safely, though in all cases the need to apprehend or capture the occupants of the enemy vehicle. Courses are at least a week long and require that the character succeed at both parts of the test:

Drive Check, DC 18 (CT roll 10+, DM Vehicle skill)

Procedures: Int Check DC 10 (CT: Roll 7+, DM +1 if Int

8+)

Failing any part of the test requires a complete re-sitting. An advanced license is required to sit the test at all.

LOCAL LICENSING AND TRAFFIC LAWS

Local conditions vary from the Imperial norm, of course, though Imperial licenses are generally recognized on most member worlds. In a few cases, Travellers are required to take a token test to show competence, but as a rule an Imperial license is taken at face value.

However, some high-law worlds refuse to accept any licenses but those issued by their own government. To determine if this is the case, roll 1d20 (CT: 2D) and add Law Level. If the result is 20 (CT: 15) or more, the world accepts Imperial licenses subject to various local laws. Travellers can use their normal driving licenses but may fall foul of special cases and local interpretation if they are not careful. If the result is 25 (CT: 18) or more, the world does not recognize Imperial licenses without a complex "conversion certificate" issued after a complete test. Otherwise, the characters will be required to familiarize themselves with local traffic regulations but can drive legally on their Imperial permits without any problems.

The Imperial authorities generally accept local licenses as valid offworld, subject to a temporary conversion fee of Cr50 per month. Permanently converting a local license to an Imperial one costs Cr500, but is simply a matter of accreditation. This leads to the occasional abuse, as some worlds award licenses to almost anyone. The most notorious offenders are well known and applicants holding licenses from these worlds are usually required to take a proper test, but some do slip through the net.

TRAFFIC LAWS

Most worlds have some form of traffic conventions, and these are usually enforced by law. Low-law worlds generally rely on common sense and accepted custom, while more rigid societies often have very tight laws and stiff penalties for infractions.

The following table gives an indication of the sort of traffic laws that may exist, and the kind of enforcement that accompanies them. Roll 2d6 (2D) and add the world's law level to determine each category within the table.

The Attitude column shows the attitude of society and the law enforcement community to traffic violations. It is entirely

TRAFFIC LAWS

Roll	Level of Enforcement	Control Multiplier	Attitude	DC	
5-	None	-	None	Routinely Disregarded	2
6-9	Minimal	(1)	Trivial part of police duty	Very Lax	5
10-12	Light	(2)	Part of police duty	Lip Service	10
13-15	Normal	(3)	Some Specialist Traffic Police units	Normal	15
16-19	Tight	(5)	Many Specialist Traffic Police units	Rigidly enforced and observe	20
20+	Draconian	(10)	Large specialist Police force	Brutally enforced; obeyed out of fear	25

possible to have a world with tight traffic laws and a large police presence to enforce them, yet where all but the most flagrant violations go unremarked. Other worlds may have few laws but enforce them harshly.

Penalties for traffic violations depend largely upon the level of control nominally in place. As a rule, minor infractions such as invalid license or insurance or slightly exceeding the speed limit are subject to fines, often administered on the spot.

Fines for minor infractions are normally 2d6 x 10 credits, multiplied by the control multiplier (the number in brackets under Control Multiplier).

More serious infractions (very high speeds, causing injury by careless driving etc.) are subject to a fine of 3d6 x 10 credits, multiplied by the world's control modifier as above, or by a term of imprisonment, normally 2d6 days multiplied by the control multiplier.

Felonies such as fleeing from police may be punished by large fines or periods of imprisonment. This is normally 2d6 weeks multiplied by the control multiplier. Characters who commit very serious crimes, such as causing death by reckless driving, may be given a sentence based on the specific crime (typically 1d6 years multiplied by the control multiplier). This gives the length of the sentence in years). In some cases, such crimes are considered to be murder, especially if the driver was drunk or otherwise voluntarily incapable. Some worlds have a death penalty for murder...

AVOIDING PUNISHMENT

Characters who wish to avoid punishment have several options. They can flee and hope to escape, indulge in a bit of fast-talk weaseling or impromptu bribery by the roadside, or take their case to court. The first option is highly risky and will result in a pursuit situation that will make things much worse if it fails. The second depends very much on personal skills and the level of corruption in the local police force.

The DC listed under Attitude can be used for most activities associated with wriggling out of a custodial sentence, whether by bribing the cops, offering the arresting officer a blazingly good excuse, or presenting a galaxy-class defense. The attitude of local society towards traffic crime, along with the local law level, will determine the outcome of the case.

The characters' legal representative has two chances to salvage the situation. Both involve checks against his K/Law skill. The first is vs. a DC equal to the world's Law Level +15. If successful, he finds enough evidence to acquit the characters

(the referee should modify the roll for circumstances, such as several witnesses, a particularly serious crime, or the bizarre situation where the characters are actually innocent!).

If the representative is unable to get the driver off completely, he may make a K/Law roll against the Attitude DC for the world, trying to play the incident down and get a minor sentence. Failing this check imposes the normal penalty. Success halves the penalty and success by 10 or more results in a minimal sentence and a good telling-off from the judge.

Using Classic Traveller: Roll Law Level+ to be acquitted, DM Legal skill. If this fails, roll 2D plus 1D per level of Legal skill. If the total exceeds the DC listed in the table, the characters receive a minimal sentence. If within 5 of the target number, halve the sentence. Otherwise, characters receive full sentence.

Characters who fall foul of local laws may have their driving privileges revoked for that world, and local licenses can be canceled. However, only an Imperial court can cancel a character's Imperial driving license.

USING TRAFFIC LAW IN THE GAME

Travellers make use of vehicles all the time, and a Referee who wants them to have contact with the authorities (or authorities who want to harass them) will find that local traffic laws are an ideal way to impose obstructions or create a do-it-or-go-to-jail situation.

Licenses and certificates are also useful aids to the Referee. Characters who need a particular license to undertake their next job will have to spend money and arrange for training. This can lead to encounters and opportunities that might not otherwise have happened.

For adventure ideas requiring vehicle licenses, see later sections of this book.

APPENDIX II: RACING

People in all kinds of cultures like to race vehicles, from animal-powered chariots to Jump-capable starships. Of all the many forms of transport, few are as exciting to race as ground vehicles. Their response to handling and terrain, the way they slide and bounce... ground vehicles, especially wheeled ones, are the most exciting (and not coincidentally, the most dangerous) of all vehicles to race.

Even on high-tech worlds, ground vehicle racing is a popular spectator sport. Most of the more advanced worlds do not allow combustion engine vehicles due to the fire hazard, or confine them to special events. Fuel-cell vehicles are the normal choice, though long-distance races sometimes feature fusion powered ATVs and similar vehicles.

TYPES OF RACES

There are many variations on the basic concept of a vehicle race, but most fall into one of these basic categories:

Sprint: The contestants race over a short distance, usually in a straight line.

Point-to-Point: Contestants try to reach a destination first. They have free choice of route so long as they pass through required checkpoints.

Circuit Race: Contestants make one or several laps of a course or circuit.

Destruction Race: Contestants are permitted (or required) to try to destroy or disable opponents' vehicles.

Arena Event: Contestants are required to complete a challenge in an arena rather than racing around it.

Endurance Event: A long race where contestants are required to stop for repairs, fueling or other support.

Offroad/Cross-Country: An event where vehicles are not competing on roads or prepared circuits.

Events are often combined. For example a long circuit race might become an endurance event, with contestants coming in for tire changes and other maintenance. Another example is a cross-country ATV race where contestants are permitted to ram one another or otherwise seek to disable their opponents' vehicles.

RACING IN THE GAME

Races can form the backdrop to a scenario, or even be the main event. Indeed, an entire campaign can be built around the adventures of a cross-country ATV racing team or motorcross squad. Such a game can include all kinds of challenges as well as racing, but some means must be found to resolve race events and even whole seasons.

The T20 core rulebook includes rules for vehicles in combat. The rules presented here expand upon those in the rulebook to allow long races to be abstracted and critical events played out.

REWARDS

Most events have some kind of prize (or "purse") for the winner and usually smaller prizes for high-placed losers. Entry and registry fees are usually high for races with a large prize at

the end, and entry fees are non-returnable. If the race is part of a series of events, there is often a large overall prize for the winning team.

However, not all the rewards of racing come from the purses. Characters involved with a winning team will gain fame and popularity (or notoriety) which may lead to interesting possibilities. Offers or sponsorship or employment may also come their way. And of course there is the adrenaline rush of the race itself.

REFEREEING A RACE EVENT

The vehicles involved need to be rated relative to one another. It can be assumed that basic performance is very similar (unless the referee is a fan of old cartoons), and that advantages gained in setup or performance are incremental rather than overpowering.

The event is broken down into four segments: Preparation, Setup, Qualifying and the Race. Each includes many opportunities for adventure and danger.

PREPARATION

During the days or weeks before the event, the team must get to the venue or start point and begin preparing their vehicle. Security may be important at this time, in case rivals try to sabotage the vehicle, intimidate the driver, or otherwise throw a wrench in the works. Characters may also decide to snoop around at what the opposition is up to, or engage in a little sabotage of their own.

For the driver, this is a period of rest and practice, while the mechanics make whatever major adjustments to the vehicle they feel are necessary. Characters with appropriate skills and feats may try to wring a little more performance out of their race vehicle, as per the T20 skill rules.

During this period, the Referee should rate the vehicles and drivers involved in the race. The majority of vehicles will be in the running (about average for the class). There will be some with at best an outside chance, some well below standard and one or two real long-shots that somehow scrape through qualification. In every race there will be a small group of obviously better vehicles and drivers from whom the winners will probably come, and maybe one or two who are way ahead of the field. This classification determines the Performance Index of a given vehicle, which is important in resolving race events.

The simplest way to determine the breakdown of the field is as a percentage of the number of vehicles involved:

Percentage	Rating	Performance Index
2%	Far Superior	+15
10%	Superior	+10
55%	Average	+5
20%	Below Average	0
10%	Outsider	-5
3%	Long-shot	-10

The Referee should generate (and name) a few of the vehicles. Percentage dice can be rolled using the chart above to determine what class a vehicle is in. Alternatively, for specific vehicles including those used by PCs, Performance Index (PI) can be determined in more detail.

SETUP

The last hours before the event are normally filled with frantic activity as the mechanics try to fix last-minute bugs and set the vehicle up just right for this driver on this course. Or weld it back together after a crash in practice...

Having looked over the course, made some practice runs and got the feel of the vehicle, fine-tuning can be undertaken. This is a risky business and always involves some guesswork. The mechanic can choose to play safe and stick with his base setup, or take increasingly serious risks to wring greater performance out of brakes, steering and motive systems.

QUALIFYING

Less formal events have no qualifying period. Contestants simply turn up and present their license – and in some cases even this is not required. However, formally run events usually have a period in which contestants must meet a certain standard (this can be anything from achieving a certain time over the course to bribing the right official, or simply showing that their car can move and steer.)

THE RACE

Once the vehicles are on the course, it comes down to their capabilities and the skill of the driver, plus a certain amount of luck. Anyone can hit a damp patch or snag a tire on something, however good they may be. Dirty tricks perpetrated during the preparation or setup period may also manifest themselves during the race.

DETERMINING PERFORMANCE INDEX IN DETAIL

For characters' vehicles and those of main rivals, the following procedure can be used to create a more detailed and varied setup.

SELECTING A VEHICLE: BASE PI

Assume an Average vehicle with a base PI of 1. This may be higher or lower if a lot of money is spent on the basic vehicle. For every quarter (25%) of base price over or under the standard for that type, PI is increased or decreased by 1, to a maximum of + or - 3.

All vehicles vary slightly from the norm. Roll 1d6 and add this to base PI, then roll 1D8 and subtract from PI. This gives an average of -1 to +1 Base PI.

The character is stuck with this basic vehicle unless she wants to pay out for a new one.

RACE PREPARATION

During the race preparation stage, a DC 15 T/Mechanical roll (CT: roll 10+, DM + Mechanical skill) is required to ensure the vehicle is ready to its basic standard. If this is failed, reduce PI by 1d6. All modifiers for workshops and additional mechanics apply to this roll. There is no bonus unless this roll is critically successful, in which case PI is raised by 1D4.

SETUP

The head mechanic chooses what DC he will roll at. If he makes the check, the vehicle's PI is raised by the amount indicated below. If he fails, the vehicle's PI is reduced by the amount shown on the chart. A fumble indicates that the setup was too fine and causes a problem early in the race. The vehicle will be crippled and have to drop out.

In the case of a fumble, the best option may be to wheel out the spare vehicle, but the mechanic team does have one last chance to salvage things. Make a DC25 T/Mechanic check. Success reduces a penalty by 2/3 (round down).

CT: Roll 10+, DM + Mechanical skill

DC Chosen	Success	Critical Success	Failure
5	+1	+2	-1
10	+1d3	+1d3+1	-1d2
15	+1d4	+1d4+1	-1d3
20	+1d6	+1d6+1	-1d4
25	+1d8	+1d8+2	-1d6
30	+2d6	+2d6+2	-1d8
35	+2d8	+2d8+3	-2d6
40	+2d10	+2d10+4	-2d8

QUALIFYING

Just before the race begins, the driver should find his form and get a feel for the track or course. Everyone has off-days, of course, so there is no guarantee that a star driver will perform to his normal standard, and even a novice can have an exceptionally good day. During qualifying, the driver should make a Drive skill check with all appropriate modifiers for feats, special vehicle focus bonuses etc. Compare the result to the chart below.

Roll	Result
0-5	-1d8
6-10	-1d4
11-15	Normal
16-20	+1d4
21-25	+1d6
26-30	+1d8
31-35	+2d6
36-40	+2d8
40+	+2d10

DETERMINING FINAL PI

The final Performance Index for a given vehicle is the sum of the results of the preceding steps. Most average race teams will come out between 0 and +5 PI.

DIRTY TRICKS AND SPECIAL ADVANTAGES

Teams that wish to sabotage the opposition will have to defeat their security. Tactics include driver or mechanic

intimidation, equipment sabotage, substitution of substandard equipment or theft of information such as tactics or setup details.

Resolution of this kind of thing (and preventing it!) is what roleplaying games are all about! Dirty tricks should be role-played out, with success normally resulting in a penalty of -1d6 to an enemy's PI or a bonus of +1d3 if that is more appropriate, for example if the team knows that their main rival has set up his vehicle for acceleration out of bends rather than straight-line speed. A good driver could exploit this information to prevent the rival from using his advantage while relying on his superior top speed to allow overtaking.

Really dramatic dirty tricks like blowing up the opposition's vehicle or sawing his wheel nuts through will usually result in some form of legal penalty, or maybe a visit from his security people.

RESOLVING THE RACE

Once the PI of the various vehicles is determined, the race can be resolved. The short way is to abstract it as a single die roll based on PI; highest result comes in first, etc. If a more detailed resolution (segment by segment or lap by lap) is required, use the following procedure.

Each lap, group of laps or segment of the race (as appropriate) the driver chooses his tactical option. Once all are chosen (most NPC drivers default to "play it safe"), actions are resolved. Actions are resolved by a Drive skill check (not a PI check) at the DC listed with the action description.

Back Off: The driver eases up, taking care to negotiate hazards. Drive rolls to avoid hazards (like being rammed!) are at +10 (CT: Special DM of +2), but the driver's PI is treated as being 0 for purposes of resolving position.

Play it Safe: The driver tries to maintain his position and outlast the opposition. Drive rolls and PI are normal. The driver will take advantage of situations that occur, but is generally more interested in surviving than fighting for a higher placing.

Stay in The Running: The driver pushes it, trying to stay with the vehicle in front and looking for an opportunity to get ahead. Make a Drive check at DC 15. Success means that PI is raised by 1d6 for this segment of the race. Failure indicates a PI reduction of 1d6.

CT: Roll 10+ to succeed, DM + vehicle skill

Go For It: The driver floors it, aiming for first place. He takes risks that border on reckless at times, and dives through gaps that might or might not actually be there. Make a DC20 Drive check. Success adds +2d6 to PI for this segment. Failure requires an immediate DC15 Drive check. If the second check is successful, the driver loses 3d6 from PI as he tries to recover from his excess of zeal. If he fails, the driver crashes his vehicle and puts himself out of the race - possibly injuring himself severely.

CT: Roll 11+ to make the first check and 10+ for the second, DM + vehicle skill

Desperate Measures: The driver throws concepts like personal survival to the wind and puts the hammer down all the way. He cuts corners, goes through fences, uses other vehicles as cornering aids and generally behaves in a lunatic way that might get him banned from future events. The driver may set a DC anywhere between 15 and 40, and makes a Drive check that this DC. Failure means he has crashed

spectacularly. A successful second DC20 Drive roll means that the vehicle is a write-off but the driver walks away. Otherwise he is critically injured. If the chosen DC is met, the driver may add 1d6 to PI, plus 1d6 for every 5 points of DC over 10, (e.g., DC15=+2d6, DC20=+5d6)

Induce Crash: The driver makes a relatively subtle and elegant attempt to nudge another vehicle off the course. His aim is to cause it to spin out or hit something rather than to damage it. An opposed Drive check is made (with bonuses as appropriate, for example for Backing Off as above). The loser must succeed in an immediate DC20 Drive roll or spin out and in any case suffers a -2d6 PI penalty this segment.

CT: Roll 10+ to maintain control, DM + Vehicle skill

This option can be combined with any of the above measures except Back Off.

Ram to Destroy: A favorite in demolition races, the driver just slams into another vehicle and tries to smash it. An opposed Drive roll is made. If the attacker is successful, he has succeeded in ramming. Normal vehicle damage rules can be used, but for speed it is simpler to use the Race Damage Rules below.

Ram to Destroy can be combined with any option other than Back Off and Induce Crash. Both vehicles involved in a ram must make an immediate DC20 Drive roll or spin out, and in any case suffer a -2d6 PI penalty this segment.

CT: Roll 10+ to maintain control, DM + Vehicle skill

Notes: To ram or induce a crash, you have to be able to reach the target vehicle. The Segment Resolution system (below) indicates which vehicles are nearby. It is normally possible to attack any vehicle in a free arena situation, any vehicle behind you on a course or circuit (though your placing drops if you have to slow down to let them catch up) and a vehicle up to 2 places ahead of you by making a sudden lunge. The vehicles you are eligible to ram are determined by the positions at the beginning of the segment in which you make the attempt.

SPINNING OUT AND CRASHING

A driver who spins out may make a DC25 Drive roll to control his movements somewhat. If the roll is failed, he crashes into something and writes his car off, possibly suffering serious injuries. If it is made, he has partially controlled his skid and comes to rest off the course but reasonably safely, taking 1d6 damage to his vehicle. He suffers a PI penalty for this segment equal to 2d20+10 (CT: 6D+10). However, if the driver can make a second DC25 control roll immediately after the first, the penalty is halved] and the vehicle suffers only 1d3 damage.

In CT, roll 11+ to control the spin, DM Vehicle skill.

RANDOM EVENTS

Each lap or segment of the race, there is a chance that an event will occur. Events on a DC of 18+. Normally, the referee will roll for one event per segment, which happens to any eligible vehicle at random. Events are resolved before the end-of-segment standings are determined.

CT: Throw 10+ (2D) for a random event to occur.

VEHICLE MALFUNCTIONS

A vehicle malfunction strikes a random driver. On a 1-4 on

RANDOM EVENTS

Roll (1d6)	Event
1	Unexpected Hazard: DC 25 Drive check or lose 2d6 from PI this round
2	Severe Unexpected Hazard: DC 25 Drive check or spin out
3	Vehicle Malfunction: See below
4	Driver goes berserk, taking Desperate Measures and trying for the lead. He may decide to ram.
5	Scary Noises: see below.
6	Collision. Both drivers make DC20 drive check or spin out.

SCARY NOISES

Roll (1d6)	Event
1-3	Minor vehicle malfunction as above. The vehicle is obviously in distress but can continue the race with a 2d6 penalty to PI
4	The problem goes away after a few tense moments
5	The problem seems to go away, then the vehicle goes wildly out of control as steering or other critical systems fail. Make a DC 30 Drive check or crash as per the T20 crash rules.
6	As 5, above but the vehicle catches fire as well.

1d6, this is a minor problem like defective tires or power loss. Lose 2d6 from PI from the rest of the race unless repaired as per damage repair, below. On a 5-6, a serious malfunction has occurred, such as a tire blowout or loss of brakes. Make a DC25 Drive check to safely halt the vehicle. The driver is out of the race.

SCARY NOISES

The driver's vehicle begins to emit warning signs, such as judders, noises or smoke. He can halt immediately and escape, or take his chances on the Scary Noises table.

SEGMENT RESOLUTION

Determining vehicle positions at the end of a segment or lap is simple. Total all bonuses and penalties for events and collisions etc. Roll 1d20 (CT: 3D) and add the vehicle's total PI. Record this Segment Position Score for each significant vehicle and a result for "the pack". The highest total is in first place, next is second and so on.

Vehicles within 5 points of one another are in close contention (the "pack" can be considered to be spread over a range of scores 5 each way of the average value).

From this ranking, the Referee can determine the order vehicles are in and their relative positions.

If the race is made up of several segments, positions at the end of one segment obviously influence the next. Divide the Segment Position Score by 3 for each vehicle and add it to next turn's result. Thus a very fast contestant will gradually draw further and further ahead, while several segments of risky driving may be required to catch up if a character loses several positions due to a spin.

RACE DAMAGE SYSTEM

Rather than use the full vehicle damage rules, simple PI reductions can be used to simulate wear on a vehicle. PI damage lasts for the whole race, though it may be possible

to halt for repairs. For simplicity, it is assumed that pitstops and the like average out over all contestants under most circumstances, and minor variations in the skill of pit teams can be assumed to be part of PI.

However, a stop for repairs is a different matter. The pit team can repair 2d6 points of PI, up to a maximum of whatever the vehicle started the race with, but the driver will lose time and therefore position in the race. If the pit team can make a DC20 T/Mechanic check (CT: 10+, DM Mechanical), the driver loses 2d10 (CT: 2D) from his PI this segment. This is 2d20 (CT: 6D) if there is no pit team or technical support squad and the vehicle crew must undertake repairs themselves. These PI penalties are doubled if the T/Mechanic check is failed.

Vehicles can judder and rattle their way around a track until their PI reaches -25. At this point they become an

DAMAGE FROM HAZARDS

Event	Damage
Trivial Hazard (major skid)	1d3
Minor Hazard (Hit kerb)	1d6
Major Hazard (Spinout, Minor collision or hit pedestrian)	2d6
Severe Hazard (Ram, Clip wall or similar)	3d6
Extreme Hazard (Crash into solid object)	5d6
Major Crash	Vehicle Destroyed.
Alterations:	
Back Off	Halve Damage
Go For It	+1d6 Damage
Desperate Measures	+3d6 Damage

immobile wreck. Damage is accrued by collisions, hazards and other problems, which conceivably might include weapons fire in some events.

RACE PRIZES

Prizes vary considerably, depending upon the stakes and how much money is coming in from advertising and sponsorship, etc. Prestigious events, "death races" and high-publicity events command the biggest purses, while some incredibly tough events are raced only for prestige or the fun of it.

As a rule, the following prizes can be expected. One-quarter of the purse amount normally goes to the second-place driver, one-eighth to the driver in third place, and the remainder going to the winner. Note that most teams make their money from other sources such as sponsorship or else treat the races as promotional events for their products, so it is not normally possible to make a living off race purses.

Event	Entry Fee	Purse
Local Race	Cr50	Cr250
Regional Race	Cr250	Cr1500
Major League Event	Cr2500	Cr10,000
Championship Event	Cr50,000	Cr1,000,000
Demolition Race		X2
High-Prestige Event		X5
Illegal "Death Race"		X2 plus demolition bonus, usually.

OTHER FACTORS

If races are conducted over a season, then it is usually best to abstract each one unless the result is particularly close, in which case they should be played out as a series of segments. Critical finals should always be played out this way.

A season will normally consist of 4-12 races, with an entry fee payable for the whole season in addition to or instead of the individual ones. The season purse will typically be 10 times the purse for each individual race.

Vehicles need to be maintained between races. This costs 1/10 of the vehicle's value and must be paid even for spare cars that are not used. If a team wishes to upgrade vehicles or add new components, this can be attempted.

An upgrade can be attempted once between any two races. It costs 2d6 x 10% of the vehicle's new cost. A DC 25 T/Mechanical check must be made (CT: Roll 10+, DM Mechanical skill). If successful, the car gains a permanent +1 to its PI. A critical is worth 1d3+1, and failure just wastes the money. The maximum possible upgrade for any given vehicle is +2d6 (determined at purchase or first upgrade attempt). After that there is nothing left to replace; the vehicle has reached its maximum capability.

A FISTFUL OF HYDROCARBONS SITUATION

Ground-car racing is a popular sport on many worlds. Some have

strict 'equalizing' rules, while others allow competitors a great deal of latitude in how they set up their vehicle with very broad limits.

The Tukera Cup is one such 'open' event, sponsored by the Imperial shipping giant Tukera Lines. Competitors must field a hydrocarbon-powered 'road car' - i.e. something that would be borderline legal on the streets - but are free to use experimental fuels, computer enhanced engine systems and all manner of technological devices to turn their road cars into something only a little short of rocket ships.

The Tukera Cup is hotly contested this year. A rank outsider has joined the usual rivals for first place, Team Lightning and the Tukera-sponsored Vakrir Racing. The Gateway Loyalists, driving sky-blue vehicles with incredible panache and daring, have come from nowhere and are making great gains up the leader board.

The Loyalists represent the Loyal Sector Guard, and their clean-cut, handsome young drivers take great pains both to play scrupulously fairly and to take the most awesome risks. Two have already been seriously injured this season in crashes that showed no sign of foul play.

However, it is becoming apparent that someone does not want the Loyalists to win. Petty acts of sabotage have lost them two critical races, and they need to win this next one to stay in contention.

The characters are approached by one of the Loyalists' drivers, a young female Vargr by the name of Dariksha Ulvorz. Dariksha is in a terrific hurry. She quickly tells the characters that her team's stock of super-high-octane fuel has been tampered with. If they'd tried to use it without thorough testing first (the Loyalists are getting paranoid) her car would be a fireball by the time the race was halfway completed.

The entire ready stock of fuel is contaminated with some kind of catalyst that will cause it to combust in the tank once fuel level drops somewhat. The only option is to replace the fuel. There is plenty of standard racing fuel available, but Dariksha knows that her team's formula delivers at least 15% more power than standard. She needs that edge.

There is a batch of fuel available at the team's base, where it was being tested to see if even more horsepower could be wrung out of it. Dariksha thinks the sabotage was an inside job, so she wants the characters to get the fuel for her. All they have to do is get to the team's depot across town, steal the tanker containing the fuel (she dare not tell the depot staff what she plans) and bring it to the circuit in less than 2 hours. Dariksha promises that as soon as they characters call her to say they've got the tanker secure, she'll inform the depot staff of what's going on, so there should not be problems with the local police.

Dariksha isn't empowered to give out team funds, but she tells the characters that if they succeed they're her guests at every race and every team function for the rest of the season - and anything she makes from this race is theirs. There is a Cr25,000 purse for the winning driver.

RESOLUTION

The depot is only a few kilometers away, but traffic is fairly heavy. The depot is just a warehouse, in which the team has set up a mobile lab unit and vehicle maintenance gear. There are a dozen technicians working on the spare car, plus three security people. Obviously, the characters cannot use violence to steal the half-full tanker, so stealth, misdirection and subterfuge are necessary.

Dariksha calls in once the characters inform her they are en route, and the depot personnel will not pursue. However, the characters are going to have to get a half-full tanker of high explosive hydrocarbon race fuel across town in the rush hour, in time to fill up the cars and get onto the track in time for race start. This will require some reckless and unorthodox driving. That will inevitably attract police attention, leading to an attempt to stop the tanker, media vans and flyers filming the chase, etc.

The referee can use the stats for the Fire Truck (Pumper) for the tanker, or design a suitable articulated version if a larger and clumsier vehicle is desired. Reckless driving will attract police and media

attention, and during the chase the characters receive a personal call from the team's manager, a prominent Loyal Sector Guard member, Baron Michael Irikaasu. The baron simply says, "I've heard what you are trying to do, gentles. The LSG will take care of legal fees and property damage. Do what you must to get here, but ON NO ACCOUNT must anyone be hurt. You will halt and give up your attempt rather than injure bystanders or police. No race is that important. Do you understand?"

If the characters try to avoid hurting people, the baron will keep his word. The LSG will cover any amount of property damage and hire such good lawyers that the case doesn't take an hour before being thrown out. If the characters mow down pedestrians, they're on their own.

The referee should play out the rush across town in dramatic style, encouraging the characters to take unorthodox routes to avoid traffic, police roadblocks and of course the inevitable street market. The authorities are unwilling to shoot at a fuel truck, but will otherwise try quite hard to stop it.

Upon arrival, the characters are likely to be arrested though an impressive legal team is already there to meet them. Unless they killed someone, they will be freed quite quickly.

The baron and his drivers hail the characters as heroes, and Dariksha makes good her promise. The characters may become minor celebrities.

And Dariksha does win the race.

OPPOSITION

Local cops, depot security people and sundry bystanders can be created or taken from *76 Gunmen*. Cops will drive ground cars, or perhaps motorcycles, with a couple of performance cars thrown in as the chase continues.

FOR A FEW HYDROCARBONS MORE SITUATION

The season is going well for the Sector Loyalists. Lead driver Dariksha Ulvorz has stormed up the leader board and needs only to finish this final race to win the championship. Even the death of another young Loyalist driver, killed when his car spun out during a reckless overtaking maneuver, has not deterred the Vargr hotshot, and she is being compared to the legendary grav-racer 'Lifters' Loursegh.

The characters are popular with the Loyalists, and have enjoyed VIP seats at every race since they helped Dariksha win her crucial midseason victory. The characters have attended balls and parties with team manger Baron Irikaasu, appeared on media shows to talk about their friends in the team, and have generally developed a good relationship with the team. Whatever anyone may say about the Loyal Sector Guard, the characters' impression is of a likable and earnest group of young people with strong loyalties to the Emperor and the people of Gateway Domain.

It is the day of the final race, and the characters are invited to watch the cars being set up at the Loyalists' test track. The two cars designated for the race are already at the event, but the spare has just been recalibrated. As a special treat, the characters are invited to drive the racecar for a couple of laps, on a 'don't tell anyone' basis. As they are playing with the car, a call comes in. It's Dariksha, looking strained and hurt. Fire crews are dealing with an inferno behind her. IN breathless tones she explains that two armed men just jumped into the team's pit area, sprayed the drivers with SMGs and threw explosives into the fueling area. They were shouting about Sydite liberation, but it was obviously an attempt to sabotage the team and prevent an historic victory.

The second-string driver, Paulus, is dead, as is the baron. The cars are written off and Dariksha is wounded. But, she says, she's not out of the game yet. She plans to win the race - or at least to finish it and win the Tukera Cup. To do that she has to be on the grid in seventeen minutes.

There's only one car, it's at a different track, and she thinks that the assassins will try to take out the spare just in case. There's only one chance - the characters will have to make another cross-town dash. This time they're driving a super-hotrod capable of 350kph, they have a kill-team out to get them, and the clock is ticking...

RESOLUTION

The car is based on a street design; it will be possible to cram a squad of characters in. It must reach the track fast and in a condition to start the race. If the characters can achieve this, Dariksha will be able to take the cup and at least the saboteurs won't have won.

As an extension to this, the referee may decide that Dariksha is too wounded to drive. Rules permit a driver substitution, but there is no one - unless a PC takes the wheel.

Whether Dariksha or a character is driving, there are still problems. The sabotage attempt has been made by an underworld figure that has a lot of money riding on a win by Team Lightning. He has a final card to play. The young daughter of Team Lightning's lead driver, Josef Gaulle, has been kidnapped. She will be killed if he fails to win the Tukera Cup. That means he has to take the Loyalist car out. If it fails to finish, he has enough points to win the cup. Josef will make increasingly blatant attempts to cause the Loyalist car to crash, and will eventually resort to ramming it on a corner.

While this is going on, the characters (who are probably using Loyalist pit area equipment and thus easy to get hold of) get a call from a Team Lightning pit crewmember, who explains the situation and whispers that there are 4 gunmen in the pit. One is watching the girl; three are discreetly covering the pit crew. They've been told they'll be killed if Josef does not win.

The characters and whatever is left of the LSG pit crew must stage a rescue. The LSG gear includes a few handguns and 'ceremonial' swords, and the Lightning pit crew has nothing to lose by fighting their captors.

If Josef can be signaled that the threat is removed, he will place his car behind the Loyalist racer and blatantly prevent any attempt to pass or even get close to it, deliberately giving the victory to his rival as a gesture of thanks. If the Loyalist car is off the track, he pulls off the track and gets out of his car, allowing Dariksha to win the competition on points, whoever crosses the line first.

If the characters can save the Lightning pit crew AND win the cup, they'll become legends in the ground-car racing community.

OPPOSITION

Josef's car is equivalent to Dariksha's. Nobody else comes even close in performance. Vakrir are having a bad season, and are out of contention for the cup, though their cars are finally performing well enough to challenge for the race victory.

The gunmen are armed with SMGs and daggers. They are typical thugs. The team sent to the test track have access to sports cars, which might give them a chance to stay with the race car in urban streets, but the characters will have a huge advantage in acceleration and top speed if they can use it.

APPENDIX III: VEHICLE DATA

MOTORIZED STEAM CARRIAGE

Class: Ground Vehicle	EP Output: 2 (0.125 excess)	
Cost: Cr1,175	Agility: 0	
Tech Level: 4	Initiative: 0	
Size: Large (750vl)	AC: 9 (-1 size)	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 32	
Climate Control? No	Visual:	
Drive Train: Wheeled (4)		
Crew: 1		
Passengers: 1	Sensors:	
Cargo Space: 124vl		
Fuel: 3.5vl		
Range: 7 hours	Comm:	
Speeds:		
Acceleration = 2kph		
Off Road = 7kph	Very Slow = 2kph	Slow = 6kph
Cruising = 12kph	Fast = 18kph	Maximum = 25kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

STEAM POWERED TRACTOR

Class: Ground Vehicle	EP Output: 4.75 (1 excess)	
Cost: Cr2,195	Agility: 0	
Tech Level: 4	Initiative: +0	
Size: Large (1,500vl)	AC: 9 (-1 size)	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 28	
Climate Control? No	Visual:	
Drive Train: Wheeled		
Crew: 1		
Passengers: 0	Sensors:	
Cargo Space: 23vl		
Fuel: 9.5vl		
Range: 8 hours	Comm:	
Speeds:		
Acceleration = 2kph		
Off Road = 17kph	Very Slow = 2kph	Slow = 6kph
Cruising = 12kph	Fast = 18kph	Maximum = 25kph
Other Equipment: Towing capacity 1000vl		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SCOOTER

Class: Ground Vehicle	EP Output: - (battery)	
Cost: Cr889	Agility: 0	
Tech Level: 9	Initiative: +0	
Size: Medium (150vl)	AC: 10	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 18	
Climate Control? No	Visual:	
Drive Train: Wheeled (2)		
Crew: 1		
Passengers: 0	Sensors:	
Cargo Space: 32.35vl		
Fuel: Battery		
Range: 1 hour	Comm:	
Speeds:		
Acceleration = 3kph		
Off Road = 3kph	Very Slow = 3kph	Slow = 7kph
Cruising = 15kph	Fast = 22kph	Maximum = 30kph
Other Equipment:		

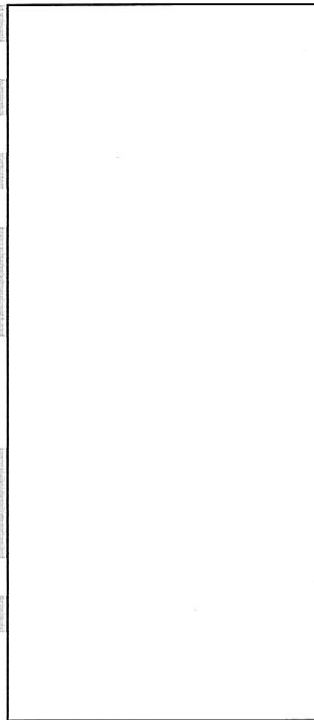


TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

MOTORCYCLE

Class: Ground Vehicle	EP Output: 5.265 (2 excess)	
Cost: Cr807	Agility: 2	
Tech Level: 8	Initiative: +2 (+2 Agility)	
Size: Medium (215vl)	AC: 12	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 25	
Climate Control? No	Visual:	
Drive Train: Wheeled (2)		
Crew: 1		
Passengers: 1	Sensors:	
Cargo Space: 17.2vl		
Fuel: 336vl		
Range: 1 week	Comm: 2-way Radio (500km)	
Speeds:		
Acceleration = 15kph		
Off Road = 15kph	Very Slow = 15kph	Slow = 37kph
Cruising = 75kph	Fast = 112kph	Maximum = 150kph
Other Equipment:		



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

PERFORMANCE MOTORCYCLE

Class: Ground Vehicle	EP Output: 9.35 (2 excess)
Cost: Cr937	Agility: 2
Tech Level: 7	Initiative: +2 (+2 Agility)
Size: Medium (245vl)	AC: 12
Streamlining: Standard	AR: 0
Pressurized? No	SI: 24
Climate Control? No	Visual:
Drive Train: Wheeled (2)	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 0vl	
Fuel: 7.4vl	
Range: 235km	Comm:
Speeds:	
Acceleration = 30kph	
Off Road = 30kph Very Slow = 30kph Slow = 75kph	
Cruising = 150kph Fast = 225kph Maximum = 300kph	
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

PERSONAL ATV - WHEELED

Class: Ground Vehicle	EP Output: 2.7
Cost: Cr1,642	Agility: 0
Tech Level: 9	Initiative: +0
Size: Large (400vl)	AC: 9 (-1 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 24
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 137.4vl	
Fuel: 10vl	
Range: 735km	Comm:
Speeds:	
Acceleration = 6kph	
Off Road = 16kph Very Slow = 6kph Slow = 15kph	
Cruising = 30kph Fast = 45kph Maximum = 60kph	
Other Equipment: Winch (ST30)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SNOWMOBILE

Class: Ground Vehicle	EP Output: 3
Cost: Cr720	Agility: 0
Tech Level: 7	Initiative: +0
Size: Large (300vl)	AC: 9 (-1 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 25
Climate Control? No	Visual:
Drive Train: Halftrack	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 36vl	
Fuel: 9vl	
Range: 270km	Comm:
Speeds:	
Acceleration = 6kph	
Off Road = 20kph	Very Slow = 6kph Slow = 15kph
Cruising = 30kph	Fast = 45kph Maximum = 60kph
Other Equipment:	

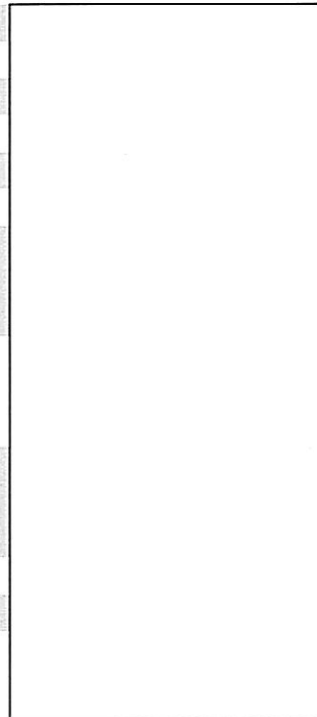


TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

JEEP

Class: Ground Vehicle	EP Output: 20 (8 excess)
Cost: Cr2,720	Agility: 2
Tech Level: 5	Initiative: +2 (+2 Agility)
Size: Large (1,000vl)	AC: 11 (-1 size, +2 Agility)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 35
Climate Control? No	Visual:
Drive Train: Wheeled (4)	
Crew: 1	
Passengers: 3	Sensors:
Cargo Space: 156vl	
Fuel: 100vl	
Range: 600km	Comm:
Speeds:	
Acceleration = 12kph	
Off Road = 17kph	Very Slow = 12kph Slow = 30kph
Cruising = 60kph	Fast = 90kph Maximum = 120kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

GROUND CAR

Class: Ground Vehicle	EP Output: 30	
Cost: Cr5,120	Agility: 0	
Tech Level: 5	Initiative: +0	
Size: Huge (2,000vl)	AC: 8 (-2 size)	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 50	
Climate Control? No	Visual:	
Drive Train: Wheeled (4)		
Crew: 1		
Passengers: 5	Sensors:	
Cargo Space: 140vl		
Fuel: 150vl		
Range: 750km	Comm:	
Speeds:		
Acceleration = 15kph		
Off Road = 20kph	Very Slow = 15kph	Slow = 37kph
Cruising = 75kph	Fast = 112kph	Maximum = 150kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SPORTS CAR

Class: Ground Vehicle	EP Output: 112 (24 excess)	
Cost: Cr20,040	Agility: 4	
Tech Level: 8	Initiative: +4 (+4 Agility)	
Size: Huge (2,000vl)	AC: 12	
Streamlining: Streamlined	AR: 0	
Pressurized? No	SI: 50	
Climate Control? No	Visual:	
Drive Train: Wheeled (4)		
Crew: 1		
Passengers: 1	Sensors:	
Cargo Space: 7vl		
Fuel: 112vl		
Range: 1000km	Comm: 2-way radio (500km)	
Speeds:		
Acceleration = 48kph		
Off Road = n/a	Very Slow = 48kph	Slow = 121kph
Cruising = 242kph	Fast = 363kph	Maximum = 484kph
Other Equipment: Improved suspension		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LIMOUSINE

Class: Ground Vehicle	EP Output: 100
Cost: Cr15,880	Agility: 0
Tech Level: 7	Initiative: +0
Size: Huge (5,000vl)	AC: 9
Streamlining: Standard	AR: 0
Pressurized? No	SI: 50
Climate Control? No	Visual:
Drive Train: Wheeled (4)	
Crew: 1	
Passengers: 4 (8)	Sensors:
Cargo Space: 199vl	
Fuel: 250vl	
Range: 375km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 15kph	
Off Road = 15kph	Very Slow = 15kph Slow = 37kph
Cruising = 75kph	Fast = 112kph Maximum = 150kph
Other Equipment: Galley	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

PICKUP TRUCK

Class: Ground Vehicle	EP Output: 45
Cost: Cr7,280	Agility: 0
Tech Level: 5	Initiative: +0
Size: Huge (3,000vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? No	SI: 51
Climate Control? No	Visual:
Drive Train: Wheeled (4)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 1,300vl	
Fuel: 225vl	
Range: 750 km	Comm:
Speeds:	
Acceleration = 15kph	
Off Road = 20kph	Very Slow = 15kph Slow = 37kph
Cruising = 75kph	Fast = 112kph Maximum = 150kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

VAN

Class: Ground Vehicle	EP Output: 45
Cost: Cr7,760	Agility: 0
Tech Level: 7	Initiative: 0
Size: Huge (3,000vl)	AC: 8 (-2 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 51
Climate Control? No	Visual:
Drive Train: Wheeled (4)	
Crew: 1	
Passengers: 7	Sensors:
Cargo Space: 100vl	
Fuel: 225vl	
Range: 750km	Comm:
Speeds:	
Acceleration = 15kph	
Off Road = 20kph Very Slow = 15kph Slow = 37kph	
Cruising = 75kph Fast = 112kph Maximum = 150kph	

Other Equipment:

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

TOW TRUCK

Class: Ground Vehicle	EP Output: 84
Cost: Cr19,336	Agility: 0
Tech Level: 4	Initiative: +0
Size: Large (1,500vl)	AC: 8 (-2 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 53
Climate Control? No	Visual:
Drive Train: Wheeled	
Crew: 1	
Passengers: 2	Sensors:
Cargo Space: 34.1vl	
Fuel: 420vl	
Range: 600km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 2kph	
Off Road = 17kph Very Slow = 12kph Slow = 30kph	
Cruising = 60kph Fast = 90kph Maximum = 120kph	

Other Equipment: Tow Hook (5000vl), Winch (ST47), towing capacity: 3200vl

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

AMBULANCE

Class: Ground Vehicle	EP Output: 84 (24 excess)
Cost: Cr107,650	Agility: 2
Tech Level: 9	Initiative: +2 (+2 Agility)
Size: Huge (3,000vl)	AC: 10 (-2 size, +2 Agility)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 51
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 125vl	
Fuel: 126	
Range: 1000km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 20kph	
Off Road = 25kph	Very Slow = 20kph Slow = 50kph
Cruising = 100kph	Fast = 150kph Maximum = 200kph
Other Equipment: Sick Bay	

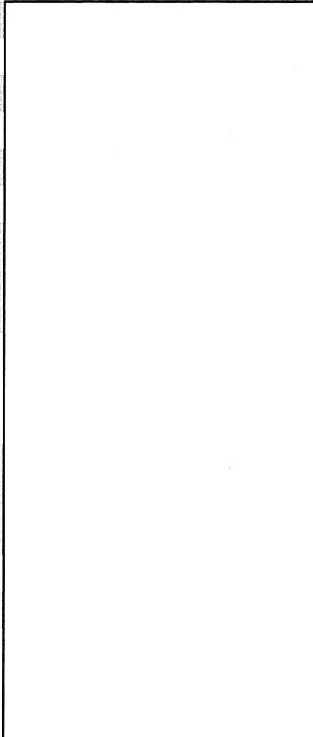


TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

FIRE TRUCK - PUMPER

Class: Ground Vehicle	EP Output: 392 (112 excess)
Cost: Cr67,136	Agility: 2
Tech Level: 12	Initiative: +2 (+2 Agility)
Size: Huge (14,000vl)	AC: 10 (-2 size, +2 Agility)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 73
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 6	Sensors:
Cargo Space: 441.6vl	
Fuel: 196vl	
Range: 1000km	Comm: 2-way Radio (500km)
Speeds:	
Acceleration = 20kph	
Off Road = 25kph	Very Slow = 20kph Slow = 50kph
Cruising = 100kph	Fast = 150kph Maximum = 200kph
Other Equipment: Winch (ST47), High Pressure Pump (6), Water Tank (6000vl), Hose Storage (500vl)	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

FIRE TRUCK - LADDER

Class: Ground Vehicle	EP Output: 112 (32 excess)
Cost: Cr21,776	Agility: 2
Tech Level: 12	Initiative: +2 (+2 Agility)
Size: Huge (4000vl)	AC: 10 (-2 size, +2 Agility)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 73
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 6	Sensors:
Cargo Space: 0vl	
Fuel: 7.4vl	
Range: 235km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 20kph	
Off Road = 25kph Very Slow = 20kph Slow = 50kph	
Cruising = 100kph Fast = 150kph Maximum = 200kph	
Other Equipment: Winch (ST47), 20m Power Ladder, Hose Storage (500vl)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LIGHT CARGO TRUCK

Class: Ground Vehicle	EP Output: 60
Cost: Cr12,080	Agility: 0
Tech Level: 5	Initiative: +0
Size: Huge (5,000vl)	AC: 8 (-2 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 55
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 2,500vl	
Fuel: 220vl	
Range: 440km	Comm:
Speeds:	
Acceleration = 12kph	
Off Road = 22kph Very Slow = 12kph Slow = 30kph	
Cruising = 60kph Fast = 90kph Maximum = 120kph	
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARMORED CAR

Class: Ground Vehicle	EP Output: 60
Cost: Cr20.240	Agility: 0
Tech Level: 5	Initiative: +0
Size: Huge (5,000vl)	AC: 11 (-2 size, +3 AR)
Streamlining: Standard	AR: 3
Pressurized? No	SI: 55
Climate Control? No	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 1,620vl	
Fuel: 300vl	
Range: 600km	Comm:
Speeds:	
Acceleration = 12kph	
Off Road = 22kph	Very Slow = 12kph Slow = 30kph
Cruising = 60kph	Fast = 90kph Maximum = 120kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CARGO TRUCK, HEAVY

Class: Ground Vehicle	EP Output: 885 (0.9 excess)
Cost: Cr604.770	Agility: 0
Tech Level: 13	Initiative: +0
Size: Gargantuan (49,000vl)	AC: 6 (-4 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 83
Climate Control? Yes	Visual:
Drive Train: Wheeled (6)	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 119vl	
Fuel: 1,810vl	
Range: 3,600km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 12kph	
Off Road = 37kph	Very Slow = 17kph Slow = 44kph
Cruising = 88kph	Fast = 131kph Maximum = 175kph
Other Equipment: Passenger Bunk (1), Galley, Fresher, Auto-pilot (1), 22,400vl towing capacity	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

PUBLIC BUS

Class: Ground Vehicle	EP Output: 56.25	
Cost: Cr551,315	Agility: 0	
Tech Level: 14	Initiative: +0	
Size: Huge (7,500vl)	AC: 8 (-2 size)	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 60	
Climate Control? No	Visual:	
Drive Train: Wheeled (4)		
Crew: 1		
Passengers: 50	Sensors:	
Cargo Space: 150vl		
Fuel: Advanced Batteries		
Range: 150km	Comm:	
Speeds:		
Acceleration = 7kph		
Off Road = 12kph	Very Slow = 7kph	Slow = 19kph
Cruising = 37kph	Fast = 56kph	Maximum = 75kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

WHEELED ALL TERRAIN VEHICLE

Class: Ground Vehicle	EP Output: 250 (4.92 excess)	
Cost: Cr57,960	Agility: 0	
Tech Level: 12	Initiative: +0	
Size: Huge (10,000vl)	AC: 8	
Streamlining: Standard	AR: 0	
Pressurized? Yes	SI: 65	
Climate Control? No	Visual:	
Drive Train: Wheeled (8)		
Crew: 1		
Passengers: 8 (16)	Sensors:	
Cargo Space: 843vl		
Fuel: 450vl		
Range: 2160km	Comm: 2-way radio (500km)	
Speeds:		
Acceleration = 12kph		
Off Road = 27kph	Very Slow = 12kph	Slow = 30kph
Cruising = 60kph	Fast = 90kph	Maximum = 120kph
Other Equipment: Galley (4), Fresher/Shower, Passenger Bunks (8)		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

TRACKED ALL TERRAIN VEHICLE

Class: Ground Vehicle	EP Output: 310 (118 excess)
Cost: Cr54,960	Agility: 0
Tech Level: 12	Initiative: +0
Size: Huge (10,000vl)	AC: 8 (-2 size)
Streamlining: Standard	AR: 0
Pressurized? Yes	SI: 65
Climate Control? No	Visual:
Drive Train: Tracked (2)	
Crew: 1	
Passengers: 8 (16)	Sensors:
Cargo Space: 843vl	
Fuel: 558vl	
Range: 1620km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 9kph	
Off Road = 27kph	Very Slow = 9kph Slow = 22kph
Cruising = 45kph	Fast = 67kph Maximum = 90kph
Other Equipment: Galley (4), Fresher/Shower, Passenger Bunks (8)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

RECREATIONAL VEHICLE

Class: Ground Vehicle	EP Output: 91
Cost: Cr22,040	Agility: 0
Tech Level: 5	Initiative: +0
Size: Huge (7,000vl)	AC: 8 (-2 size)
Streamlining: Standard	AR: 0
Pressurized? No	SI: 65
Climate Control? Yes	Visual:
Drive Train: Wheeled (4)	
Crew: 1	
Passengers: 4 (8)	Sensors:
Cargo Space: 860vl	
Fuel: 455vl	
Range: 600 km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 15kph	
Off Road = 20kph	Very Slow = 15kph Slow = 37kph
Cruising = 75kph	Fast = 112kph Maximum = 150kph
Other Equipment: Galley (2), Fresher/Shower, Passenger Bunks (4)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

GRAV BELT

Class: Grav Vehicle	EP Output: 1 (0.76 excess)
Cost: Cr9,192	Agility: 0
Tech Level: 12	Initiative: 0
Size: Medium (100vl)	AC: 10
Streamlining: Standard	AR: 0
Pressurized? No	SI: 4
Climate Control? No	Visual:
Drive Train: Grav	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 33.94vl	
Fuel: 33.6vl	
Range: 28 days	Comm:
Speeds:	
Acceleration = 12 kph	
Off Road = n/a Very Slow = 12kph Slow = 30kph	
Cruising = 60kph Fast = 90kph Maximum = 120kph	
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

GRAV BIKE

Class: Grav Vehicle	EP Output: 5.05
Cost: Cr38,188	Agility: 2
Tech Level: 12	Initiative: +2
Size: Medium (130vl)	AC: 12
Streamlining: Standard	AR: 0
Pressurized? No	SI: 16
Climate Control? No	Visual: Headlight (6m beam)
Drive Train: Grav	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 21.645vl	
Fuel: 42.42vl	
Range: 1 week	Comm: 2-way radio (50km)
Speeds:	
Acceleration = 30kph	
Off Road = n/a Very Slow = 30kph Slow = 75kph	
Cruising = 150kph Fast = 225kph Maximum = 300kph	
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

HIVER FLOATER

Class: Grav Vehicle	EP Output: 2 (0.075 excess)
Cost: Cr50,368	Agility: 0
Tech Level: 15	Initiative: +0
Size: Large (1,500vl)	AC: 9
Streamlining: Standard	AR: 0
Pressurized? No	SI: 42
Climate Control? No	Visual:
Drive Train: Grav	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 1,145vl	
Fuel: 36vl	
Range: 1 year	Comm: 2-way radio (50km)
Speeds:	
Acceleration = 7kph	
Off Road = n/a	Very Slow = 7kph Slow = 19kph
Cruising = 37kph	Fast = 56kph Maximum = 75kph
Other Equipment: Navigation computer (Parallel, 200 cpu, pilot +3, Navigation +3)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

AIR/RAFT

Class: Grav Vehicle	EP Output: 10 (2.8 excess)
Cost: Cr265,920	Agility: 0
Tech Level: 8	Initiative: +0
Size: Huge (8,000vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? No	SI: 57
Climate Control? No	Visual:
Drive Train: Grav	
Crew: 1	
Passengers: 3	Sensors:
Cargo Space: 4118vl	
Fuel: 336vl	
Range: 1 week	Comm: 2-way Radio (500km)
Speeds:	
Acceleration = 12kph	
Off Road = n/a	Very Slow = 12kph Slow = 30kph
Cruising = 60kph	Fast = 90kph Maximum = 120kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

GCARRIER

Class: Grav Vehicle	EP Output: 42	Turret: Pulse laser, ROF 5 Attack +0, Damage 2d10, range 3.7km
Cost: Cr576,432	Agility: 0	
Tech Level: 9	Initiative: +0	
Size: Huge (10,000vl)	AC: 14	
Streamlining: Standard	AR: 6	
Pressurized? Yes	SI: 65	
Climate Control? Yes	Visual: Visual + LI (4km), 2 headlights (12m beam), 2 taillights (1.5m area)	
Drive Train: Grav		
Crew: 2		
Passengers: 12	Sensors:	
Cargo Space: 557vl		
Fuel: 1764vl		
Range: 1 week	Comm: 2-way radio (500km)	
Speeds:		
Acceleration = 12kph		
Off Road = n/a Very Slow = 12kph Slow = 30kph		
Cruising = 60kph Fast = 90kph Maximum = 120kph		
Other Equipment: Fire control computer		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SPEEDER

Class: Grav Vehicle	EP Output: 34
Cost: Cr629,728	Agility: 2
Tech Level: 10	Initiative: +2
Size: Huge (2,000vl)	AC: 10
Streamlining: Airframe	AR: 0
Pressurized? No	SI: 50
Climate Control? Yes	Visual: Visual + LI (1km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 1004vl	
Fuel: 123.6vl	
Range: 15,600km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 83kph	
Off Road = n/a Very Slow = 100kph Slow = 250kph	
Cruising = 500kph Fast = 750kph Maximum = 1000kph	
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SUB-ORBITAL TRANSPORT

Class: Grav Vehicle	EP Output: 310
Cost: MCr8.45	Agility: 1
Tech Level: 13	Initiative: +1
Size: Gargantuan (20,000vl)	AC: 12
Streamlining: Airframe	AR: 5
Pressurized? Yes	SI: 76
Climate Control? Yes	Visual:
Drive Train: Grav	
Crew: 2	
Passengers: 10	Sensors: Radar (500km)
Cargo Space: 1312vl	
Fuel: 930vl	
Range: 2 months	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 120kph	
Off Road = n/a	Very Slow = 120kph Slow = 300kph
Cruising = 600kph	Fast = 900kph Maximum = 1200kph
Other Equipment: Fresher, Autopilot/3	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CARGO HAULER, LIGHT

Class: Grav Vehicle	EP Output: 19
Cost: Cr657,072	Agility: 0
Tech Level: 9	Initiative: +0
Size: Huge (7,000vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? No	SI: 59
Climate Control? Yes	Visual: 2 headlights (12m beam, 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 5,000vl	
Fuel: 218vl	
Range: 5,750km	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 25kph	
Off Road = n/a	Very Slow = 25kph Slow = 62kph
Cruising = 125kph	Fast = 187kph Maximum = 250kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

CARGO HAULER, HEAVY

Class: Grav Vehicle	EP Output: 194
Cost: MCr7.2	Agility: 0
Tech Level: 9	Initiative: +0
Size: Gargantuan (31,500vl)	AC: 6
Streamlining: Partial	AR: 0
Pressurized? No	SI: 79
Climate Control? Yes	Visual: Video+LI (1km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 2	Sensors:
Cargo Space: 22,400vl	
Fuel: 291vl	
Range: 1 month	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a	Very Slow = 60kph Slow = 150kph
Cruising = 300kph	Fast = 450kph Maximum = 600kph
Other Equipment: Autopilot/0	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

AMBULANCE

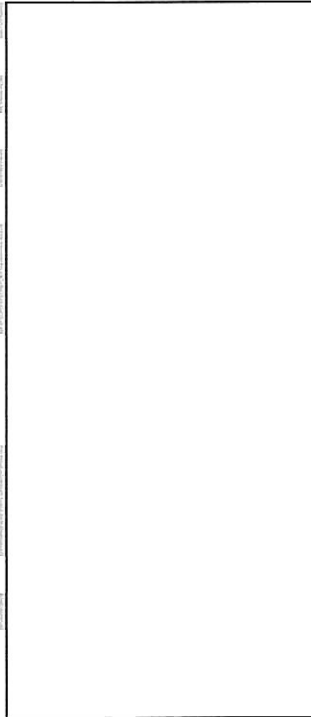
Class: Grav Vehicle	EP Output: 90
Cost: MCr1.13	Agility: 3
Tech Level: 9	Initiative: +3
Size: Huge (5,000vl)	AC: 11
Streamlining: Partial	AR: 0
Pressurized? No	SI: 55
Climate Control? Yes	Visual: Visual+LI (1km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 3	Sensors:
Cargo Space: 156	
Fuel: 1296vl	
Range: 4 days	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 50kph	
Off Road = n/a	Very Slow = 50kph Slow = 125kph
Cruising = 250kph	Fast = 375kph Maximum = 500kph
Other Equipment: Autopilot/0, Medical computer/1, 2 sickbays	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

GRAV ATV

Class: Grav Vehicle	EP Output: 95
Cost: MCr1.61	Agility: 1
Tech Level: 14	Initiative: +1
Size: Huge (10,000vl)	AC: 11
Streamlining: Partial	AR: 2
Pressurized? Yes	SI: 65
Climate Control? Yes	Visual: Video+LI (1km), 2 Headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 7	Sensors:
Cargo Space: 1764.4vl	
Fuel: 427.5vl	
Range: 3 months	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 40kph	
Off Road = n/a	Very Slow = 40kph Slow = 100kph
Cruising = 200kph	Fast = 300kph Maximum = 400kph
Other Equipment: Autopilot/0, galley, fresher/shower, laboratory	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

GRAV BUS

Class: Grav Vehicle	EP Output: 44
Cost: MCr1.14	Agility: 0
Tech Level: 10	Initiative: +0
Size: Huge (10,000vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? Yes	SI: 65
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 20/24	Sensors:
Cargo Space: 421vl	
Fuel: 370vl	
Range: 1 week	Comm:
Speeds:	
Acceleration = 30kph	
Off Road = n/a	Very Slow = 30kph Slow = 75kph
Cruising = 150kph	Fast = 225kph Maximum = 300kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

CARGO LIFTER

Class: Grav Vehicle	EP Output: 42
Cost: Cr730,000	Agility: 0
Tech Level: 9	Initiative: +0
Size: Huge (7,800vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? Yes	SI: 60
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 116vl	
Fuel: 605vl	
Range: 4 days	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 6kph	
Off Road = n/a	Very Slow = 6kph Slow = 15kph
Cruising = 30kph	Fast = 45kph Maximum = 60kph
Other Equipment: 2 lift arms (Str:64, 56 tons capacity)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LIGHT TANK

Class: Grav Vehicle	EP Output: 136	Heavy Turret: Pulse Laser 32MW, ROF 1, Damage 6d10, Range 42km. Body: Light Machine Gun, 200 rounds, ROF 20, Damage 1d12-5, Range 60m
Cost: MCr1.34	Agility: 3	
Tech Level: 10	Initiative: +3	
Size: Huge (7,200vl)	AC: 21	
Streamlining: Partial	AR: 10	
Pressurized? Yes	SI: 54	
Climate Control? Yes	Visual: Visual+LI+IR (4km), 2 headlights (12m beam), 2 taillights (1.5m area)	
Drive Train: Grav		
Crew: 4		
Passengers: 0	Sensors:	
Cargo Space: 8vl		
Fuel: 212vl		
Range: 2100km	Comm: 2-way radio (5,000km)	
Speeds:		
Acceleration = 40kph		
Off Road = n/a	Very Slow = 40kph Slow = 100kph	
Cruising = 200kph	Fast = 300kph Maximum = 400kph	
Other Equipment: Fire Control Computer		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

MEDIUM TANK

Class: Grav Vehicle	EP Output: 410
Cost: MCr4.43	Agility: 3
Tech Level: 10	Initiative: +3
Size: Gargantuan (21,500vl)	AC: 19
Streamlining: Partial	AR: 10
Pressurized? Yes	SI: 76
Climate Control? Yes	Visual: Visual+IR+LI (4km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 4	
Passengers: 0	Sensors:
Cargo Space: 10v	
Fuel: 1516vl	
Range: 7075km	Comm: 2-way radio (5000km)
Speeds:	
Acceleration = 50kph	
Off Road = n/a Very Slow = 50kph Slow = 125kph	
Cruising = 250kph Fast = 375kph Maximum = 500kph	
Other Equipment: Fire control computer	

Heavy Turret: 65mm Mass driver cannon, 160 rounds, ROF 4, damage 5d12, range 1.1km

Body: Light machine gun, 200 rounds, ROF 20, damage 1d12-5, range 60m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

HEAVY TANK

Class: Grav Vehicle	EP Output: 510
Cost: MCr6.19	Agility: 3
Tech Level: 12	Initiative: +3
Size: Gargantuan (24,000vl)	AC: 21
Streamlining: Partial	AR: 12
Pressurized? Yes	SI: 77
Climate Control? Yes	Visual: Visual+LI+IR (4km), 2 headlights (12m), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 4	
Passengers: 0	Sensors:
Cargo Space: 11vl	
Fuel: 573.73vl	
Range: 5625km	Comm: 2-way radio (5000km)
Speeds:	
Acceleration = 50kph	
Off Road = n/a Very Slow = 50kph Slow = 125kph	
Cruising = 250kph Fast = 375kph Maximum = 500kph	
Other Equipment: Fire control computer	

Heavy Turret: Fusion-4, ROF 1, damage 4d20, range 1.0km

Body: Light machine gun, 200 rounds, ROF 20, damage 1d12-5, range 60m.

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

MISSILE ARTILLERY SLED

Class: Grav Vehicle	EP Output: 86
Cost: Cr732,674	Agility: 3
Tech Level: 10	Initiative: +3
Size: Huge (4,600vl)	AC: 16
Streamlining: Partial	AR: 5
Pressurized? Yes	SI: 55
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors:
Cargo Space: 18vl	
Fuel: 310vl	
Range: 4800vl	Comm: 2-way radio (5000km)
Speeds:	
Acceleration = 40kph	
Off Road = n/a Very Slow = 40kph Slow = 100kph	
Cruising = 200kph Fast = 300kph Maximum = 400kph	
Other Equipment: Fire control computer, 4 loading arms (Str:7)	

Body: Heavy MRL, ROF 100, damage 6d8, range 2.1km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARTILLERY SLED

Class: Grav Vehicle	EP Output: 122
Cost: MCr2.0	Agility: 1
Tech Level: 12	Initiative: +1
Size: Huge (12,750vl)	AC: 14
Streamlining: Partial	AR: 5
Pressurized? Yes	SI: 70
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors:
Cargo Space: 70vl	
Fuel: 293vl	
Range: 9600km	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration = 40kph	
Off Road = n/a Very Slow = 40kph Slow = 100kph	
Cruising = 200kph Fast = 300kph Maximum = 400kph	
Other Equipment: Fire control computer	

Body: 12cm Autocannon, 80 rounds, ROF 2, damage 8d12, range 1.7km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARMORED PERSONNEL CARRIER (APC)

Class: Grav Vehicle	EP Output: 146	Turret: Beam Laser-12Mw, ROF 1, damage 3d8, range 3.9km
Cost: MCr1.24	Agility: 3	
Tech Level: 12	Initiative: +3	
Size: Huge (8,500vl)	AC: 19	
Streamlining: Partial	AR: 8	
Pressurized? Yes	SI: 62	
Climate Control? Yes	Visual: Visual+LI+IR (4km), 2 headlights (12m beam), 2 taillights (1.5m area)	
Drive Train: Grav		
Crew: 3		
Passengers: 8	Sensors:	
Cargo Space: 7.5vl		
Fuel: 153.3vl		
Range: 4200km	Comm: 2-way radio (5000km)	
Speeds:		
Acceleration = 40kph		
Off Road = n/a Very Slow = 40kph Slow = 100kph		
Cruising = 200kph Fast = 300kph Maximum = 400kph		
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARMORED RECOVERY SLED

Class: Grav Vehicle	EP Output: 460	
Cost: MCr5.45	Agility: 3	
Tech Level: 12	Initiative: +3	
Size: Gargantuan (20,000vl)	AC: 15	
Streamlining: Partial	AR: 5	
Pressurized? Yes	SI: 76	
Climate Control? Yes	Visual: Visual+LI+IR (4km), 2 headlights (12m beam), 2 taillights (1.5m area)	
Drive Train: Grav		
Crew: 6		
Passengers: 0	Sensors:	
Cargo Space: 1512vl		
Fuel: 1104vl		
Range: 9600vl	Comm: 2-way radio (5000km)	
Speeds:		
Acceleration = 40kph		
Off Road = n/a Very Slow = 40kph Slow = 100kph		
Cruising = 200kph Fast = 300kph Maximum = 400kph		
Other Equipment: Winch (Str: 52), 2 lift arms (Str:55, Dex:1), 3 engineering shops		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

ARMORED ENGINEERING SLED

Class: Grav Vehicle	EP Output: 100
Cost: MCr2.73	Agility: 0
Tech Level: 10	Initiative: +0
Size: Huge (8,000vl)	AC: 11
Streamlining: Partial	AR: 3
Pressurized? No	SI: 61
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 2	
Passengers: 0	Sensors:
Cargo Space: 1790vl	
Fuel: 360vl	
Range: 4,800km	Comm: 2-way radio (5000km)
Speeds:	
Acceleration = 40kph	
Off Road = n/a	Very Slow = 40kph Slow = 100kph
Cruising = 200kph	Fast = 300kph Maximum = 400kph
Other Equipment: Winch (Str:52), Front ram plate	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARMORED TRUCK

Class: Grav Vehicle	EP Output: 103
Cost: MCr2.9	Agility: 0
Tech Level: 10	Initiative: +0
Size: Gargantuan (19,000vl)	AC: 9
Streamlining: Partial	AR: 3
Pressurized? Yes	SI: 76
Climate Control? Yes	Visual: 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 1	
Passengers: 2	Sensors:
Cargo Space: 10,070vl	
Fuel: 741.6vl	
Range: 9,600km	Comm: 2-way radio (5000km)
Speeds:	
Acceleration = 40kph	
Off Road = n/a	Very Slow = 40kph Slow = 100kph
Cruising = 200kph	Fast = 300kph Maximum = 400kph
Other Equipment:	

Pintle Mount

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LIGHT MAIN BATTLE TANK

Class: Grav Vehicle	EP Output: 347.5
Cost: MCr6.59	Agility: 4
Tech Level: 14	Initiative: +4
Size: Huge (14,000vl)	AC: 27 (+13 armor, +4 Init, +2 chameleon)
Streamlining: Partial	AR: 13
Pressurized? Yes	SI: 73
Climate Control? Yes	Visual: Holodisplay+IR+LI (4km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: Neutrino (50km)
Cargo Space: 117.75vl	
Fuel: 868.75vl	
Range: 50 day	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: Three holodisplay units, fire control computer, chameleon armor, 5000EP battery.	

Turret: Fusion-6, ROF 1, damage 6d20, range 1.5km

Body: Autocannon, 200 rounds, ROF 10, damage 1d10, range 111m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

HEAVY MAIN BATTLE TANK

Class: Grav Vehicle	EP Output: 541
Cost: MCr10.52	Agility: 4
Tech Level: 14	Initiative: +4
Size: Gargantuan (22,000vl)	AC: 26 (+14 armor, +4 init, +2 chameleon)
Streamlining: Partial	AR: 14
Pressurized? Yes	SI: 76
Climate Control? Yes	Visual: Holodisplay+IR+LI (4km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: Neutrino (50km)
Cargo Space: 101.25vl	
Fuel: 1,221.75vl	
Range: 45 days	Comm: 2-way Radio (5000km), lasercom (5000km)
Speeds:	
Acceleration =60kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: Three holodisplay units, fire control computer, chameleon armor, 8,500EP battery	

Turret: Fusion-8, ROF 1, damage 8d20, range 1.9km

Body: Autocannon, 200 rounds, ROF 10, damage 1d12, range 111m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

FAST ATTACK SLED

Class: Grav Vehicle	EP Output: 930
Cost: MCr31.37	Agility: 6
Tech Level: 14	Initiative: +6
Size: Huge (14,000vl)	AC: 25 (+9 armor, +6 init, +2 chameleon)
Streamlining: Hypersonic	AR: 9
Pressurized? Yes	SI: 73
Climate Control? Yes	Visual: Holodisplay+IR+LI (4km)
Drive Train: Grav	
Crew: 2	
Passengers: 0	Sensors: Neutrino (50km), Radar (5000km), Ladar(500km)
Cargo Space: 94.1vl	
Fuel: 1,395vl	
Range: 50 days	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration = 480kph	
Off Road = n/a Very Slow = 480kph Slow = 1200kph	
Cruising = 2400kph Fast = 3600kph Maximum = 4800kph	
Other Equipment: Holodisplay unit, fire control computer, chameleon armor	

Body: Four pulse laser-9.4Mw, ROF 1, damage 4d10, range 12km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARTILLERY SLED

Class: Grav Vehicle	EP Output: 2603
Cost: MCr28.54	Agility: 4
Tech Level: 14	Initiative: +4
Size: Gargantuan (110,000vl)	AC: 17
Streamlining: Partial	AR: 7
Pressurized? Yes	SI: 98
Climate Control? Yes	Visual: Holodisplay+LI+IR (4km)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: Neutrino (50km), radar (5000km)
Cargo Space: 166.55vl	
Fuel: 6,377.35vl	
Range: 49 days	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: holodisplay unit, fire control computer	

Body: 18cm mass driver cannon, 100 rounds, ROF 10, damage 10d12, range 2.7km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ARMORED PERSONNEL CARRIER

Class: Grav Vehicle	EP Output: 440
Cost: MCr6.7	Agility: 4
Tech Level: 14	Initiative: +4
Size: Gargantuan (18,400vl)	AC: 22
Streamlining: Partial	AR: 10
Pressurized? Yes	SI: 75
Climate Control? Yes	Visual: Holodisplay+LI+IR (4km), 2 headlight (12m beam), 2 taillight (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 10	Sensors:
Cargo Space: 30.4vl	
Fuel: 650vl	
Range: 30 days	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a	Very Slow = 60kph Slow = 150kph
Cruising = 300kph	Fast = 450kph Maximum = 600kph
Other Equipment: Three holodisplay units, Fire control computer, chameleon armor, 8,500 EP battery	

Turret: Fusion-4, ROF 3, damage 4d20, range 1.2km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

POINT DEFENSE SLED

Class: Grav Vehicle	EP Output: 440
Cost: MCr14.3	Agility: 4
Tech Level: 14	Initiative: +4
Size: Gargantuan (18,400vl)	AC: 22
Streamlining: Partial	AR: 10
Pressurized? Yes	SI: 75
Climate Control? Yes	Visual: Holodisplay+IR+LI (4km), 2 headlights (12m beam), 2 taillights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: radar (500km), ladar (500km)
Cargo Space: 30.2vl	
Fuel: 660vl	
Range: 30 days	Comm: 2-way radio (5000km), lasercom (5000km)
Speeds:	
Acceleration =60kph	
Off Road = n/a	Very Slow = 60kph Slow = 150kph
Cruising = 300kph	Fast = 450kph Maximum = 600kph
Other Equipment: Three holodisplay units, Fire control computer, chameleon armor	

Turret: Two 40mm mass driver cannon, 7,500 rounds, ROF 100, damage 2d12, range 500m.

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

ARMORED RECOVERY SLED

Class: Grav Vehicle	EP Output: 1,146
Cost: MCr21.2	Agility: 2
Tech Level: 14	Initiative: +2
Size: Gargantuan (66,000vl)	AC: 16
Streamlining: Partial	AR: 8
Pressurized? Yes	SI: 87
Climate Control? Yes	Visual: Visual sensor + LI + IR (4000 m). 2 headlight (12m beam), 2 tail lights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 3	Sensors:
Cargo Space: 146.6vl	
Fuel: 1,719vl	
Range: 30 days	Comm: 2-way radio (5,000km)
Speeds:	
Acceleration = 60 kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: Winch (ST:52), Three 6m arms, Arm Motors (STR: 58, Dex 0).	
TAS Form 3.1v (Condensed)	

Vehicle Data (Commercial)

HEAVY MAIN BATTLE TANK

Class: Grav Vehicle	EP Output: 716
Cost: MCr13.74	Agility: 4
Tech Level: 15	Initiative: +4
Size: Gargantuan (29,250vl)	AC: 27 (+15 armor, +4 Initiative, +2 chameleon)
Streamlining: Partial	AR: 15
Pressurized? Yes	SI: 78
Climate Control? Yes	Visual: Holodisplay + LI + IR (4km) 2 headlight (12m beam), 2 tail lights (1.5m area)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: Neutrino (50km)
Cargo Space: 20.8vl	
Fuel: 1,074vl	
Range: 30 days	Comm: 2-way radio (5,000km), Lasercom (5,000km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: Three holodisplay units, Fire control computer, chameleon Armor, 44,000 EP battery.	
TAS Form 3.1v (Condensed)	

Turret: Fusion-9, ROF 4, damage 9d20, range 2.2km
Body: VRF Gauss, 2000 rounds, ROF 100, damage 1d12-4, range 1km

Vehicle Data (Commercial)

MESON ARTILLERY SLED

Class: Grav Vehicle	EP Output: 1746EP
Cost: MCr51.8	Agility: 2
Tech Level: 15	Initiative: +2
Size: Gargantuan (113,000vl)	AC: 17
Streamlining: Partial	AR: 7
Pressurized? Yes	SI: 99
Climate Control? Yes	Visual: Holodisplay + LI + IR (4km)
Drive Train: Grav	
Crew: 3	
Passengers: 0	Sensors: Neutrino (50km), Radar (5000km),
Cargo Space: 48.62vl	
Fuel: 2,619vl	
Range: 30 days	Comm: 2-way radio (5,000km), Lasercom (5,000km)
Speeds:	
Acceleration = 60kph	
Off Road = n/a Very Slow = 60kph Slow = 150kph	
Cruising = 300kph Fast = 450kph Maximum = 600kph	
Other Equipment: Three Holodisplay units, targeting computer	

Body: Meson Gun, ROF 1, damage 9d20, range 6km

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

CANOE

Class: Watercraft	EP Output: 0
Cost: Cr220	Agility: 0
Tech Level: 6	Initiative: +0
Size: Medium (150 vl)	AC: 10
Streamlining: Standard	AR: 0
Pressurized? No	SI: 18
Climate Control? No	Visual:
Drive Train: None	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 115vl	
Fuel:	
Range: n/a	Comm:
Speeds:	
Acceleration = 0.6 kph	
Off Road =	Very Slow = 0.6kph Slow = 1.5kph
Cruising = 3koh	Fast = 4.5kph Maximum = 6kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

KAYAK

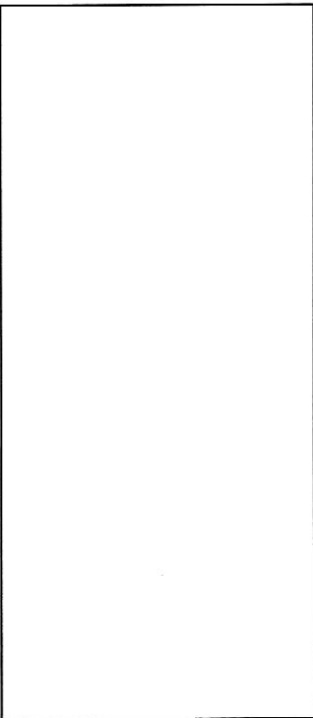
Class: Watercraft	EP Output: 0
Cost: Cr110	Agility: 0
Tech Level: 2	Initiative: +0
Size: Medium (75vl)	AC: 10
Streamlining: Standard	AR: 0
Pressurized? No	SI: 13
Climate Control? No	Visual:
Drive Train: None	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 75vl	
Fuel: 0	
Range:	Comm:
Speeds:	
Acceleration = 0.6kph	
Off Road =	Very Slow = 0.6kph Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph Maximum = 6kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

DINGHY

Class: Watercraft	EP Output: 0
Cost: Cr918	Agility: 0
Tech Level: 7	Initiative: 0
Size: Large (680vl)	AC: 9
Streamlining: Standard	AR: 0
Pressurized? No	SI: 31
Climate Control? No	Visual:
Drive Train: Watercraft	
Crew: 1	
Passengers: 3	Sensors:
Cargo Space: 500vl	
Fuel: 0	
Range:	Comm:
Speeds:	
Acceleration = 0.2kph	
Off Road = n/a	Very Slow = 0.2kph Slow = 0.5kph
Cruising = 1kph	Fast = 1.5kph Maximum = 2kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

INFLATABLE DINGHY

Class: Watercraft	EP Output: 2.2
Cost: Cr1,788	Agility: 0
Tech Level: 7	Initiative: 0
Size: Large (1100vl)	AC: 9
Streamlining: Standard	AR: 0
Pressurized? No	SI: 26
Climate Control? No	Visual:
Drive Train: Watercraft	
Crew: 1	
Passengers: 3	Sensors:
Cargo Space: 768vl	
Fuel: 6vl	
Range: 5.4 hours	Comm:
Speeds:	
Acceleration = 4kph	
Off Road = n/a	Very Slow = 4kph Slow = 10kph
Cruising = 20kph	Fast = 30kph Maximum = 40kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

PERSONAL WATERCRAFT

Class: Watercraft	EP Output: 2.6 (2 excess)
Cost: Cr604	Agility: 2
Tech Level: 6	Initiative: +2
Size: Medium (200vl)	AC: 12
Streamlining: Standard	AR: 0
Pressurized? No	SI: 21
Climate Control? No	Visual:
Drive Train: Surface Water	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 8vl	
Fuel: 4vl	
Range: 3 hours	Comm:
Speeds:	
Acceleration = 6kph	
Off Road = n/a	Very Slow = 6kph Slow = 15kph
Cruising = 30kph	Fast = 45kph Maximum = 60kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SMALL SAILBOAT

Class: Watercraft	EP Output: 0
Cost: Cr1, 282	Agility: 0
Tech Level: 2	Initiative: 0
Size: Large (500vl)	AC: 10
Streamlining: Standard	AR: 0
Pressurized? No	SI: 25
Climate Control? No	Visual:
Drive Train: Sails	
Crew: 1	
Passengers: 1	Sensors:
Cargo Space: 128vl	
Fuel:	
Range:	Comm:
Speeds:	
Acceleration = 0.6kph	
Off Road = n/a	Very Slow = 0.6kph Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph Maximum = 6kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LUXURY SAILBOAT

Class: Watercraft	EP Output: 10.5
Cost: Cr43, 410	Agility: 0
Tech Level: 9	Initiative: 0
Size: Huge (7, 000vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? No	SI: 59
Climate Control? No	Visual:
Drive Train: Sails/Water	
Crew: 2	
Passengers: 4	Sensors:
Cargo Space: 64.55	
Fuel: 37.8	
Range: 24 hours	Comm: 2-way Radio (5000km)
Speeds:	
Acceleration = 0.5/3kph	
Off Road = n/a	Very Slow = 0.5/3 Slow = 1/7kph
Cruising = 2/15kph	Fast = 2/22kph Maximum = 5/30kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LONGBOAT

Class: Watercraft	EP Output: 6.4
Cost: Cr86, 451	Agility: 0
Tech Level: 1	Initiative: +0
Size: Gargantuan (32, 000vl)	AC: 6
Streamlining: Standard	AR: 0
Pressurized? No	SI: 79
Climate Control? No	Visual:
Drive Train: Sails/Watercraft	
Crew: 32	
Passengers: 0	Sensors:
Cargo Space: 10,656	
Fuel: 0	
Range:	Comm:
Speeds:	
Acceleration = 0.7/0.4kph	
Off Road = n/a	Very Slow = 1/0.4 Slow = 2/1kph
Cruising = 3/2kph	Fast = 5/3kph Maximum = 7/4kph
Other Equipment:	



TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

TRIREME

Class: Watercraft	EP Output: 34	
Cost: Cr276, 000	Agility: 0	
Tech Level: 1	Initiative: 0	
Size: Gargantuan (70, 000vl)	AC: 6	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 88	
Climate Control? No	Visual:	
Drive Train: Sails/Oars		
Crew: 200		
Passengers: 0	Sensors:	
Cargo Space: 2910vl		
Fuel:		
Range:	Comm:	
Speeds:		
Acceleration = 0.5kph		
Off Road = n/a	Very Slow = 0.5kph	Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph	Maximum = 6kph
Other Equipment: Front Ram		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

COASTER

Class: Watercraft	EP Output: 0	
Cost: Cr270, 600	Agility: 0	
Tech Level: 2	Initiative: +0	
Size: Colossal (120, 000vl)	AC: 2	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 100	
Climate Control? No	Visual:	
Drive Train: Sails		
Crew: 30		
Passengers: 0	Sensors:	
Cargo Space: 60,650		
Fuel:		
Range:	Comm:	
Speeds:		
Acceleration = 0.4kph		
Off Road = n/a	Very Slow = 0.4kph	Slow = 1kph
Cruising = 2kph	Fast = 3kph	Maximum = 4kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SCHOONER

Class: Watercraft	EP Output: 0
Cost: Cr173, 520	Agility: 0
Tech Level: 3	Initiative: 0
Size: Gargantuan (43, 000vl)	AC: 4
Streamlining: Standard	AR: 0
Pressurized? No	SI: 81
Climate Control? No	Visual:
Drive Train: Sails	
Crew: 620	
Passengers: 0	Sensors:
Cargo Space: 290	
Fuel: 0	
Range:	Comm:
Speeds:	
Acceleration = 0.4kph	
Off Road = n/a	Very Slow = 0.4kph Slow = 1kph
Cruising = 2kph	Fast = 3kph Maximum = 4kph
Other Equipment:	

Fixed Mount (4x Right, 4x Left): Light Artillery, ROF 2: 3, Attack +0, damage 5d12, range 705m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CLIPPER SHIP

Class: Watercraft	EP Output: 86
Cost: MCr8.8	Agility: 0
Tech Level: 9	Initiative: +0
Size: Colossal (840, 000vl)	AC: 2
Streamlining: Standard	AR: 0
Pressurized? No	SI: 190
Climate Control? Yes	Visual: lights (1.5m area x10)
Drive Train: Sails	
Crew: 56	
Passengers: 7	Sensors: Radar (50km)
Cargo Space: 357, 000vl	
Fuel: 3, 069	
Range:	Comm: Radio 2-Way (5000km)
Speeds:	
Acceleration = 1.2kph	
Off Road = n/a	Very Slow = 1.2kph Slow = 3kph
Cruising = 6kph	Fast = 9kph Maximum = 12kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

STEAMBOAT

Class: Watercraft	EP Output: 160
Cost: Cr170, 680	Agility: 0
Tech Level: 4	Initiative: +0
Size: Gargantuan (100, 000vl)	AC: 6
Streamlining: Standard	AR: 0
Pressurized? No	SI: 96
Climate Control? No	Visual: Lights (1.5m area x10)
Drive Train: Watercraft	
Crew: 22	
Passengers: 80	Sensors: Sonar (0.2km)
Cargo Space: 20, 000vl	
Fuel: 9, 600vl	
Range: 10 days	Comm: Radio 2-way (50km)
Speeds:	
Acceleration = 3kph	
Off Road = n/a	Very Slow = 3kph Slow = 8kph
Cruising = 16kph	Fast = 24kph Maximum = 32kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LUXURY POWERBOAT

Class: Watercraft	EP Output: 42
Cost: Cr40, 180	Agility: 0
Tech Level: 8	Initiative: +0
Size: Huge (7, 000vl)	AC: 8
Streamlining: Partial	AR: 0
Pressurized? No	SI: 59
Climate Control? No	Visual: Lights (1.5m area x5)
Drive Train: Watercraft	
Crew: 2	
Passengers: 2	Sensors:
Cargo Space: 778.85	
Fuel: 504	
Range: 24 hours	Comm:
Speeds:	
Acceleration = 12kph	
Off Road = n/a	Very Slow = 12kph Slow = 30kph
Cruising = 60kph	Fast = 90kph Maximum = 120kph
Other Equipment: Fresher/Shower	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

PERFORMANCE POWERBOAT

Class: Watercraft	EP Output: 72.5 (32 excess)	
Cost: Cr58, 020	Agility: 2	
Tech Level: 9	Initiative: +2	
Size: Huge (4, 00vl)	AC: 10	
Streamlining: Partial	AR: 0	
Pressurized? No	SI: 53	
Climate Control? No	Visual: Lights (1.5m area x5)	
Drive Train: Hydrojet		
Crew: 2		
Passengers: 0	Sensors: Sonar (0.2km)	
Cargo Space: 90.85vl		
Fuel: 1305vl		
Range: 7 days	Comm: 2-way Radio (50km)	
Speeds:		
Acceleration = 20kph		
Off Road = n/a	Very Slow = 20kph	Slow = 50kph
Cruising = 100kph	Fast = 150kph	Maximum = 200kph
Other Equipment: Fresher		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

RACING HYDROPLANE

Class: Watercraft	EP Output: 21.122 (8 excess)	
Cost: Cr5, 971	Agility: 4	
Tech Level: 8	Initiative: +4	
Size: Large (486vl)	AC: 13	
Streamlining: Airframe	AR: 0	
Pressurized? No	SI: 28	
Climate Control? No	Visual:	
Drive Train: Watercraft		
Crew: 1		
Passengers: 0	Sensors:	
Cargo Space: 0.2311		
Fuel: 5.28		
Range: 1 hour	Comm:	
Speeds:		
Acceleration = 54kph		
Off Road = n/a	Very Slow = 54kph	Slow = 135kph
Cruising = 270kph	Fast = 405kph	Maximum = 540kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

FISHING BOAT

Class: Watercraft	EP Output: 2310	
Cost: Mcr4.9	Agility: 0	
Tech Level: 14	Initiative: 0	
Size: Enormous (1, 40,000vl)	AC: 2	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 276	
Climate Control? Yes	Visual: Floodlight (10x 6m area), work lights (6x 51m beam)	
Drive Train: Watercraft		
Crew: 50		
Passengers: 0	Sensors: Sonar (50km), Radar (50km)	
Cargo Space: 913, 310vl		
Fuel: 103, 950vl		
Range: 3 months	Comm: 2-Way Radio (500km)	
Speeds:		
Acceleration = 3kph		
Off Road = n/a	Very Slow = 3kph	Slow = 7.5kph
Cruising = 15kph	Fast = 22.5kph	Maximum = 30kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LARGE CARGO SHIP

Class: Watercraft	EP Output: 66,000	
Cost: Mcr82.1	Agility: 0	
Tech Level: 14	Initiative: +0	
Size: Enormous (33Mvl)	AC: 2	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 6,851	
Climate Control? No	Visual: floodlights (6m area x20)	
Drive Train: Watercraft		
Crew: 40		
Passengers: 0	Sensors: Radar (50km x2)	
Cargo Space: 23.28Mvl		
Fuel: 1,188,000vl		
Range: 1 year	Comm: 2 way radio (500km x2)	
Speeds:		
Acceleration = 4kph		
Off Road = n/a	Very Slow = 4kph	Slow = 10kph
Cruising = 20kph	Fast = 30kph	Maximum = 40kph
Other Equipment: Small Cabin (40), Galley (10)		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SHORE PATROL SHIP

Class: Watercraft	EP Output: 8500 (excess)
Cost: MCr5.32	Agility: 1
Tech Level: 12	Initiative: +1
Size: Colossal (600,000vl)	AC: 8
Streamlining: Streamlined	AR: 3
Pressurized? No	SI: 160
Climate Control? Yes	Visual: Floodlights (6m area x10), Spotlights (50m beam x6)
Drive Train: Watercraft	
Crew: 37	
Passengers: 0	Sensors: Sonar (50km), Radar (50km)
Cargo Space: 10,103vl	
Fuel: 153,475vl	
Range: 15 day	Comm: 2-way radio (500km)
Speeds:	
Acceleration = 22kph	
Off Road = n/a	Very Slow = 22kpm Slow = 55kph
Cruising = 110kph	Fast = 165kph Maximum = 220kph
Other Equipment: Vehicle Shop (X4), Sickbay (x4), Galley (x10)	

Heavy Turret: 2x VRF Gauss Gun, Damage 2d12-5, ROF100, Range 111m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ICEBREAKER

Class: Watercraft	EP Output: 20,160
Cost: MCr25.55	Agility: 2
Tech Level: 14	Initiative: +2
Size: Enormous (1.8Mvl)	AC: 7
Streamlining: Standard	AR: 3
Pressurized? No	SI: 351
Climate Control? Yes	Visual: Floodlights (6m area x10), Spotlights (50m beam x6)
Drive Train: Hydrojet	
Crew: 24	
Passengers: 0	Sensors: Sonar (50km), Radar (50km)
Cargo Space: 750,000	
Fuel: 362,000vl	
Range: 1 year	Comm: Radio, 2-way (500km)
Speeds:	
Acceleration = 12kph	
Off Road = n/a	Very Slow = 12kph Slow = 30kph
Cruising = 60kph	Fast = 90kph Maximum = 120kph
Other Equipment: Vehicle Ship (4), Sickbay (2), Galley (6)	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

EARLY SUBMARINE

Class: Submarine	EP Output: 0.4
Cost: Cr1195	Agility: 0
Tech Level: 4	Initiative: +0
Size: Large (760vl)	AC: 9
Streamlining: Standard	AR: 0
Pressurized? No	SI: 32
Climate Control? No	Visual:
Drive Train: Subsurface	
Crew: 3	
Passengers: 0	Sensors:
Cargo Space: 0	
Fuel: 0	
Range:	Comm:
Speeds:	
Acceleration = 0.15kph	
Off Road = n/a	Very Slow = 0.1kph Slow = 0.4kph
Cruising = 0.75kph	Fast = 1.1kph Maximum = 1.5kph
Other Equipment:	

Safe Depth: 60m / 4m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

HAND SUB

Class: Submarine	EP Output: 0.1
Cost: Cr71	Agility: 0
Tech Level: 11	Initiative: +0
Size: Tiny (2.7vl)	AC: 12
Streamlining: Standard	AR: 0
Pressurized? No	SI: 3
Climate Control? No	Visual: Light (6m beam)
Drive Train: Subsurface	
Crew: 1	
Passengers: 0	Sensors:
Cargo Space: 0	
Fuel:	
Range: 8 hours	Comm:
Speeds:	
Acceleration = 0.5kph	
Off Road = n/a	Very Slow = 0.5kph Slow = 1.2kph
Cruising = 2.5kph	Fast = 3.8kph Maximum = 5kph
Other Equipment:	

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SHALLOW WATER EXPLORER

Class: Submarine	EP Output: 6
Cost: Cr8,088	Agility: 0
Tech Level: 9	Initiative: +0
Size: Huge (2100vl)	AC: 8
Streamlining: Standard	AR: 0
Pressurized? Yes	SI: 50
Climate Control? No	Visual: Lights (1.5m area, x5)
Drive Train: Subsurface	
Crew: 1	
Passengers: 6	Sensors: Sonar (0.2km)
Cargo Space: 102	
Fuel:	
Range: 10 hours	Comm: Radio, 2-way (50km)
Speeds:	
Acceleration = 0.8kph	
Off Road = n/a	Very Slow = 0.8kph Slow = 2kph
Cruising = 4kph	Fast = 6kph Maximum = 8kph
Other Equipment:	

Safe Depth 30m / 3m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LUXURY SUBMARINE

Class: Submarine	EP Output: 41
Cost: Cr194,229	Agility: 0
Tech Level: 12	Initiative: +0
Size: Huge (14,400vl)	AC: 10
Streamlining: Reinforced	AR: 2
Pressurized? Yes	SI: 73
Climate Control? No	Visual: Lights (1.5m area x12)
Drive Train: Subsurface	
Crew: 2	
Passengers: 12	Sensors: Sonar (0.2km)
Cargo Space: 354vl	
Fuel: 256	
Range: 625km	Comm: Radio, 2-way (500km)
Speeds:	
Acceleration = 1kph	
Off Road = n/a	Very Slow = 1kph Slow = 2.5kph
Cruising = 5kph	Fast = 7.5kph Maximum = 10kph
Other Equipment: Fresher/Shower, Galley (4)	

Safe Depth: 250m / 16m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE DATA

DEEP WATER EXPLORER

Class: Submarine	EP Output: 62	Safe Depth: 15,000m / 900m
Cost: Cr602,230	Agility: 0	
Tech Level: 14	Initiative: +0	
Size: Huge (8,000 vl)	AC: 22	
Streamlining: Bathyscaphe	AR: 14	
Pressurized? Yes	SI: 61	
Climate Control? No	Visual: Holovideo+IR+LI (x8), Light (6m area x12)	
Drive Train: Subsurface		
Crew: 3		
Passengers: 0	Sensors: Sonar (1km), Densitometer	
Cargo Space: 634.3vl		
Fuel: 279		
Range: 3 months	Comm: Radio, 2-way (5000km)	
Speeds:		

Acceleration = 3kph
Off Road = n/a Very Slow = 3kph Slow = 7.5kph
Cruising = 15kph Fast = 22.5kph Maximum = 30kph
Other Equipment: Arms STR:10, DEX:10 x2, Laboratory, Galley

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CARGO SUBMARINE

Class: Submarine	EP Output: 18,500	Safe Depth: 60m / 4m
Cost: Mcr16.78	Agility: 0	
Tech Level: 13	Initiative: +0	
Size: Enormous (2Mvl)	AC: 10	
Streamlining: Standard	AR: 8	
Pressurized? Yes	SI: 385	
Climate Control? No	Visual:	
Drive Train: Subsurface		
Crew: 33		
Passengers: 0	Sensors: Sonar (50km)	
Cargo Space: 893,640vl		
Fuel: 83,250vl		
Range: 3 months	Comm: Radio, 2-way (500km)	
Speeds:		

Acceleration = 4kph
Off Road = n/a Very Slow = 4kph Slow = 10kph
Cruising = 20kph Fast = 30kph Maximum = 40kph
Other Equipment: Galley (13), Sickbay

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SUPERCAVITATION SUBMARINE

Class: Submarine	EP Output: 256 (48 excess)	Safe Depth: 250m / 15m
Cost: MCr3.31	Agility: 1	
Tech Level: 11	Initiative: +1	
Size: Huge (12,000vl)	AC: 12	
Streamlining: Supercavitation	AR: 3	
Pressurized? Yes	SI: 69	
Climate Control? No	Visual: Vidoe+IR+LR x6	
Drive Train: Underwater Grav		
Crew: 6		
Passengers: 8	Sensors: Sonar (50km), Densitometer	
Cargo Space: 413.2vl		
Fuel: 691.2vl		
Range: 24 hours	Comm: Radio, 2-way (500km)	
Speeds:		
Acceleration = 40kph		
Off Road = n/a	Very Slow = 40kph	Slow = 110kph
Cruising = 220kph	Fast = 330kph	Maximum = 440kph
Other Equipment: Vehicle Shop, Sickbay, Fresher		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LAND SAILER

Class: Ground Vehicle	EP Output: 0	
Cost: Cr188	Agility: 0	
Tech Level: 6	Initiative: +0	
Size: Medium (45 vl)	AC: 10	
Streamlining: Standard	AR: 0	
Pressurized? No	SI: 10	
Climate Control? No	Visual:	
Drive Train: Wheeled/Sails		
Crew: 1		
Passengers: 0	Sensors:	
Cargo Space: 0		
Fuel: 0		
Range: n/a	Comm:	
Speeds:		
Acceleration = 1.2kph		
Off Road = 1.2kph	Very Slow = 1.2kph	Slow = 3kph
Cruising = 6kph	Fast = 9kph	Maximum = 12kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

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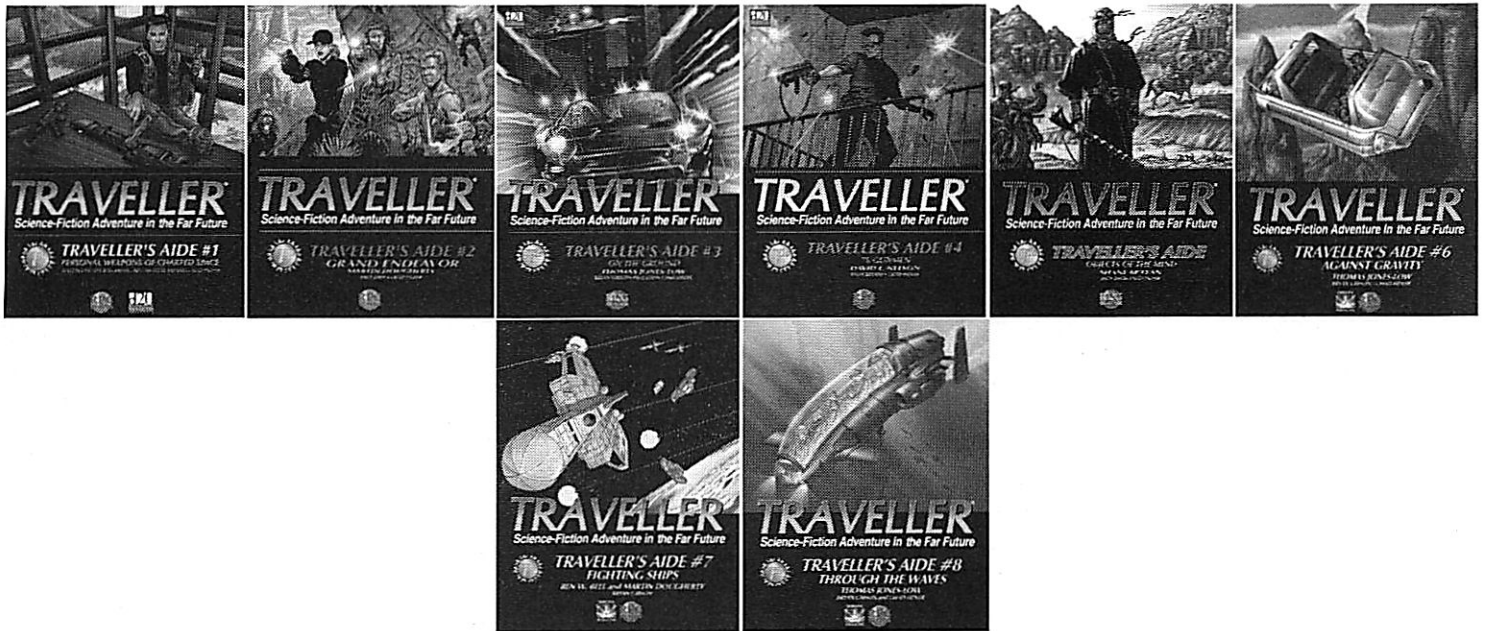
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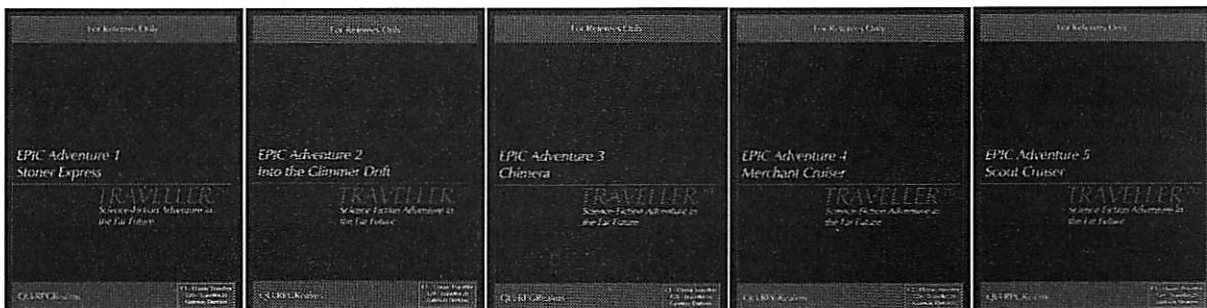
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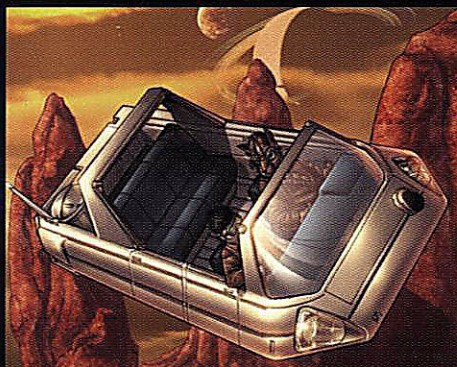
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GRAV VEHICLES

- Grav Belt
- Grav Bike
- Hiver Floater
- Air/Raft
- GCarrier
- Speeder
- Sub-Orbital Transport
- Cargo Hauler, Light
- Cargo Hauler, Heavy
- Ambulance
- Grav ATV
- Grav Bus
- Cargo Lifter
- Light Tank
- Medium Tank
- Heavy Tank
- Missile Artillery Sled
- Artillery Sled
- Armored Personnel Carrier (APC)
- Armored Recovery Sled
- Armored Engineering Sled
- Armored Truck
- Light Main Battle Tank
- Heavy Main Battle Tank
- Fast Attack Sled
- Armored Personnel Carrier
- Point Defense Sled
- Meson Artillery Sled

GROUND VEHICLES

- Motorized Steam Carriage
- Steam Powered Tractor
- Scooter
- Motorcycle
- Performance Motorcycle
- Personal ATV - Wheeled
- Snowmobile
- Jeep
- Ground Car
- Sports Car
- Limousine
- Pickup Truck
- Van
- Tow Truck
- Ambulance
- Fire Truck - Pumper
- Fire Truck - Ladder
- Light Cargo Truck
- Armored Car
- Cargo Truck, Heavy
- Public Bus
- Wheeled All Terrain Vehicle
- Tracked All Terrain Vehicle
- Recreational Vehicle

WATERCRAFT

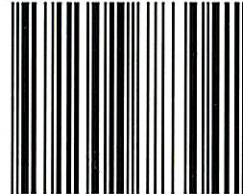
- Canoe
- Kayak
- Dinghy
- Inflatable Dinghy
- Personal Watercraft
- Small Sailboat
- Luxury Sailboat
- Longboat
- Trireme
- Coaster
- Schooner
- Clipper Ship
- Steam Boat
- Luxury Powerboat
- Performance Powerboat
- Racing Hydroplane
- Fishing Boat
- Large Cargo Ship
- Shore Patrol Ship
- Icebreaker
- Early Submarine
- Hand Sub
- Shallow Water Explorer
- Luxury Submarine
- Deep Water Explorer
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- Supercavitation Submarine
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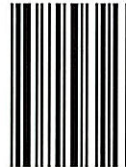
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