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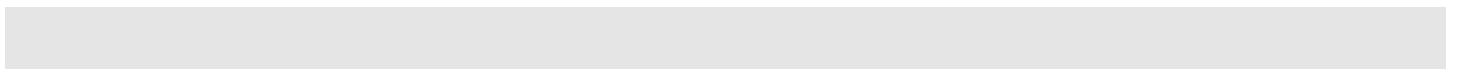## Halfway Station Presents…

Expanding Universe

*White Dwarf Classic Traveller Articles
by Andy Slack*

Expanding Universe

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Expanding Universe Part 1

> *Additions to* Traveller *Rules by Andy Slack*
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SKILLS AND THEIR USE

General Use of Skills

Normally, for combat, 8+ must be rolled to succeed, with a positive Die Modifier (DM) equal to expertise level in the relevant skill. Thus a throw of 6 plus expertise level 2 gives 8 - a success. For consistency, it would be best to adopt this system throughout, as the existing rules produce a great variety of DMs in other skills.

Parrying can be introduced into blade combat; the defending player simply subtracts his expertise level from his opponent's attack roll.

Similarly, if for any reason another character has booby-trapped or jinxed an item, the dice are rolled, the expertise level (hereinafter denoted by EL) of the operator is added and the EL of the jinxer is subtracted; a score of 8+ after all other modifiers have been taken into account means the device will operate correctly.

Persons Without Relevant Expertise

A person attempting something he has no skill in is subject to a DM of -3, additionally he may well use the wrong tools or technique. So the player rolls 3D6; if the result is less than or equal to his personal Intelligence, then he has guessed the correct tool or technique to use. If the result is greater, he has picked the wrong way to do it, and is subject to a further DM of -2, making -5 in all. (Referees may prefer to use Education, not Intelligence, or two dice instead of three.) Either way he adds to this his EL (if any) in Jack-of-Trades, as a positive DM.

This makes Jack-of-Trades expertise very valuable, especially if a player should reach a high level. So the J-O-T skill should be considered to be an inborn ability, as I believe was intended. Thus is cannot be learnt after leaving the Services, or increased by most normal means.

Effects of Culture Shock

All player characters are supposed to have expertise 1/2 in all weapons. This has its drawbacks though. The hero is, shall we say, an Army veteran. All his life he has been using rifles etc. But stick him on a low tech level planet and he instinctively knows how to use a *kontos*. Players should be larger than life; but not to such an extent.

Players should have expertise 1/2 in all devices that are *common* on their home planet (except exotic ones like starships, fusion power plants etc.). Each character is assigned his home planet; its tech level is the one he is familiar with. It must be noted on his character sheet. The numerical difference between the character's tech level and the tech level of any device he is attempting to use we call D. There are two basic possibilities: the character has been trained in something similar (or at least has heard of the thing) or he hasn't. If he has, he is subject to a negative DM equal in size to D/EL. Example: The character has Rifle-4, and is given a thermonuclear phase-interlocked grunge rifle produced on a world two tech levels higher than his home planet. His DM on the to-hit roll would be -1/2, and is therefore ignored (If the grunge rifle had been 8 tech levels higher, the DM would have been -2.) If he hasn't then we must find out if he looks at it and thinks, "Hmm, that looks trigger shaped. I'll pull that bit." If the device is of a higher tech level than the would-be operator, the personal characteristic used is Intelligence; if the tech level is equal to or lower than the operator's, he uses his Education. He rolls 3D6 and adds D. If the result is less than or equal to the characteristic used he has figured it out. (Or he will figure it out - only the referee knows how long it will take. Additional DMs are needed if the object is totally alien, e.g. produced by animate 12' cockroach-eating plants on the Galactic rim.)

The Invention and Design of Devices

The total number of appropriate expertise levels of those present in the research group must equal twice the tech level of the proposed device, as set by the referee for any chance of success. The referee must work out how long it will take them, and whether additional expertise over and above that required will help or hinder the effort.

To succeed, the group must roll its average Intelligence or less on 3D6. Computer Aided Design can save a lot of wasted effort, so subtract from the roll the sum of the model numbers of the computers used, divided by the number of people involved - effectively raising the average Intelligence.

Repair and Maintenance of Devices

This aspect of skill use is similar to *Invention and Design* (*Culture Shock* is particularly relevant) and one expertise level is required in the repair crew per tech level of the device, e.g. Level 5 needs one man of EL 5, or two of EL 2 and one of EL 1, and so on.

Implied Skills

(This section was brought in because at one stage in our campaign we had a player of Engineering-4 who couldn't change the wheel on his car - no Mechanical skill. But for 16 years this man has been sticking melted starships back together with cellotape. This aspect is still under scrutiny, but Pilot, Engineering and Weapon skills have been tackled.)

A Pilot has an implied skill in Ship's Boat equal to half his Pilot expertise level. Thus a man learning Pilot-2 would have Ship's Boat-1. (The culture shock rule should also apply.) A man wishing to learn Pilot skills has to first learn Ship's Boat to level 2. Only then can he become a Pilot. (This only applies on leaving the Services, of course, or nobody could learn Pilot *and* something else.) With regard to engineering skills, Engineer-1 also has implied skills of Electronics-1 and Mechanical-1.

In the matter of weapons, the Umpire must use more discretion: but if a person with Revolver-4 didn't know where the trigger was on an automatic pistol, it would be nonsensical. He might not know any gun maintenance - though I suspect he could make a very good guess - but the firing technique isn't that different. And, as was forcibly pointed out to me during one adventure, a character with both Rifle and Submachinegun skills ought to have vague ideas about the use of automatic rifles.

Learning by Experience

Each time the character successfully uses a skill in a crisis (lasering a computer simulation doesn't prove very much, I think) he gains experience points equal in number to his Intelligence. One thousand of these can be traded in for another expertise level. Whether to keep separate e.p. records for each skill; sum all e.p.; or - my preference - split them into weapon e.p. and non-weapon e.p. is left to the referee.

Should the character do something he has no skill in, he also gets one e.p. per Intelligence point, but this should be recorded separately. Since it is a much harder way to make a living, only 100 of these e.p. are required to learn a new skill to expertise level one.

It is up to the referee whether the player should be allowed to allocate his new expertise level or skill himself, or whether it should be determined randomly; players will doubtless prefer the former method.

Some check must be kept on how many skills a player can have, though: so add the player's Intelligence to his Education and take that as the maximum number of skills (not experience levels) he can have.

Language

An amusing way to use Education is in languages. A character speaks his native language with fluency 5. For each point of Education over 5, the player gains another fluency level, to use as he pleases. Thus he may hold it in reserve or learn another tongue. The more fluency levels devoted to a language, the better it will be spoken. Level 5 is only just distinguishable from a native. Level 1 is suitable for "Help!", "Me hungry" and so on. Fluency can be used as a DM on a roll to understand jargon or whispers, or when attempting to communicate something unusual - in which case a very low roll might be insulting to the listener.

If languages are used, it is advisable to have some patois which is vaguely understood by all spacemen and starport officials so that players can speak to someone. (According to our dice, many patrons are Serbo-Croatian, and how many players pick that to learn?) This also gives more point to Education, which didn't seem much use originally.

Skill in Tactics

Tactical skill is difficult to simulate. In fairly large combats, use simultaneous movement to brief written orders, then Tactics expertise can be used in two ways: first, the tactician can "guess" (translation: he is told by the referee) of hidden forces on the other side; in which case if he muffs the die roll, the referee tells him a false position - so he shouldn't know what he threw on the dice for this, or he'd know he was being lied to and take no notice - and second, the tactician can write his orders, or just move, after seeing what the other side has done that turn. In either case he must throw 8+ to succeed, with DMs of plus his expertise and minus the opponent's tactical expertise. Military personnel should, I think, all have fractional Tactics, especially if commissioned.

Leader Skills

Leader skill is even worse. However, one may find some use for it, as follows: It influences the behaviour of the leader's minions. If told to do something dangerous, or bribed, or tortured, or not paid for a long time, etc, the minion must roll his Loyalty score or less to obey orders or not betray his boss, as appropriate. His boss may subtract his Leader expertise from the die roll. (Loyalty will be covered next issue.)

Leaders will be eligible for experience points for Leader skill in the following situations:

- On obtaining a commission for his group.

- On successful completion of a mission.

- Each time his DM for expertise on a Loyalty check as detailed above is both necessary and successful.

Military officers should have fractional Leader skill.

POISONS AND CHEMICAL WARFARE

Saving Throws
The basic saving throw is successfully achieved by rolling endurance or less on 3D6. This must be done three times. Those failing to save at all take the Tertiary effect of the poison or agent, those saving once take the Secondary effect. Those saving twice take the Primary effect and anyone saving three times in a row has completely avoided any effects of the poison.

Saving Throw Modifications
Persons in vacc suits are immune to all gaseous poisons; persons in filter masks or respirators gain a DM of -3 to their saving throws against gaseous agents. First aid has the effect of an additional DM to each saving throw of plus or minus the attendant Medical expertise, depending on the medic's feelings about the person he is treating. If several medics are involved, sum their expertise levels to get the DM. Assorted wide- or narrow-spectrum immunisations and antidotes of varying DM may be made available by the referee.

Masking When Under Gas Attack
To successfully mask himself the individual must throw his dexterity or less on 3D6.

The reason for using 3D6 in these throws is to allow for persons with characteristics over 12. If the referee feels this is too harsh, alternatives are to use two dice, or give a blanket DM of -3 to all saves, thus moving the range of scores from (3-18) down to (0-15), which is a bit gentler or a blanket DM of -2, which means there is a slight chance of a 1 endurance surviving unharmed, and an equal chance of a 15 endurance being poisoned.

Poisons and Agents
In general, a poison will have previously been rated by the referee in the following:

Dosage: This is a relatively simple matter; it is suggested that dosages range from 1-15, where they can usually be determined by a roll of 3D6-3.

Effects: All three effects of a poison - that is, primary, secondary and tertiary - must be specified. The referee should draw up a random determination chart or specify all his poisons before commencing play. Possible effects are:

Death	Euphoria	Insanity	Paralysis
Stimulant	Sedative	Hallucinations	Corrosion
Confusion	Tranquiliser	Convulsions	Twitching
Nausea	Choking	Fever	Blistering
Acute pain	Weeping	Blindness	Irritation

Alternative effects are to add or subtract from strength, dexterity, endurance, or intelligence, either permanently or temporarily. Death should always be a tertiary effect.

Stinging animals will generally use some poison that leaves their victims amenable to digestion, such as a sedative or paralysing agent. Persons with expertise in untested skills such as chemist or biologist might be allowed to design their own agents for chemical warfare.

Speed of Action: This is given by a simple formula and the characteristics of the poison. The formula is:

$$\text{Time} = \frac{\text{Factor x Target Mass x Target Endurance}}{\text{Dosage x Attacker's Mass}}$$

Where *Time* is the time until the effects of the poison are felt; *Dosage* is as detailed above; *Target Mass* is the victim's mass in kilogrammes (about 70 for an average human male); *Attacker's Mass* is either the weight in kg of the munition delivering the chemical, or the mass in kg of the attacking animal, or the amount in kg of poison introduced into the victim by any other means; *Target Endurance* is either the player's endurance or the amount of damage required to stun an animal.

Factor is another item to be specified by the referee; normally roll percentile dice and call this the *Factor* in seconds. Then by working out the formula the referee can warn the adventurer when he first feels something is wrong. It is suggested that the player then has a while to get medical aid before being incapacitated. For example, the referee rolls the player's saves in secret and fails to save at all. Then after the period denoted by *Time* the referee will inform him that he is feeling the primary effect; after another period - not necessarily the same - he is told that he is feeling the secondary effect; and finally after a third period of time he is told he has suffered the tertiary effect. The process should not be irreversible until the tertiary effect is felt. Until that point, help is still possible; if the victim is hospitalised or given medical aid by a medic called in, a fresh set of saves should be made against whatever effects remain to be felt.

Cumulative Poisons

If a person has, for example, been fed small quantities of a cumulative poison in his feed, or been repeatedly exposed to cumulative toxins, the *Dosage* is regarded as being equal to the sum of the individual *Dosages* the individual has previously received. The same process can be used with catalytic poisons, where one substance has no effect until a dose of a second chemical is administered, whereupon the product of the reaction between the two becomes poisonous.

Burst Radii of Chemical Munitions

Anyone caught within the burst radius of a chemical munition is regarded as being affected by the agent; he must commence saving throws. If outside the burst radius, he is assumed to escape the effects of the chemical agent. Such agents seem to persist in the burst area for periods of several hours to several days before becoming harmless. Anyone passing through the area in that time must save or take the effects of the agent.

Munition	Launcher	Rough "Attacker's Mass"	Burst Radius in Metres
Grenade	Rifle Grenade Launcher Hand	1 kg	10
"Shell"	Sandcaster	50 kg	35
Missile	Missile Rack	100 kg	50
Bomb	Missile Rack	1000 kg	100

These burst radii are only a rough guide calculated from the burst radii for roughly similar amounts of TNT.

Generally, rain will clear an area more quickly, and the effects will persist longer in vegetated areas. The effects will also be more efficient in confined spaces. Decontaminants are normally available as they may be improvised from such materials as bleach; fire will almost always decontaminate. Military Chemical Warfare Officers can normally specify roughly the *Factor* and *Dosage* of their agents.

After the initial bombardment the agents will naturally tend to spread and thin out saves for each additional 'radius' the victim is away from the burst point. Also, persons outside the burst radius will almost certainly have time to mask themselves.

"Antique Equivalents" of Chemical Agents

Information on these is surprisingly easy to find, and a trip to the library would well repay the effort. Here are brief details for several war gases:

The details of this section may well be inaccurate as I have little or no chemical knowledge; however, I am fairly confident of their accuracy as they are derived from declassified (and hence out of date) US Army chemical warfare manuals which, to my astonishment, I found on a second hand bookstall in London.

Phosgene: A few hours after exposure, the lungs begin to fill with fluid, rendering breathing difficult; this leads eventually to death by anoxia.

Nerve Gases - Tabun, Sarin, Soman: These are very similar in effect. In only a few minutes, the victim develops influenza-like symptoms, accompanied by twitching and vomiting followed by confusion and drowsiness, convulsions, and death. The entire process seldom takes more than 15 minutes, and is normally considered irreversible without immediate first aid (injection of atropine tartrate, I am told) and subsequent hospitalisation. Even so, recovery is doubtful.

Hydrogen Cyanide: Persons affected by this have an increased respiration rate, and generally die within a few minutes at most.

Cyanogen Chloride: This takes several minutes to affect a person. The lungs and exposed skin become irritated; this is followed by a decrease in the respiratory rate and choking, then death.

Arsine: Taking up to several days to show its effects, arsine causes headaches and uneasiness, followed by chills and nausea; its victim does not normally die, but remains anaemic thereafter.

Mustard Gas: Several hours after inhalation/contact, the victim's eyes and skin become inflamed. Blisters and ulcers on exposed skin follow; then, finally, inflammation of the lungs, throat, and so on, which can prove fatal.

Nitrogen Mustards: A group of gases with similar effects; up to three or four days after exposure are required for the full effects to show. First the eyes and skin become inflamed, followed by the blisters characteristic of all mustard type gases, and irritation of the lungs, nose and throat. Then, as a result, loss of voice, followed by fever and severe diarrhoea.

Lewisite: A much improved (?) type of mustard gas that acts within a quarter of an hour, first producing blisters and ulcers, then blindness and irritation of the lungs, followed by death.

Vomiting Gases: A group (e.g. training and riot control gases) which, like tear gases, are not normally fatal but can be so in confined spaces. They take effect in a few minutes,

irritating the eyes and nose; then a headache and symptoms of a cold appear, followed by acute chest pains, nausea, and vomiting.

Tear Gases: There are several of these, all with similar symptoms. They take effect within half a minute normally, irritating the eyes and lungs and causing weeping. Continued exposure results in itching and an effect similar to sunburn on exposed flesh. Severe exposure will cause blisters and nausea.

ACKNOWLEDGEMENT

AUTHOR'S NOTES

This was the first RPG article I ever had published, and was knocked out on an ancient typewriter in a student bedsit in late 1977 when I should have been revising for my exams.

Writing these four articles taught me two main lessons: First, the value of a good editor - who can take something you thought was perfect, cut 30% of it out, and produce something that is better than your original piece. And second, how the same ideas are taken more seriously as they move from hand-written notes to typescript to published article.

As I look back on this now, it seems dated - most of the rules no longer survive in my games:

- Skills and Their Use *has been overtaken by the task systems found in most modern RPGs - the DGP task system, used in* Travellers' Digest, MegaTraveller *and* 2300 AD*, was adopted as soon as I found it.*

- Learning by Experience *was one of the more durable rules, remaining in use even after* Mercenary *appeared and introduced the mighty Instruction skill, in fact until the mid-1980s.* Traveller *has official experience rules now, although those in* GURPS *and* 2300 AD *are more to my liking.*

- Skill in Tactics *was eventually replaced in my games by the DGP concept of 'roving DMs' as defined in* MegaTraveller*, although not until the early 1990s.*

- Leader Skills *remain something for which I have never been able to find or write rules that really please me.*

- *The section on* Poisons and Chemical Warfare *is the one with which I am now happiest, although these days I would only roll one set of dice and decide which effects applied based on how close the player came to saving.*

Twenty years after, I'm still trying to recapture the fresh, heady feeling of playing original Traveller *- or maybe that was just the feeling of being 20 years old, and high on a mixture of beer, chocolate, and 40 hours' straight gaming with no sleep.*

> *Suggested Additions to* Traveller *Rules by Andy Slack*
> *Originally published in* White Dwarf *14 - © Games Workshop Limited 1979*

STARSHIPS

Launching & Landing

Streamlining should not apply to any sized hull; anything bigger than an 800 tonne hull cannot be re-entered in one piece. (This can lead to ingenious starship designs.)

On planets of size 8 or greater and of the same order of density as Earth, a Free Trader - or anything with a 1G drive - cannot take off. Thus, strap-on boosters are available for hire at starports of classes A or B. These help launch a vessel, and may be subsidised by local government or a purely private enterprise. In the former case, a flat rate is charged for launch at the standard ground-to-orbit cargo cost of 10 Credits per tonne; in the latter case, exorbitant fees may be charged for launch depending on circumstances. Alternatively, the vessel may remain in orbit and shuttles may be used.

There are jump boosters, manoeuvre boosters and combination boosters. The jump and manoeuvre boosters are both a small (100-400 tonne) hull with only fuel, controls, and drives/power plans. The general specification for boosters is, for example, A5FBR-type booster. The first character gives the hull size or type; the second indicates a booster variant of the hull, as distinct from other variants designed by the Referee or players, and is always "5"; the third is the jump drive classification, if any; the fourth is the classification of both manoeuvre drive and power plant, if any; the final figure may be either "R" for "Reusable" or "T" for "Throwaway". Throw-away boosters are relatively expensive and normally reserved for emergency or military use.

The purchase price of a booster is the prices of the hull, drives, power plants and controls added together and divided by 2 if reusable, by 4 if throw-away. Any space not taken up by these components will usually be fuel tankage; some users may reserve hold and computer space in order to use the booster as an unmanned exploration vessel, a "message torpedo", etc.

Reusable boosters may be used 10 times without maintenance; thereafter it requires an overhaul as laid out in the starship maintenance rules. Throw-away boosters of course are only used once. Both varieties may be built in half the time given in the tables for starship construction.

Failures & Breakdowns

Many things may go wrong with such a highly complex mechanism as a starship. The percent chance of a failure in a given day is calculated as follows:

$$\% \text{ Chance of Failure per Day} = \frac{E \times \text{Hull Displacement}}{100 \text{ Tonnes}}$$

Where E is the environment weighting, which is 1.5 for civil vessels and 4 for military vessels. Some players may build ships of standard types with second-hand military engines in order to reduce the chance of misjumping when running on unrefined fuel, in which case the chance of failure is increased by 10%. If the % chance of failure exceeds 100, as it well may for large vessels, each 100% indicates a certain failure that day, and any remaining figure under 100 is the percent chance of an additional failure.

Percentage dice are rolled once for each day when not in port; if the result is less than the calculated chance a failure has occurred. Next, two six-sided dice are rolled consecutively, for severity and repairibility. For severity, a 1, 2 or 3 indicates a "Fail-Operational" condition, where back-up systems or voting units are able to continue the

ship's normal functioning without the failed part. A 4 or 5 indicates a "Fail-Safe" condition, where although the component which failed was vital to the function of the ship, safety interlocks prevent any damage to the passengers or crew which might have been caused by the failure. This roll has a Die Modifier of -1 for all hulls which are not custom built, and a further DM of +1 for every annual overhaul which has been missed, thus, for well-maintained ships it is impossible to get a score of 6 which is a single-point failurer, where a vital component fails without warning in a totally unexpected manner, with possibly fatal consequences. Next a roll for repairibility is made; 1, 2 or 3 indicates that the faulty part can be replaced from ship's stores, a 4 or 5 indicates that although a spare is not carried, the faulty part can be repaired and replaced by the crew; and a 6 indicates that the ship's crew has neither the skill nor the spares to put things right - a shipyard or some fast thinking is required!

For the location of the fault, roll percentile dice and consult the table below:

Starship Fault Location

01-40	False alarm; the testing circuitry is faulty.
41-60	Computer crash.
61-64	Structural failure in the hull.
65-72	Life support system failure.
73-76	Power plant failure.
77-78	Manoeuvre drive failure.
79-80	Jump Drive failure.
81-82	Fuel supply failure.
83-92	Sensor failure.
93-98	Throw twice ignoring 93-00.
99-00	Throw thrice ignoring 93-00.

Acceleration Damage

Acceleration at high G causes damage to the crew. They take one D6 of damage for every G of acceleration above one; this damage is removed as they stop accelerating, unless it has rendered them unconscious.

Example: A ship's boat - or a ship - accelerates at 4G. Its crew take 3D6 of damage each. Later it eases off to 2G, so the crew regain 2D6 of hit points, except for Alphonso the gunner who had an unfortunate endurance of 1 and lies unconscious on his couch, and is dealt with under normal wounding rules.

A DM is applied to the dice thrown for acceleration damage. This is +2 if the victim is not protected, i.e. lying on the floor or similar; 0 if a standard acceleration couch is used; -2 for oil baths (mentioned in Niven & Pournelle's *The Mote in God's Eye* and other books); and -4 for fluorocarbon tanks (as used in Haldeman's *Forever War* stories).

COMPUTERS

Damage

The hits on computers outlined in the original rules are too lenient; a similar system to that used on engines is better, so that for example, a Mod-5 taking 3 hits in combat becomes reduced to the effectiveness of a Mod-2. This necessitates the introduction of back-up and front-end computers to take over in the event of destruction or to relieve the main machine of some burden.

Programs

Many and varied are the possibilities for new computer programs; some examples are:

Anti-crash Program: This is loaded into a back-up computer. If the main machine crashes or is reduced by combat to a Mod-0, i.e. non-working, the back-up computer loads into its

own CPU all programs currently being run on the main machine, except any which caused a crash. Thus the action of the computer unit is kept up.

Double Jump Program: This is especially useful for attacking heavily defended ground targets. The ship jumps in, looses off a spread of missiles, and then immediately jumps out again; the entire process taking about a tenth of a second.

Deliberate Misjump Program: This causes the drive to make a misjump deliberately. It can be used to avoid the forces of law and order or escape from a system if there is fuel for a jump but not enough to reach the next star. It is, however, a risky business.

Programming Skills into the Computer

Any skill may be programmed into a computer but the programmer must have at least the same expertise in the skill as is desired for the program, and at least a like amount of computer expertise. The cost of such a program is Cr 0.2 million if a consultant is hired (consultants will never program computer skill into a machine!), or whatever a sufficiently skilled player character will do the job for. The space required is 2 units per level of expertise. A non-detectable failure in the program reduces the expertise level programmed in by several levels.

All these programs were originally mooted by players of Reading University Wargames Association. To them therefore goes the credit.

ENGINEERING

Nature of Manoeuvre Drive

Manoeuvre drives operate on an antigravity principle, as this does not vapourise everything within several miles and render beam weapons useless.

Misjumps

Any engine making a misjump will use up fuel for the misjump or the maximum jump possible, whichever is the larger. For each jump number that the size of the misjump exceeds the maximum possible normal jump, the jump drive will take one hit of damage.

Blowing the Drive

A pilot or engineer on a doomed vessel can elect to blow the drive. (This tactic can be used to take some enemies with you or to blow up starports if you are dying and cannot leave.) When the drive is blown, it explodes with the force of a strategic nuclear device (see below), the size of which depends on the power pplant size. (Type A = 1 megatonne, B = 2 megatonnes, etc.)

Tractor Beams

To generate a tractor beam, 20 tons of additional control gear are required. It has the effect of making the target ship behave as if it were being accelerated by the M-drive unit attached to the tractor beam device in a direction indicated by the wielder of the beam, in addition to any other acceleration it undergoes. Extra maneouvre drives and power plants may be built in so that the wielder's own engines are free.

Warp Scramblers

These operate on a similar principle to tractor beams. Another 20 tons of controls are required, and the effect is that the target ship misjumps immediately the next movement phase comes around under the normal or amended misjump rules. The operator of the scrambler pays the fuel cost for this, as he does for tractor beams.

Matter Transporters

These require another 20 tons of control gear and behave as laid down in the teleportation rules under psionics. Their equivalent psi strength is determined by the class of power plant driving them: A Type A has psi strength 10, a type B - 20, and so on.

GUNNERY AND MISSILES

Hit Equivalents

One 'Hit' is assumed equivalent to 20D of damage. A ship's hull will take 3-18 dice of Hits, as will an AFV hull; a ship's boat hull will take 2-12 dice, and an ATV, aircraft etc. 1-6 dice. Any remaining damage is carried through and distributed evenly between any crew behind the wall when it caves in. Alternatively, the remaining damage can be split into 4D6 "parcels" and disposed of as if shotguns were being fired at the occupants. Note that any Hit getting through the skin of a vacc suit, punctures it. Civilian vacc suits are about equal to jack, and military ones to mesh or ablat. Armour can be worn over them.

Types of Missile

General: A ship's main defence is its laser batteries, as for all practical purposes they cannot be seen coming, whereas missiles may be spotted in time for evasive action. Thus, missiles tend to be reserved for infighting, when ships are a few inches apart.

Missiles are assumed to accelerate continuously at 10G. For quadruple the normal cost, they can be custom-built to achieve 25G.

HE Missiles: These are the standard variety mentioned in the rules. They weigh one ton, cost Cr 5,000, and do 1D6 hits on impact. In ground actions they will be treated as 100 kg fragmentation weapons (see below).

Tactical Nuclear Missiles: These weigh one ton but cost 50,000 Credits. They are treated as 100 kiltonne nukes in ground actions. A ship hit by one of these suffers (1-6)D6 Hits. If it is not in atmosphere at the time of the attack, its streamlining, if any, is destroyed and due to spallation from the walls all the crew are considered to be attacked by a shotgun wielded by someone of expertise 1.

Strategic Nuclear Missiles: These are hydrogen bombs of 1 megatonne yield. They cost half a million Credits. If the ship is not in atmosphere when attacked, the streamlining is destroyed and the crew are attacked as if by shotguns as for the tactical nuke above; but the "strat" does more damage. Throw one die. Each spot represents a die. Throw this number of dice. The result is then the number of dice to be thrown for Hits done to the target. Further, if in atmosphere, any ship hit which survives must immediately make a forced landing, although if in atmosphere the spallation and destruction of streamlining doe not occur. The strategic nuke also creates blackout, so for 1-6 turns no radio or radar in the neighbourhood functions, and missiles attack in or behind the fireball at -5.

HE Bombs: Weigh one ton, cost 2,000; 2D6 of Hits vs ship, counts as 1,000 kg fragmentation weapon. Alternatively it could contain gas or germs.

Drop Tank: Cost 1,000 Credits. This is merely a tank containing one ton of fuel.

Mobile Infantry Drop Capsule: Direct from Heinlein's *Starship Troopers*, this capsule costs 4,000 Credits and holds but one man in powered battle armour. It re-enters under the rules for re-entry in a vacc suit, but any weapons fired at the trooper on his way down have a DM of -3 imposed.

Dump Box: This is a cheap re-entry capsule for emergency escape or delivering cargo. It re-enters under the vacc suit rules, costing 5,000 Credits and capable of holding 5 men plus equipment or 500 kg of cargo.

Missile Failures
Available data suggest that modern missiles have a failure rate of about 25%. As this is quite probably wrong and things will surely be improved in the future, missiles will fail to explode on target even though they have hit if an unmodified 12 is scored.

Types of Sandcaster Ammunition
Sand: Straight from the book, this costs 400 Credits, weighs 50 kg and imposes a DM of -3 on laser fire through it.

Window: This costs 400 Credits for a 50 kg canister. Its effect is a DM of -3 on missile fire.

Gravel: This is just what it says - gravel. (Or scrap iron and other such junk.) Its cost is 100 Credits for a 50 kg canister and it is the best sandcaster weapon normally available. Missiles passing through it are total write-offs and fail to explode. It does damage on ships as follows: calculate the velocity vector of the target relative to the gravel as it hits. For each 1" (1,000 miles) of magnitude this vector has, the gravel does one Hit of damage. A ship orbiting through gravel around a planet takes Hits, as would one leaving orbit or taking off.

Example: A vessel in low orbit around an Earth-sized planet is doing about 17,500 mph, perhaps more; this is about 2.9 inches per turn, so a stationary cloud of Gravel - i.e. one tossed up so that the vessel hit it when it had no relative velocity toward the target, just before it fell back - would do 3 Hits of damage; one orbiting the opposite way entirely would do 6 Hits. If the target were attempting to leave the planet, it must reach at least 25,000 mph for an Earth-sized world, which is about 4.2 inches per turn. If it ran into a "stationary" cloud, it would take 4 Hits, and by dropping some Gravel over the side from a great height one could probably score up to 8 Hits.

Also, "dead" missiles, i.e. those which have failed to detonate or been burnt out by a nearby "nuke", could count as Gravel with a greatly reduced hit probability; alternatively Gravel warheads could be carried, which could do a lot of damage.

HE Shell: This does 1-3 Hits against a ship, counts as a 50 kg fragmentation weapon, costs 500 Credits and weighs 50 kg. It is most useful for ship defence on the ground.

Force Fields
The force field is (tentatively) assigned to tech level 14. Its cost is 100,000 Credits per point, it weighs 0.1 tons per point. The point value of the field is the number of Hits it will absorb from missiles, lasers etc. Imperial warships have about 100 points of field, their ship's boats about 10, and naval bases several hundred to a thousand. The field can re-radiate absorbed energy at 10% of its point value per turn. When the sum of all Hits so far inflicted minus the sum of those so far re-radiated exceeds the point value of the field, it burns out, and further Hits attack the ship's structure in the normal way.

Example: A pinnace with a 10 point field is hit by two HE missiles doing 6 hits. The 6 are absorbed, and one is re-radiated, leaving 5. Next turn another missile hits it doing 6 Hits. This makes a total of 11. One is re-radiated, leaving 10. At this point the generators burn out and the pinnace is on its own.

Use of Radar for Ship Defence
Ship's radars are very powerful, capable of detecting a ship many hundreds or thousands of miles away. So men not within ships or hard cover can be attacked by radar as if by a laser rifle, and all men within range will be affected together, i.e. simultaneously. Electronic devices ot protected by ships' hulls or similar will burn out unless specifically designed for this contingency at quadruple cost.

Slaved Turrets

In order to reduce manpower requirements, two or more turrets may be "slaved"; in this case there is a master turret, and when it attains a target and locks on, all other turrets slaved to it also lock on. N.B. this can only be done if all the turrets so slaved can point in the same direction!

EFFECTS OF NUCLEAR WEAPONS

Craters

Anything or any person who would be within the crater after detonation is considered totally destroyed. Crater depths and radii are as follows:

10 MT (Megatonne) groundburst	Radius 640 m	Depth 150 m
1 MT groundburst	Radius 290 m	Depth 70 m

NB: A "groundburst" is an explosion which takes place on or very near to the surface; this is contrasted with an "airburst", where the weapon is set off high above the ground, which causes no crater.

Blast Effects

10 MT Groundburst: Within a radius of 9.6 km, buildings etc. are destroyed; persons take 6D6 damage. Within a radius of 14.4 km, buildings etc. are damaged; there are hurricane force winds; persons take 5D6 damage. Within a radius of 24.8 km, buildings are damaged; persons take 3D6 damage.

1 MT Groundburst: Within a radius of 4.3 km, buildings etc. are destroyed; persons take 6D6 damage. Within a radius of 6.4 km, buildings etc. are damaged; there are hurricane force winds; persons take 5D6 damage. Within a radius of 11.5 km, buildings are damaged; persons take 3D6 damage.

10 MT Airburst: Within a radius of 12.8 km, buildings etc. are destroyed; persons take 6D6 damage. Within a radius of 22.4 km, buildings etc. are damaged; there are hurricane force winds; persons take 5D6 damage. Within a radius of 42.5 km, buildings are damaged; persons take 3D6 damage.

1 MT Airburst: Within a radius of 5.6 km, buildings etc. are destroyed; persons take 6D6 damage. Within a radius of 10.4 km, buildings etc. are damaged; there are hurricane force winds; persons take 5D6 damage. Within a radius of 20.8, buildings are damaged; persons take 3D6 damage.

Damage is not cumulative; take the highest applicable.

Grounded aircraft and civilian ATV, groundcars etc. take severe damage if within the "buildings damaged" radius; airborne vehicles must immediately force-land.

Airborne vehicles and AFV are destroyed if within the "buildings destroyed" radius. (Starships count as AFV for this purpose.)

Persons within the "hurricane force winds" radius need not take damage if they seek refuge in stout structures.

Within the "hurricane force winds" radius, objects and bodies up to several hundred kg in weight in the open are hurled about at potentially lethal speeds.

Fire Effects

10 MT Groundburst: Within a radius of 23.2 km, fabrics and paper ignite; persons take 4D6 damage. Within a radius of 37.6 km, there will be blistering burns (2nd degree);

persons take 2D6 damage. Within a radius of 38.4 km, dry leaves ignite; persons take 1D6 damage.

1 MT Groundburst: Within a radius of 9 km, fabrics and paper ignite; persons take 4D6 damage. Within a radius of 15 km, blistering burns (2nd degree); persons take 2D6 damage. Within a radius of 15.2 km, dry leaves ignite; persons take 1D6 damage.

10 MT Airburst: Within a radius of 28 km, fabrics and paper ignite; persons take 4D6 damage. Within a radius of 42.4 km, blistering burns (2nd degree); persons take 2D6 damage. Within a radius of 44.8 km, dry leaves ignite; persons take 1D6 damage.

1 MT Airburst: Within a radius of 9.6 km, fabrics and paper ignite; persons take 4D6 damage. Within a radius of 17.6 km, blistering burns (2nd degree); persons take 2D6 damage. Within a radius of 18.4 km, dry leaves ignite; persons take 1D6 damage.

Damage is not cumulative; take the highest applicable.

Even though a person may well survive the fire damage, the "nuke" will cause a firestorm of "fabrics and paper ignite" radius. If records from World War II are accurate, the chance of a person escaping or surviving a firestorm is very small. It is the responsibility of the players to specify how they will attempt to do so, and of the Referee to consider if they would succeed.

Radiation Effects

Electromagnetic Pulses: EMP occur when a "nuke" is detonated. It is safest to use the "fabric and paper ignite" radius since accurate information on the effect is difficult to obtain. This EMP will severely damage or immobilise electrical or electronic equipment, though measures may be taken to avoid this at great expense. There is also a slight chance that false signals will be generated in computers, communications systems, and detectors.

Fallout: The materials remaining after a nuclear explosion are radioactive, and emit radiation for a long time. When they mix with earth etc. thrown up by the explosion, radioactive clouds form and create a fallout hazard for people who are downwind. Because groundbursts cause craters they throw up more dirt; so the fallout is more dangerous because there is more of it.

Blackout: Blackout weapons are specially designed devices which maximise the blackout effect of the detonation. The area covered by the blackout increases with the size of the device and the altitude at which it is detonated. The exact figures seem to be classified; one source suggests a blackout cloud of 100 km radius from a device of several MT at a "suitably high altitude". This cloud might endure for hours, and certainly for a few minutes at least. (The exact duration can be controlled by the attacker by careful design of his bomb, and careful choice of the number and location of the explosions.) Radar and radio systems are "blacked out" and cannot "see" through the cloud. The duration of blackout is less for devices transmitting higher frequencies; it goes approximately as the square of the radar/radio frequency. Thus UHF is out of action for perhaps 10 minutes while S-band radar is covered for only a few seconds. However, even after the radars can "see" again, their pulses are refracted. Thus substantial errors - up to tens of kilometres - in estimates of positions occur. This problem may be overcome in the absence of Window or decoys by using two frequencies which differ widely, e.g. S-band and UHF, and comparing the estimates from both. This is the reason for the substantial DM on missile fire through blackout above. Blackout is due to atmospheric ionisation in part, and thus its effect is reduced when it is used in deep space.

Blindness: People facing a "nuke" when it detonates may have their sight seriously damaged or destroyed. For the radius of this effect use the "ignition of fabrics and paper" radius. (This is an estimate based on little information.)

Effect of Radiation on Characters: After a nuclear explosion, persons in or passing through the affected area or the area below or in the fallout cloud, or an area the fallout

cloud has passed over, must "save" by throwing their endurance or less on 3D6. Failure to save indicates 1D6 of radiation damage taken. The associated DMs are:
Antiradiation suit or similar: -4.
Airburst: -3 to -1 depending on viciousness of the attack.

These are applied to the damage die roll, not the save. Each day thereafter that the character remains in such an area, he must save again. On leaving the area a final save is rolled; failure on this final save means that the victim will continue to take 1D6 damage per day until hospitalised. (The DMs above still apply.)

A Note on the Devices

The nuclear devices considered are hydrogen bombs of standard types. It is possible by careful design to enhance any one of the three types of effect - i.e. radiation, fire or blast - at the expense of the others. In all cases, the airbursts are assumed to occur at that height which would do the most damage. Airbursts at lower altitudes cause less fire and blast damage, but more fallout. The effects of weapons of different sizes is calculated as follows: For each factor of ten times larger, multiply all radii by 2.2; each factor of ten times smaller, divide all radii by 2.2. Thus, a 10 kilotonne device, being 1,000 times smaller than a 10 MT device, affects an area with a radius 2.2 x 2.2 x 2.2 = 10.648 times smaller, i.e. a radius about 9.5% as large.

It is recommended that "nukes" be very rare.

EFFECTS OF EXPLOSIVES

Blast Radii for Chemical Explosives

Any person within the blast radius of the explosion may be hit for (1-6)D6 of damage. The explosive needs a base of 8+ to "hit", with an armour DM as shotgun if the victim is more than half the blast radius away from it, or as assault rifle if closer.

Weight of Explosive	Blast Radius
1,000 kg	101 m
100 kg	46 m
10 kg	21 m
1 kg	9.5 m
100 grammes	4.5 m
10 grammes	2 m
1 gramme	0.9 m

To find blast radii for bombs of mass between the values listed, the blast radius increases as the cube root of the mass.

Effect of Fragmentation Jackets

Most munitions, as opposed to explosive charges, are fragmentation weapons which on detonation throw out shrapnel. To simulate this effect, fragmentation weapons have double the blast radius indicated for their size. Normal charges can be easily converted to fragmentation weapons by closely packing them with bits of gravel, nails, etc.

Grenades

Grenades are assumed to be 1 kg fragmentation weapons. (This makes them slightly less effective than real grenades.) Characters may throw grenades a distance equal to three times their strength in metres. (This means they will sometimes be inside the blast radius themselves!) The hit probability for a grenade is the same as for thrown daggers, i.e. 2D6 + expertise + dexterity, an 18 or higher indicating a hit. If a grenade fails to hit, where it actually lands is determined by dicing for the direction on an imaginary hex grid. Having

found this direction, the distance, in metres, by which the grenade missed is found by subtracting the modified dice roll from 18.

ARTILLERY

Skill Use
When using direct fire, i.e. the target is visible to the gun crew, the gunner applies his gunnery expertise to the shot, and picks up any resulting experience. If the target is out of sight a forward observer must be used, he applies his expertise to the shot and is successful acquires the experience. To hit, a score of 18 is required, with appropriate DM for expertise, and gunner's dexterity added, to a two dice roll, with an additional DM of +4 for rangefinders if used by the appropriate party, i.e. gunner for direct fire and forward observer for indirect fire. (Alternatively heavy weapons may be treated as normal gun weapons with no required dexterity, or a referee-assigned required dexterity; or as starship turret-mounted weapons.) Normally bunkers, AFV etc. require a direct hit to "kill" them, whereas men may be killed even if the 25-pounder shell misses them by several feet. Use the sections on blast radii and fragmentation above for heavy weapon fire; though the weight of the shell must be established. If the projectile misses, determine as for grenades above. The distance in metres it missed by is determined by subtracting the Gunner's/Fwd Observer's expertise level from a 3D6 roll (or by subtracting the modified "to hit" score from 18).

Camouflage and Defences
These have an adverse effect on heavy weapon fire; after the attacker has added his expertise to the roll, the target may, if he has prepared for the shelling, subtract any expertise he holds in gunnery, tactics or forward observer from the attacker's roll, and, if the shell misses, add the same amount to the distance by which it missed (this latter is done by making dummy emplacements etc). If this subtraction is instrumental in making the shell miss, the defender should be awarded experience for it. Parties with no such expertise and no training in surface combat (i.e. not marines or army) are subject to a DM of +3 added to the gunner's attack roll.

AUTHOR'S NOTES

> *I spend much less time gaming now than in the late 1970s when these rules were written; to make best use of that time, I now focus on the characters, and treat starships as a way to deliver the characters to the next scenario. Similarly, I have abandoned rolling dice for random events; if the plot of the scenario requires the ship to break down, it breaks down, otherwise it carries on working.*
>
> *Acceleration damage has been superceded by the statement that ships have internal grav fields. A rule suggested by Bob McWilliams as an alternative was that the drive rating covered both the ship's acceleration and the internal compensation - for example, a 5G drive could accelerate the ship at 3G, and compensate for 2G, leaving the crew in a 1G field; but if the drive accelerated the ship at 4G, only 1G was left for compensation, so the crew suffered 3G internally.*
>
> *The rules for ship weaponry, artillery, nukes and explosives have now been superceded by official* Traveller *canon - initially Books 4 and 5, and later the* MegaTraveller, New Era *and* 4th Edition *rulebooks.*
>
> *But, in many ways, it was more fun when we had to make up our own empires, heavy weapons, and other rules. Of course, there's nothing stopping us doing that now...*

> *Suggested Additions to* Traveller *Rules by Andy Slack*
> *Originally published in* White Dwarf 15 - © *Games Workshop Limited 1979*

CAMPAIGN LOCATION

There are several sorts of region where a campaign is "plausible". These are:

Globular Clusters

These clusters are distributed in a sphere about the Galactic Nucleus. Usually there are no O, B or A class stars still radiating, though they may be present as "Remnants". They are spherical in form, with a diameter up to about 150 hexes, and contain 1,000 to 100,000 stars. There are about 1-100 stellar systems per hex. (Thus they are ideal for a huge campaign - but require great patience.)

Open Clusters

A favourite for a campaign setting, the open clusters are distributed in the plane of the Galactic Spiral Arms. They have no consistent shape, but average about 2-20 hexes in "diameter". Stars of classes O, B, A, F, G, K and M are present. They have around 2D6-2 stellar systems per hex.

Associations

These comprise rough groupings of 24-500 stars, all of similar spectral type, and have open clusters as nuclei, surrounded by single star systems. They are up to 200 hexes across.

Spiral Arms

These contain clusters and associations, but also there are single stellar systems not in any groups. These are found in a hex not part of a cluster or association on a throw of 9 (exactly) on 2D6.

As the Galactic Nucleus contains about 2,000 systems per hex, and the space not already covered is even more sparsely populated than the spiral arms, these are in my opinion the only "reasonable" locales, always assuming you want so much detail.

STELLAR SYSTEMS

For each star system in the hex, go through the following procedure:

Determination of Star System Type

Throw 2D6. A throw of 3 indicates a Remnant star; 11 or 12, a Variable star. A throw of 6 or 7 indicates the "star" in question is in fact two stars, and you should throw again to see if it is a Variable or Remnant. Large multiple systems may occur by repeated sevens.

Determination of Spectral Type

For each star in each system, throw percentile dice:

Dice	Spectrum	Radius Factor	T_{eff}	Colour
01-10	B	4.1	21,750	Blue-White
11-32	A	2.0	9,200	Blue-White
33-51	F	1.3	6,990	Yellow
52-65	G	1.0	5,775	Yellow
66-96	K	0.8	4,515	Orange
97-99	M	0.4	2,893	Orange-Red
00 01-25	O	5.9	40,000	Blue-White
00 26-50	N	0.4	2,500	Orange-Red
00 51-75	R	0.4	2,500	Red
00 -76-00	S	0.4	2,500	Red

(Binary and multiple systems have much nicer colours, e.g. emerald green and purple.)

Variable Stars

If a variable star is indicated, check below to see what type it is, depending on its spectrum and the umpire's whim.

T-Tauri Variables: These are small stars, spinning rapidly in a dense gas cloud. They may be G or K types.

Flare Stars: These stars periodically "flare up", greatly increasing their output of radiation. They are marked with big red splotches on star charts saying "Don't bother" or words to that effect. They are normally M type.

Magnetic Variables: These are normally A type, and have a varying magnetic field of great intensity, which would probably be very dangerous to shipping.

RR Lyrae Variables: These are common in globular clusters - another reason for not having a campaign there. These are often A or F class, and for game purposes they count one spectral class higher when in a bad mood, i.e. A counts as B and F as A.

Cepheid Variables: These are of F or G type, and over a period of 2-20 days their output of radiation (and their radius) increases one spectral class, then back down again (F goes to A, and G to F).

Mira Ceti Variables: These have a period of 50 x 2D6-1 days, with great variation of radiation output. They are M or S type.

Semi-Regular Variables: These are of type M or N, having a period of average length 60 x 1D10 days, during which they vary their radiation output semi-randomly.

Novae: If a star doesn't fit standard variable categories, either rig them or call it a nova! Then dice the time left until it explodes - a D10 x 40,000 years!

In a more serious vein, stars with a radius factor greater than 1.0 go nova fairly randomly. Each such star is diced for yearly to see if it will do so; this requires 4 rolls of 00 in succession on percentile dice followed by a roll of 99 or 00. Should it happen, all planets in the system are sterilised and the spectral type becomes O, ignoring the radius increase (the new radius could be said to be that of the expanding gas cloud from the explosion, how accurate this would be is another matter).

Supernovae: Supernovae are more difficult to get, but worth rolling for! However, people usually have enough time to evacuate as supernovae threaten for a while first. As far as

can be made out, any star of class O, B or A is eligible: to occur, roll yearly - you need 00 5 times followed by 94-00 on percent dice. The planets are all sterilised, and 1D6 of them are destroyed - work outwards from the inmost one.

Remnant Stars

These are very interesting objects, especially in space combat. They are the bits left after supernovae have occurred, or stars that have died in a less violent fashion.

Whites Dwarfs (Plug!): White Dwarfs are left after some supernovae, or the death by old age of stars type F, G, K, M, N, R, S. They have an A spectrum and a large magnetic field. After a while, they give up completely and become black dwarfs, which are the same thing but don't shine at all. (There is a small possibility that uninformed players will mistake them for black holes, probably causing them great concern.)

Neutron Stars: These can be the remains of A, F or G stars or supernovae. If they rotate, they have a magnetic field that doesn't bear thinking about.

Black Holes: Remains of supernovae and O, B, A, F stars. These are the best player-worrying devices in the Traveller universe, and well worth reading up on.

Many Remnants are found in gas clouds.

Densities of Objects for use in Space Combat Templates

Object Type	"K" or Density
Planets of size 0-20	3D6/10
Planets of size 21+	2D6/10
"Normal" Stars	10D6/100
Giant Stars (50% chance if G, K, M; 20% chance if A, F)	5D6/100
White Dwarf	$2D6 \times 10^4$
Neutron Star	$3D6 \times 10^{11}$
Black Hole	$4D6 \times 10^{14}$

Radii of Objects for use in Space Combat Templates, etc

Stars: Radius Factor x 432" x 3D6/10 (If giant, now multiply by 2D10).

Neutron Stars: 1/48 of an inch.

Black Holes: 1/24 of an inch (for game purposes).

White Dwarf: 5D6 inches.

PLANETS

Planetary Systems

Any star of classes F, G, K or M will have attendant planets unless there is a remnant in the system, or a variable star.

Number and Type of Planets

For each planetary system diced up, there will be 2D6-2 Terrestoid planets and 1D6-1 giant planets. Arrange these in a semi-random order, note that giant planets tend to congregate towards the outside. This order is the order of the planets going outwards from the star.

Size and Moons

Terrestoid planets have a size of 4D6-4 inches, giant ones of 5D6 + (2-12)D6 inches. (Terrestoid planets of size 0 are asteroid belts.)

Terrestoid planets have 1D3 moons, and giants 3D6 moons. Moons have a size of 1-100 x 0.002 times their parent planet's, and if big enough can be diced up as worlds in their own right. Each gas giant moon has a 5% chance of disintegrating into a ring such as encircles Saturn.

Distance from the Primary

The distance of a planet from the sun, or a moon from its parent body, is estimated by the following formula:

$$R = 200 \times r \times B$$

Where r is the radius of the sun or parent body, R is the orbital radius, and B is a factor defined from the table below.

Planet No. (From inside outwards)	B	Planet No. (From inside outwards)	B
1	0.4	9	38.8
2	0.7	10	77.2
3	1.0	11	154.0
4	1.6	12	307.6
5	2.8	13	614.8
6	5.2	14	1229.2
7	10.0	15	2458.0
8	19.6		

Determining the Length of Year

The length of the body's year, in Earth years, is given by the formula:

$$Year = B \times T \times r / 432$$

Where B is from the table above, r is the radius of the parent body or star, and T is taken from the table below. "Planet No." is again the order reading outwards from the primary.

Planet No.	T	Planet No.	T	Planet No.	T
1	0.5	6	2	11	6
2	1	7	3	12	6
3	1	8	4	13	7
4	1	9	4	14	8
5	2	10	5	15	8

Determining the Length of Day

Giant planets have a day of 4D6 hours. For terrestoid planets, throw 2D6 and impose a DM of -n, where n is the number of planets closer to the star than the one in question. A score of 12 indicates a day of length equal to 1-10% of the year; any other score indicates a day 6D6 hours long.

Determining the Surface Temperature

This is the nastiest bit. First the albedo factor A must be calculated. Roll 2D6, add the atmosphere and hydrographic percentage numbers (calculated in the normal way), subtract 12, divide by 10; finally subtract the whole lot from 1.0, and quickly amputate any minus signs because they're going to cause trouble later on. (It will be noticed that giant planets have enormous atmosphere and hydrosphere numbers. Don't worry about it as few people will land there and even fewer will lift off again.)

Now brace yourself - calculator is recommended! Look up the Teff for the star that you're worried about. (And if you're not worried about it by now you soon will be.) Square it. Square it again. Multiply it by the square of the star's radius (in inches). Divide by 4. Multiply the result by the factor A, and divide the lot by the square of the planet's orbital radius (in inches). Then square root the product, and square root it again. This chops it down to a reasonable size and provides the planet's surface temperature in Kelvin - subtract 273 for Centigrade.

Here is a formula expressing the process more concisely:

$$\text{Surface Temperature} = (0.25 \times (r/R)^2 \times (Teff)^4 \times A)^{0.25}$$

A little practice reveals short cuts and reduces the horror of it all. Make a note of the temperature as it shows what the sea's made of and whether the planet may be habitable.

Habitable Planets

Habitable planets must have a mass of at least $M = 0.1$, a day of length not exceeding 96 hours, and a surface temperature of between 200 and 300 Kelvin. (Water freezes at 273 K and boils at 373 K.)

Native Life Determination

If a planet counts as "habitable", throw 2D6 to determine the Earth equivalent of the highest life form yet developed. DM: F stars -1, K stars +1, M stars +2.

Dice	Highest Life-Form
2	DNA molecules
3	Coacervates
4	Bacteria
5	Protozoa
6	Worms
7	Fish
8	Reptiles
9	Avians
10	Mammals
11	Intelligent species, Tech Level 0-2
12	Civilised species, Tech Level 3 or higher

Determination of Orbital Velocity and its Use

The orbital velocity, Vo, is given by:

Vo = 0.00012 x R/Year in inches per turn.

Suppose you have some Travellers who are on an interplanetary trip. They can do this in two ways:

Minimum Fuel Orbit: This is a lengthy process; the time taken for transfer is equal to, on average, half the difference between the lengths of years at the end-points of the trajectory. However, only as much fuel is expended as is required to generate a vector equal to the sum of the orbital velocities of the end-points, plus that required to take off and land (see Escape Velocity below). While on such an orbit count the ship as if closed-down in orbit, i.e. minimum detection range.

Constant Acceleration Orbit: This is shorter in time but higher in fuel cost. Assume the distance travelled is equal to one-quarter of the destination's orbit circumference, plus the difference in orbit radii. And the ship must take off, land, and match velocities with its destination. Ships on these orbits are always detectable at maximum range.

Escape Velocity

To take off, land, leave or enter orbit, a ship must generate a vector equal to the escape velocity of the planet at the relevant altitude and direction.

To take off or land, the vector has a size of:

$$V = (2\ G\ R)^{0.5}$$

Where G, R have the value derived in Traveller space combat.

To enter or leave orbit, use the formula below to find the vector size:

$$V = (2\ G\ R2\ /\ H)^{0.5}$$

Where G and R are as before, and H is the distance from the ship in orbit to the centre of the template or body in inches.

Ships may opt to enter "forced orbits" where by constant acceleration they may traverse an orbit either at a different distance or orbital velocity than normal. Watch out for atmospheric braking at an inopportune moment though!

ALIEN LIFE

Basic Type

The basic type of life on each planet is determined. Use the table from Native Life Determination and common sense as necessary, together with these tables, to determine the basic type of life.

Basic Type/Shape of Most Animals:

1	Insectoid	4	Avian
2	Icythoid	5	Mammalian
3	Reptilian	6	Other (i.e. Ref's Special)

Symmetry of Most Animals:

1	Asymmetric	5	Rotational of order 2-6
2, 3, 4	Bilateral	6	Other

Number of Limbs:

1D6-1 pairs of limbs, but refer to the symmetry and use common sense (e.g. you can't have four legs and rotational symmetry order 3).

Main Sense of Most Animals:

1, 2	Vision	5	Olfactory
3	Audio	6	Other
4	Tactile		

Note for vision that it will be most acute at the predominant colour of the star; i.e. beings from a red star's planet would see into the infrared a short way but might well be blind to blue, seeing it perhaps as blackness.

Characteristics: Determine type, weaponry, size etc. as in Traveller Book 3.

Intelligent Aliens

These are first diced for as if an ordinary animal, biasing the results slightly towards the 50-200 kg mass range and away from herbivorous types. Then characteristic DMs are diced for. All characteristic DMs are generated by 2D6-7, followed by applying common sense.

Primary characteristic DMs are applied to the UPP of a character, and consist of DMs to strength, dexterity, endurance, intelligence, education and social standing, therefore. Secondary and tertiary DMs are applied to 2D6 rolls for secondary and tertiary characteristics; however, provided he could have diced it, a player may always specify his own secondary characteristics.

Secondary characteristics (with apologies for plagiarism to Tony Bath) are Disposition, Morals, Generosity, Loyalty, Courage, and Ambition. The way in which they are used is as follows: The higher the score, the more socially correct and "nice" is the character's behaviour in that area. Thus, should a police officer be offered a bribe, throw 2D6 in secret; if the score is less than or equal to his Morals, he has done the socially correct thing and refused the bribe. If a beggar accosts a character whose player is not present, dice - a roll equal to or under his generosity indicates he has given alms; and so on.

Tertiary characteristics are largely individual; they start with Appearance and Activity, but then the remaining four are "held" for use in describing organ-playing ability, shoe size, etc., as is required by the individual character.

Quaternary DMs for each species should also be diced. These apply to the Population, Government, Law Level and Tech Level of planets inhabited by that species. (An example is the blanket -2 on human Populations.)

ROBOTS

Dice up robots as if they were a member of the constructing species, except for the following points:

a) Shape, Symmetry and Main Sense may be altered by the specific task envisaged for the robot.

b) The robot's skin counts as Mesh armour.

c) Strength, Dexterity and Endurance have an additional DM: +1D6.

d) Intelligence has an additional DM: + Home planet Tech Level, -18.

e) Social Standing has an additional DM: + Home planet Law Level, -18.

f) Robots are not psionic, nor may they as player characters do anything other than make suggestions and follow orders literally, unless they are constructed at a high enough Tech Level for artificial intelligence.

g) Robots not imbued with artificial intelligence have an ambition of 2; all other secondary characteristics are 12.

Robots have up to one expertise level (in non-combat skills only) plus one language point per Tech Level over 6; these are programmed in at the owner's choice. Robots may be reprogrammed as if computers (see Part 2, Issue 14). No robot which has not been reprogrammed can contemplate harming a living creature unless it has artificial intelligence in which case it may act with minimum necessary force in self-defence.

The cost of a robot is 20,000 Credits per expertise level.

As will be apparent, robots usually have a negative intelligence; thus on succeeding in using a skill, they lose experience rather than gain it. Just work the normal experience rules (See Part 1, Issue 13) backwards. Note that all robots have a special skill at level 6 in obeying orders; this is used whenever a robot is asked to do something unsavoury or illegal - to perform the act requested the robot must roll 8+, DM: + obeying orders expertise. The point of this is that "killer" and criminal robots eventually refuse to obey orders of this type. Killer robots should also start malfunctioning (try dicing on the C&S Mental Health charts each time a level of obey orders expertise is lost).

Androids, that is to say organic as opposed to synthetic robots, count as needing a base Tech Level 2 levels higher than normal robots; however, they are indistinguishable from "real" beings, which they in fact become at tech 19. This is useful in light of the suggestion that robots or androids, if discovered, on most planets will be destroyed by the populace with "Luddite" fervour and their owners treated as if they were psionics - check the robot's social status against the special levels in Part 4, next issue, it will almost always be under -5.

AUTHOR'S NOTES

> *Can you believe we used to do all this stuff with dice and calculators?*
>
> *The astronomical data and physics I used to work these equations out are either outdated or just plain wrong in many cases. These days, I would recommend* GURPS Space *or one of several computer programmes available free over the Internet - Winchell Chung's website is a good place to start looking.*

Expanding Universe Part 4

> *Suggested Additions to* Traveller *Rules by Andy Slack*
> *Originally published in* White Dwarf 16 - © *Games Workshop Limited 1979*

SOCIAL STATUS

Income

The social status score determines the character's net income in long-term situations. Thus a player getting a job as say a clerk, or any non-player in a civilian job, would have this much money left after living expenses were deducted:

Social Status	Net Income p.a.	Social Status	Net Income p.a.
Less than 0	0	9	19,683
0	1	10	59,049
1	3	11	177,047
2	9	12	531,441
3	27	13	1,594,323
4	81	14	4,782,969
5	243	15	14,348,907
6	729	16	43,046,721
7	2,187	17	129,140,160
8	6,561	18	387,420,480

This may also be used to indicate the amount offered by a patron initially - perhaps 2-12% or 20-120% of the patron's annual income, depending on the danger involved. Also it may represent the income accruing to a noble player due to his ancestral fief.

Special Levels of Social Status

Social Status	Situation
-5 or less	Condemned to death
-2 to -4	Slave
-1	Imprisoned
0	Wanted criminal
1	Suspected criminal
2-10	Normal
11-15	Nobles
16	Prince - next in line to rule a planet
17	King - ruler of a planet
18	Emperor - ruler of more than one planet

Ancestral estates may be portions of large worlds, or small worlds in their own right. The population level of an ancestral fief is equal to the controlling noble's status less 9, so perhaps the player has a small world waiting for him when his eight older brothers drop dead!

Social Status and Crime

When infringing the law, roll over the Law Level on 2D6 to avoid arrest. DM: + Social Status, -7. (You can get away with it, you just have to be rich!) This gives some meaning to law levels over 12.

If arrested, throw law level or under to be convicted, DMs: subtract the prosecution's law expertise, add the defence's law expertise. Forged papers etc. give additional DMs at umpire's discretion.

If convicted, penalties are in the form of losses of status. One status level will be lost for minor offences; 1D6 status levels are lost for things such as theft, fraud, forgery etc.; 2D6 levels are lost for mugging, burglary and assault; and 3D6 levels for murder, treason etc.

These penalties are most effective in reducing income and seldom result in jail unless something really nasty is done (a player in jail is an unhappy player).

Lawyers may be hired at the following costs per case:

Lawyer-1	3,000 Cr	Lawyer-4	81,000 Cr
Lawyer-2	9,000 Cr	Lawyer-5	243,000 Cr
Lawyer-3	27,000 Cr	Lawyer-6	729,000 Cr

Incrementing Social Status Level

It is recommended that players retire characters of social status 16+, although they may still participate by being burgled, generating commissions etc.

Adventurers may increase their family's status by accumulating Status Experience Points or SEP. When a character accumulates a number of SEP equal to his current status level, his status level is increased by one and he loses all SEP so far gained.

SEP may be gained as follows:

- 1 SEP per 1,000,000 Credits amassed.

- 2 SEP per 1,000,000 Credits wasted.

- 1 SEP per level of glamourous skill acquired, e.g. Pilot, Leader.

- 1 SEP per promotion.

- 1 SEP per year served as a slave or prisoner.

PSIONIC SPECIAL TALENTS

It is rare for someone to acquire only a special talent, so it is suggested that special talents enhance the other ones. Below are given some examples of additional tricks a psionic can perform if he has the stated talent and a special talent. These extras can only be used when the talisman is to hand; the talisman also confers 1D6 extra psionic strength points, but these do not in any way affect the maximum strength attainable.

Clairvoyance and Special Talents

Persons with this combination may use their clairvoyant abilities through time as well as space; count one second forwards or backwards as equivalent to one metre of range. In game terms, the player may ask the umpire a number of questions equal to his clairvoyance level, which the umpire must answer truthfully "yes" or "no". (See Frank Herbert's Dune trilogy for a well-handled account of such abilities.) Due to the mechanism of the hyperspace Jump, persons with this combination, whether or not they have their talisman are likely to feel nauseous and confused for 1-6 days after such a Jump. Roll 2D6, DM -7, + endurance. If the score is lower than or equal to the psionic's clairvoyance level, he has fallen ill.

Telepathy and Special Talents

This combination enables the psionic to affect reaction tests. One creature or person per level can be affected, and a DM equal in size to the number of strength points expended is added to or subtracted from the reaction test at the psionic's discretion. (This is from an idea in Larry Niven's A Gift From Earth.) Further, such combined talents may be used to penetrate telepathic Shields; when penetrating a Shield, count psionic strength and level as half normal, rounded down.

Telekinesis and Special Talents

This combination gains the ability to affect temperature. Instead of telekinesis on an object in the normal manner, they may choose to raise or lower its temperature by one degree centigrade per telekinetic level per strength point expended. This can be used as a lethal weapon by raising the temperature of the brain by a few degrees - ten should be enough for death. The brain weighs one to two kilos.

Teleportation and Special Talents

This combination gives the power to do two new tricks: First, to teleport another being or object instead of oneself; and second, to teleport forwards or backwards in time. Count one second as equal to one metre for range costs. As with normal teleportation, it is up to the player to specify possible hazards and how he will avoid them. This is the hardest talent to umpire, so it's just as well it's the rarest. (The idea comes from Poul Anderson's There Will Be Time, and reading that will show the best way to handle the talent.)

These persons suffer from Jumps in the same way as Clairvoyance and Special Talents.

Awareness and Special Talents

Such persons may enhance dexterity on the same terms as strength. Further - and I like to think this is part of the reason for anti-psionic prejudice - instead of expending a psionic strength point to enhance one of their own characteristics, they may "drain" points from another intelligent being's strength, dexterity or endurance in order to gain an equal number of psionic strength points. However, the range cost must still be paid so this works best at close range.

And there you have it. Since starting this series, there have been new rules sets - notably Traveller Book 4: Mercenary and Starquest - which duplicate or render obsolete, in a

sense, parts of these suggested rules; however, I have lethargically not done anything about it.

It is also inevitable that I have unwittingly plagiarised the work of other umpires and rules sets; I apologise in advance for this. A lot of material has been taken from SF books. Where this has been done I have tried to credit the author and book concerned.

Finally, there are inevitably going to be mistakes in my assumptions or working out; and I will be glad to hear from anyone spotting one, but I leave you with this thought: *If I knew how starships really worked, I'd be writing to the Patents Office, not White Dwarf.*

AUTHOR'S NOTES

The social status rules still survive in a mutated form in Social Class in 2300 AD, published in Challenge *magazine in the 1980s, although I didn't realise it until I converted both to be hosted on the Web; and the psionic special talents rules are unique amongst the Expanding Universe series in remaining in use in my campaign almost unchanged for over twenty years.*

Some time after the series was published, it was updated and reprinted in The Best of White Dwarf Articles. In hindsight, this was a mistake, and they should have been reprinted as originally written; so you will not see the updated versions on this website.