Space Opera

Volume 2

5.0 GENERAL EQUIPMENT LISTS

The following items represent some of the equipment available for use in Space Opera. Virtually all such equipment is single-system design. However, vehicles are multi-system units.

5.1 SURVIVAL EQUIPMENT

CWC COLD WEATHER CLOTHING: A complete set of clothing that will protect the wearer from the effects of exposure and frostbite. Several versions are available:

CWC Model	A	B
Temperature	-125⁰F1-87⁰C	-75⁰F/-59⁰C
Weight	15% body mass	10% body mass
Cost (CR)	1250	600
CWC Model	C	D
Temperature	-50⁰F/-45⁰C	-25⁰F /-32⁰C
Weight	7% body mass	5% body mass
Cost (CR)	250	100

WWC WARM WEATHER CLOTHING: Air-conditioned clothing which will protect the wearer from the effects of temperatures up to 1500 F/65⁰C and high humidity. It weighs 5% of body mass and costs CR 900. It is ideally suited to tropical jungle conditions and normal desert/steppe conditions. The material will not rot from exposure to humid conditions, fungi, etc.

SSDPC 'STILLSUIT' DESERT PLANET CLOTHING: A highly efficient set of protective clothing which provides a~ almost self-contained environment. Heavy emphasis is placed upon conservation of body water through the use of sealed zips, filtered face masks or nose filters, and a water/waste reclamation system that is muscle. powered. Goggles also provide protection against wind-blown grit and sand. The units may be air-conditioned at an additional expense of CR 350 to increase protection +25OF/+14OC over standard limits, Basic StillSuits cost CR 500 and give protection in temperatures up to 160⁰F/71⁰C. Weight is 7% of body mass,

SH SHELTER HALF: A sheet of waterproof material 1.5m x 2.5m, with provision to be ziplocked to another shelter half to make a full tent, Mass = I kg, Cost = CR IC. The lightweight material will fold into a space equivalent to that of several packs of cigarettes.

TENT: A basic lightweight tent for 2 persons made of the same lightweight waterproof material as a shelter half, but it includes a floor, ,end flaps, tent poles of light telescoping construction, and pegs. Larger tents are also available. Mass = 3 kg. Cost = CR 45.

CWT COLD WEATHER TENT: A basic lightweight tent for 2 persons which is insulated against the cold. It can be heated most satisfactorily with a CWH Cold Weather Heater. Mass = 5 kg. Cost = CR 125.

CWH COLD WEATHER HEATER: A lightweight heating unit which runs on hydrox fuel cells. The CWH will warm a cold weather tent so that temperatures will remain above freezing in outside temperatures up to .125OF/.870C. Duration = 120 hours (5days) minus 1 hour per -10⁰F/5.5⁰C below freezing (per day). Mass = 3 kg. Cost = CR 40. Fuel cells cost CR 9 and mass 2 kg. Mass of heater includes one fuel cell. The unit can also be used for cooking, with I hour of fuel used per 2 litres of food cooked (litre = about 1 kg of solid food or else boiled water).

HWT HOT WEATHER TENT: A basic lightweight tent for 2 persons which is insulated against the heat and may be sealed to provide water security. Mass = 5 kg. Cost = CR 125. A powercell operated refrigeration unit may be acquired at CR 350 which provides cooling for 96 hours of operation. Mass = 2.5 kg. Cooled tents are equivalent to StillSuits for overall protection.

PT PRESSURE TENT: A basic shelter for two persons which provides standard atmosphere and living conditions for 168 hours (7 days). The unit includes an air reclamation system and a powercell operated heating/cooling system with a survival range from 150⁰F/.1O1OC to 212⁰F/100⁰C. Mass = 25kg. Cost = CR 2000. Larger, heavier models are also available.

PFC (UP) PRE-FABRICATED CABIN (UN-PRESSURISED): A modular un-pressurised unit providing quarters for 6 persons. Area = 2.5m x 6m. Cold or hot weather options can be obtained, giving an endurance of 2 weeks for 6 persons. Mass = 2.5 tonnes for basic unit. Cost = CR 7500. Cold and/or Hot Weather options add CR 2500 and 1 tonne mass each.

PFC(P) PRE-FABRICATED CABIN (PRESSURISED): A basic shelter for six persons which provides standard atmosphere and living conditions for 30 days, The unit includes an air reclamation system, and a mini-fusion reactor heating/cooling system giving a survival range from -250⁰F/-157⁰C to 400⁰F/204⁰C. The unit is modularised and has a volume 2.5m x 3m x 6m. Mass = 10 tonnes. Cost = CR 25000. Such features as airlocks, etc., are standard.

SLEEPING BAG: An insulated sleeping bag is available in 4 versions, corresponding to CWC Cold Weather Clothing types. All mass 2 kg. Type A costs CR 250, Type B CR 150, Type C 60, and Type D CR 40.

RESPIRATOR: An oxygen-delivering mask covers the nose and mouth (some versions will cover the entire face). The unit is for use in atmospheres where protective Suits aren't needed, but the oxygen levels are too low to sustain life or to permit strenuous activity. It provides 6 hours of oxygen on chemical purifiers (re-breather type), and the chemicals may be reused if they are heated to burn Out the 'impurities.' Powered filter masks cost CR 175 and have a 168-hour (7 days) endurance before the powercell must be recharged/replaced.

OXYGEN BREATHING APPARATUS: A self-contained breathing system utilising a facemask or mouthpiece and oxygen tanks. A tank of oxygen lasts 3 hours and costs CR ISO. The breathing mask, hoses, and adapter cost CR 100. A standard unit consists of two tanks and breathing equipment, for a mass of 5 kg and a cost of CR 450. A chemical purifier system is available at CR 50 to increase breathing time by 100%. A powercell purifier system is available at CR 250 to increase breathing time by 1600% (96 hours on two tanks). The units are usable in underwater conditions as SCUBA gear, as well as in dangerous atmosphere and in low-pressure or vacuum conditions.

ARTIFICIAL GILL: A powercell operated unit which extracts oxygen from surrounding water. It has an endurance of 48 hours on a power-cell. The Gill is usable Only on planets with a sufficient oxygen atmosphere to permit the waters to contain a reasonable oxygen content. Mass = 2,5 kg. Cost = CR 1000.

SCUBA SUIT: A protective underwater suit, including swimming fins and face mask. Mass = 2 kg. Cost = CR 125.

PROTECTIVE SUIT: An all-purpose coverall of syntheleather mesh (armour class H) which will provide protection against most corrosive chemicals and atmospheric Constituents, poison gases (including nerve gases), etc., as it is sealed against the atmosphere, Mass = 5 kg. Cost = CR 400. The suit can be worn over other clothing and may be totally sealed if oxygen breathing apparatus is used with it. It is not, however, a full-fledged vacuum suit in a sealed condition; for it cannot with-stand large pressure differentials.

ROPE: A variety of different types of rope are available, all of 30m (100 ft.) lengths:

Rope Type	Nylon A	Nylon B	Synthelon A	Synthelon B	Duralon
Break, Strain	1500 kg	2500 kg	2500 kg	4000 kg	5000 kg
Breakdown No.	1/15	1/15	1/15	1/15	1/15
Mass	1.5 kg	2.25 kg	1 kg	1.5 kg	1 kg
Cost (CR)	10	16	20	27	30

WIRE LADDERS: A variety of very compact wire ladders are avail. able in 6, 9, and 15 meter lengths. Mass = 2 kg for 6m ladder, 3 kg for 9m ladder, and 4 kg for 15m ladder. Cost = CR 5 per meter. The ladders are designed to be joined together if necessary.

BACKPACK: An 'H' frame lightweight backpack with a capacity of 30 liters/3C kg or 60 liters/60 kg Weight = 2 kg. Cost = CR 35.

JERRYCANS: Both plastic and metal jerrycans are available for storage of water, fuel, and other liquids, They come in 10 litre and 25 litre capacities. Mass = 1/2 kg for plastic 10L/25L and 2/4 kg for metal 10L/20L. Cost = CR 10 for 10L and CR 15 for 25L containers.

FIELD RATIONS: Standard rations which will sustain a man (or equivalent) for 1 day. Mass = 500gm. Cost = CR 2.50. Bulk purchases of 100 ration packs (50 kg) may be made at a reduced cost of CR 200. The food is quite tasty, with many items dehydrated to save weight. (These are cooked).

CONCENTRATED RATIONS: Food lozenges suitable for a space-suit or Power Armour dispenser may be obtained which provide a full days' requirement in 100 gm. Cost = CR 275 for 100 lozenges (10 kg). The food is not superb' cuisine by a long shot, but it can be tolerated for quite some time.

5.2 COMPUTERS

The computer or, more correctly, the MultiComputer, is an ultra-high performance data processing system with storage capacity measured in thousands of data processing units (kdpu). One data processing unit or dpu is roughly equivalent to 100,000 bits, so the capacity of the largest units is almost vast enough to store much of the significant knowledge of the race. In addition to being able to run a great many programs simultaneously, such Units can store data equivalent to the largest libraries today for instant reference and inclusion in any program being run. All MultiComp units are capable of 'managing' the automatic functions of highly complex multi-systems like Starships and even Cities, particularly the higher 'marks' (Mk.)

The mass of such units includes only the main systems. Each terminal adds additional mass, usually in the neighbourhood of 25 kg. Also, for each Tech level a producing culture is below the Tech level given for a particular Mk. of Multi-Camp, increase the mass x5. Thus, a Tech/7 version of a MultiComp Mk, VII would be 5 x 5 x S x 5 x 7.5 tonnes = 937.5 tonnes. This reflects the inferior technological capacities of a lower level culture. Similarly, reduce the mass of computers rated at a lower Tech level by 1/2 far each Tech level that the producing culture is above the rating. Thus a Tech/IC version of a MultiComp Mk. is 1/2 x 1/2 x (/2 x 500 kg = 62,5 kg, reflecting the superiority of Tech/IC technology.

MultiComp Mk.	I	II	III	IV	V	VI	VII
Tech Level	6-7	7	7	8	8	8	9
Mass	500 kg	750 kg	1000 kg	2t	3t	5t	7.5t
CPU	100 kdpu	250 kdpu	500 kdpu	1000 kdpu	2000 kdpu	5000 kdpu	7500 kdpu
Data Bank	500 kdpu	1260 kdpu	2500 kdpu	5000 kdpu	10 000 kdpu	25 000 kdpu	37 500 kdpu
Time Factor	0.25	0.15	0.1	0.05	0.025	0.01	0.08
Cost (CR)	100 000	250 000	500 000	1 000 000	2 000 000	5 000 000	7 500 000

MultiComp Mk.	VIII	IX	X	XI	XII	XIII	XIV
Tech Level	9	9	10	10	10	10	II
Mass	10t	12.5t	1St	20t	25t	50t	50t
CPU	10000 kdpu	12 500 kdpu	15 000 kdpu	20 000 kdpu	25 000 kdpu	50 000 kdpu	100 000 kdpu
Data Bank	50 000 kdpu	62 500 kdpu	75 000 kdpu	100K kdpu	125K kdpu	250K kdpu	500K kdpu
Time Factor	0.06	0.05	0.04	0.03	0.02	0.01	0.005
Cost (CR)	10 000 000	12 500 000	15 000 000	20 000 000	25 000 000	50 000 000	100 000 000

The cost of a computer rated at a lower Tech level than the producing culture is reduced by 3/5. A Tech/9 culture can therefore produce a Mk. VI MultiComp at 3/5 x 5,000,000 = 3,000,000 credits.

Mk. X MultiComp and higher Mk.s are sentient (that is, they are aware in the same fashion that a living being is aware), for their circuitry rivals in complexity the nerve synapse systems of the brain. However, the volitional capacity ('free will') of such units is quite restricted, and the spectre of a cybernetic revolt is unlikely. Indeed, the partnership between such units and their creators is usually congenial, and 'cybernetic rights' to personal computer time have been established in most cultures to maintain the units at maximum 'happiness' (efficiency). Further, there are too many safeguards and back-up systems to permit such a unit to run amok; at least 3 separate systems are hooked in tandem, and any component exhibiting any form of malfunction or aberrant behaviour is instantly isolated and repaired.

A vast range of MultiComputer programs are available. They are rated interns of the kdpu of capacity required to store them in the data bank and to run the program in the CPU or central processing unit. The number of programs that may be run simultaneously in the CPU is equal to the CPU's capacity. All units have a Breakdown No, of II.

Some of the programs and players as needed:

TITLE	**KDPU SIZE**	**CR COST**	**PROGRAM**
ROUTINE PROCEDURES			
Library I	50	20 000	General Encyclopaedic information
Library 2	10	5000	Recreational programs.
Library 3	1000	20 000	Technical data on ship's systems.
Library 4	1500	100 000	Research level data (science).
Library 5	5000	250 000	Universal Encyclopaedia.
Ship's Systems	I/1000t	500/kpdu	Computer monitors/controls basic ship's systems.
Life Support I	10	15000	Computer monitors/controls life support for 1-20 crew.
Life Support 2	20	25 000	Computer monitors/controls life support for 21-100 crew.
Life Support 3	50	100 000	Computer monitors/controls life support for 100+ crew.
Galley 1	3	5000	Computerised galley.
Galley 2	5	10 000	Computerised galley, with Cordon Bleu cuisine.
Astrogation 1	10	20 000	Starmap library and star-sight analysis program for basic navigation and sub-light course plots.
Astrogation 2	50	20 000	Spatial anomaly analysis program for computing approaches.
Astrogation 3	50	20 000	HyperJump course computation.
Astrogation 4	50	20 000	Discontinuity drive course computation. Tech/10.
Hyperjump 5	10	10 000	Tech/7 Computer monitors/controls phasing of Ship during HyperJump. Programs is run simultaneously with Astrogation 3, and ship's position is computed at point of emergencies. Program numbers refer to the distance of the HyperJump possible.
Hyperjump 10	20	15 000	Tech/7
HyperJump 25	30	20 000	Tech /7
HyperJump 50	40	30 000	Tech/8

HyperJump 100	50	40 000	Tech/8
Hyperjump 250	60	50 000	Tech/9
Discontinuity	20	20 000	Tech/7 Computer monitors/controls warp drive.
Auto-Nav 1	10	5000	Automatic pilot for sub-light drive.
Auto-Nay 2	30	20 000	Automatic pilot for warp drive (discontinuity).
Servo-Mech	30	20 000	Cybernetic monitoring/control of maintenance robots.
Damage Control	20	20 000	Emergency procedures program.
Security	10	5000	Computer monitors activities of passengers and crew and institutes security precautions when a hijack or other suspicious activity seems imminent.
Engineering	200	45 000	Computer monitors/controls routine power plant and drive unit operations.
SURVEY PROCEDURES			
Stellar Analysis	10	10 000	Computer analysis of spectrographic and other data,
Planetary Survey	50	20 000	Computer analysis program for gravity, atmosphere, surface temperatures, general climate, surface terrain (computer map), radiation levels. etc.
Astronomical Survey	50	25 000	Computer analysis program far analysis of solar system--orbits of planets, etc.
Comparative Cultures	50	30 000	Computer analysis program for comparison and evaluation of contacted cultures to known types. with delineation of observed cultural patterns, political and social structure, etc.
Linguistics	50	20 000	Computer analysis program decoding alien language groups and providing computerised translation.
ecosystem	50	30 000	Comprehensive computer analysis programs for determining ecological factors on a planetary surface.
Sensor Probe	30	15 000	Tech/8 Programs to analyse composition of observed subject.
BIOMEDICAL PROCEDURES			
Medical 1	100	20 000	Library on racial medicine.
Medical 2	100	35 000	Cybernetised diagnosis and recommended procedures for racial medicine,
Medical 3	200	35 000	Library on Exo-Medicine.
Medical 4	100	40 000	CyberneticiSed diagnosis and recommended procedures for racial and Exo-Medicine.
Biomedical	500	60 000	Comprehensive programs for diagnosis and treatment of all known races, plus research programs for fast and efficient analysis of new exo-biologies and detection of pathogens.
BATTLE PROCEDURES: SITUATION ANALYSIS			
Tactics (R)	100	50 000	Tech/7 Computer analysis of 'enemy' intentions based on known tactical doctrines; in attack/defence.
Identification	50	20 000	Computer analysis of detector and sensor probe data to identify target vessel by type, racial origin, and known capabilities.
Battle Display (R)	25	10 000	Tech/7 3-D battle display and read-out for all ships in detector range; 2% DM in attack/defence,
BATTLE PROCEDURES: OFFENSIVE ACTION			
Target Lock-On 1	10	25 000	+2%DM (Tech/7) Program predicts target manoeuvres/evasions.
Target Lock-On 2	20	50000	+4%DM (Tech/7) Program predicts target manoeuvres/evasion.
Target Lock-On 3	30	75 000	+5%DM (Tech/8) Program predicts target manoeuvres/evasion.
Target Lock-On 4 (R)	40	100 000	+6%DM (Tech/B) Program predicts target manoeuvres/evasion.
Target Lock-On 5 (R)	50	125 000	+8%DM (Tech/9) Program predicts target manoeuvres/evasion -
Target Lock-On 6 (R)	60	150 000	+10%DM (Tech/ICI Program predicts target manoeuvres/evasion.
Director	20	10000/gum	Program required for each weapon battery on computer-assisted fire control.
CyberLink	10	5000/gum	Program required for gun layer to employ computer-assisted fire control, then to exercise personal command to add gunner expertise DRM upon firing.
Target Selection	10	5 000/gum	Program required for gun layer to fire at specified target area on enemy ship; -10 %DM to hit.
Missile 1	10	5 000/missile	Computerised missile launch control.
Missile 2 (R)	20	5 000/missile	Piloted control of missile after launch. Add Pilot DM.
Missile 3 (R)	30	10 000/missile	Computer guidance control of missile after launch. Add computer DM and Predict DM.
Multiple Targeting 2	50	25 000	Program required to engage 2 targets simultaneously with computer-assisted fire control (1 target per battery).
Multiple Targeting 3 (R)	75	50 000	Program required to engage up to 3 targets simultaneously.
Multiple Targeting 5 (R)	100	75 000	Program required to engage up to 5 targets simultaneously.
Multiple Targeting 10 (R)	150	100 000	Program required to engage up to 10 targets simultaneously. This program is restricted to Tech 9+ Starships of the Line (Heavy Cruisers, Battlecruisers, BattleStars).
Master Fire Control (R)	200	275 000	Comprehensive Tech/10+ fire control program incorporating Predict 6, Director (10), Gunner Interact, Select Target, Missile 1/2/3, Multi-Target 5 or 10. Strictly restricted to military vessels of Cruiser class and up.
BATTLE PROCEDURES: DEFENSIVE ACTION			
AutoNav: Evasive 1	10	20 000	Tech/7 Evasion program; -4%DM on enemy attacks.
AutoNav: Evasive 2	25	30 000	Tech/8 Evasion program; -6%DM on enemy attacks.
AutoNav: Evasive 3	50	40 000	Tech/9 Evasion program; -8%DM on enemy attacks.
AutoNav: Evasive 4	75	50 000	Tech/10 Evasion program; -10%DM on enemy attacks.
			All Auto-Evade programs may be engaged when Auto-Nav is running simultaneously in the main Computer.

PilotNav: Evasive 1	25	20 000	-25% pilot's expertise on enemy attacks (minimum -1%DM).
PilotNav: Evasive 2	50	30 000	-50% pilot's expertise on enemy attacks (minimum -1%DM).
PilotNav: Evasive 3	75	40 000	-100% pilot's expertise on enemy attacks (minimum -1%DM).
			PilotNav: Evasive programs may be augmented by computerised AutoNav : Evasive programs, but gunnery of a ship under full evasion is reduced by a DRM equal to the DRM reduction to enemy hit probabilities. PilotNav programs are also used for all routine manoeuvres under direct pilot control.
Auto-Fire	25	10000	Automatic return fire if attacked.
Anti-Missile 3	50	50 000	Computerised fire control on 1-6 incoming missiles Program may be employed with CyberLink and Target Lock-On programs (equivalent to Multiple Targeting, but only for defensive purposes).
Force Screen	50	10 000	Program synchronises and maintains defensive screens. One program required for each screen maintained.
ECM I	50	10 000	Detection jammer to reduce enemy gunnery -2%DM per EW superior.
ECM2	50	30000	Multi-image target; 2-6 images of ship appear on enemy detectors to confuse incoming missiles/ enemy gunners. Visual sighting is required to deter. mine actual position of ship. -2%DM on enemy attacks per image appearing. Tech/10+ electronics countermeasures program.
ECM 3	20+	10 000	Communication jammer to prevent enemy transmissions; also a counter-jamming program.

ROUTINE PROCEDURES

Library: Much of the detailed information concerning the known universe is contained in the encyclopaedic information program, and these are regularly consulted by crew and passengers. It should be noted that some information will be incomplete or in error, even non-existent. Technical data (Library 3) is essential for significant repairs to damaged ship's systems to be performed. Research data (Library 4) contains highly detailed information on a variety of scientific disciplines which would be required to undertake serious research. The Universal Encyclopaedia (Library 5) contains all of the basic knowledge of the race (to its Tech level), and military and survey ships have highly classified data as well, under coded need-to-know and even self-destruct interlocks to prevent unauthorised access. Technical programs tend to be very accurate and are regularly employed by Science Officers, Astrogator's, Engineering Officers, etc., in the course of their duties. In any case, the chance of error or incompleteness of information must be decided by the StarMaster as is appropriate to the situation and the nature of the questions asked of the computer. Retrieval time: variable, from seconds x computer speed to days.

Ship's Systems: Routine programs to monitor and regulate the many secondary systems aboard ship, illumination, automatic doors, etc.

Life Support: Program to monitor and regulate the internal temperature, atmospheric pressure and composition, hydroponics and emergency systems, etc. When running in tandem with a medical program, it is possible to monitor the life responses of each person fitted with biomedical telemetry. Life support programs are not essential, but their absence requires a crewman to maintain regular watch and adjust the systems when required.

Galley: Programs which operate automated galley facilities and which also contain recipe libraries. Galley 2 will have not only racial recipes for haut cuisine but also information on the preparation of alien foods—essential to passenger vessels carrying a variety of races.

Astrogation: A series of programs required to plot courses and manually navigate the vessel under various conditions. Setting courses may require computer speed x seconds, minutes, or hours, depending upon the nature of the procedure. Known courses are retrieved almost instantly from the memory banks, as are standard manoeuvres.

HyperJump: Programs which are run simultaneously with Astro 3, interfacing the course program with the phase-shift generators to take the ship to the plotted destination. A HyperJump program is merely the control program and must be directed by the course figures fed into it. Manual course directions are possible (in case of a malfunction of Astro 3), but course setting will take many hours as a program must literally be written by the Astrogator.

Discontinuity: Program which is run simultaneously with Astro 4, interfacing the course program with the warp-drive units to produce the discontinuity field which places the ship slightly out of phase with the normal space-time continuum and so permits FTL speeds.

Auto-Nav: Auto-pilot programs permitting the main computer to con the ship. When interfaced with a simultaneously running Auto-Evade program, Auto-Nav will make course corrections to avoid objects in space, etc.

Servo Mech: Program to monitor and direct cybernetised maintenance systems and robots. Such systems are typically found on large vessels, but may be installed on small ships as well to reduce crew and increase safety.

Damage Control: Emergency procedures program automatically activated whenever any of the ship's systems malfunction or the ship is hulled, and the lives or safety of the crew and passengers are endangered. Closing of air-tight doors, emergency alarms, activation of backup systems, alerting of Servo-Mech systems, etc., are included in this program.

Engineering: Program to monitor and control routine power plant and drive unit operation, with technical data interface with Library 3, Ship's Systems, Life Support, Servo-Mech, and Damage Control programs, as required. Mandatory program on all Starships.

Security: An internal security program which monitors suspicious activities and automatically locks doors and imposes coded interlocks on key systems when a hijacking or other related action seems apparent. Such measures can be thwarted by rolling 1d6 and obtaining a result of 1 or 2.

SURVEY PROCEDURES

Stellar Analysis: Program to analyse spectrographic and other astronomical data about a particular star. Retrieval time = computer speed in minutes. When running simultaneously with an Astrogation program, bright marker stars are automatically analysed and compared to data on known stars in the memory bank for identification--most useful in finding out the position of the ship after an Anomaly Jump or HyperJump has resulted in the ship's becoming lost.

Planetary Survey: Program to analyse sensor and visual data to determine basic planetary conditions from the ship while in orbit or when grounded. Local data may also be transmitted for computer analysis by landing parties. Some error is likely during initial observation, but as data is collected over time, accuracy increases significantly. Retrieval time = computer speed in seconds, minutes, or hours, depending upon the type and complexity of the questions posed for analysis, and whether data is already stored in the memory bank.

Astronomical Survey: Program to chart the major bodies in the star system, compute orbits, orbital speeds, distance from primary, etc. Retrieval time = computer speed in hours (to account for astronomical scanning time). Known systems have retrieval time in seconds.

Comparative Cultures: Contact program to analyse alien cultures. The program is regarded as essential by Contact Officers, who must recommend procedures for approaching unfamiliar cultures. For example, the program requires Library 5 to reach reasonably accurate results, while Library 1 is too general to produce more than a sketchy analysis (often inaccurate or incomplete in many respects). Library and Comparative Culture programs must be run simultaneously for analysis. Retrieval time = computer speed x hours or days, depending upon the amount of data on known races is a matter of seconds or minutes, depending upon the completeness of the read-out.

Linguistics: Contact program to analyse alien languages. For analysis, the program requires Library 5 to be accurate, while Library 3 will not produce more than a basic vocabulary of several hundred words and phrases. Retrieval time computer speed x hours for basic speech: computer speed x days or weeks for fluent speech. It is assumed that sufficient data (in the form of actual alien speech patterns and tangible referents for comparison to racial language equivalents) has been acquired to permit accurate translation into familiar symbolisation. Furthermore, some alien races have concepts and behavioural requirements so alien to others that translation of some elements of the language will prove impossible over the short term. Speech patterns derived from known languages (say, the language of a 'lost' colony speaking a variant of Ancient Anglish) can often be analysed in minutes. Once a language has been decoded, simultaneous computer translation is possible.

EcoSystem Survey: A highly complex program to analyse and provide extrapolations of possible life form and their relationships in the planetary environment. The program requires preliminary data from a Planetary Survey and must be run simultaneously with a Library 5 program to interface all known data with the data obtained on specimens gathered and observed on the new planet's surface. Depending on the range of specimens found, the depth of the problem set, and the accuracy of data obtained, retrieval time = computer speed x minutes, hours, days, weeks, or even months. Generally, preliminary analysis of a particular life form is possible in minutes. More complex problems take longer. Where known planets are involved, retrieval time is in seconds. StarMasters should work in some degree of inaccuracy or incompleteness when answering, especially in the earlier stages of the survey. Further, when interfaced with a Medical 5 programs, detailed analysis of micro-organisms, etc., can be made.

Sensor Probe: A program which analyses data and provides chemical and physical analysis of the 'target' or subject of the probe. When interfaced with the ship's Library 5 program, known objects or beings can be analysed with great accuracy, and biomedical data can be obtained by interfacing with medical program.

BIOMEDICAL PROCEDURES

Medical I: Standard reference library on all significant aspects or racial medicine.

Medical 2: Program to monitor/regulate computerised medical systems and, when interfaced with Medical I programs, to make diagnoses and recommendations for treatment.

Medical 3: Standard reference library on significant aspects of exomedicine.

Medical 4: Program resembling Medical 2. except with application to alien life forms on which data has been acquired.

Medical 5: Comprehensive programs which, when interfaced with Medical 1/2/3/4, will provide detailed diagnosis and treatment procedures for all known life forms; regulate and monitor automatic medical support systems; operate cybernetised surgeries, pharmacies, and culture labs; and conduct computer research on a wide variety of medical subjects. When interfaced with EcoSystem programs, detailed analysis of pathogens may be performed.

Retrieval times will vary. Generally, routine procedures on known life farms will produce answers in seconds. Diagnosis may require significantly longer periods, depending upon the symptoms and the illness itself. Research may take considerable time.

BATTLE PROCEDURES: SITUATION ANALYSIS

Tactics: A restricted program reserved for military use, but which may be obtained by commercial vessels venturing into dangerous regions of space (upon passing a rigorous security check). The program contains data on all known tactical doctrines of races with which contact has been made or hostility has been encountered. When engaged, the program can assess with a high degree of probability the likely intentions of a ship from its manoeuvres. When engaged, the program enhances offensive and defensive capability.

Identification: A program containing all known configurations of ships with which contact has been made or hostility has been encountered. It is routinely engaged whenever the detectors reveal the presence of a ship within detector range. Enemy vessels so identified produce an automatic alarm.

Battle Display: A restricted program reserved for military use. A holographic 3-D display presents the region around the ship in a 'battle tank,' with full read-outs on speeds, courses, power manoeuvres, defensive screens, apparent armaments, and identification of type and, racial origin. The system can also be used to identify asteroids, etc., within detector range. The program must be interfaced with Tactics and Identification, and is essential to the operation of Multiple Target 5/10 or Master Fire Control programs. Rarely is it employed on ships of less than Light Cruiser class. Offensive/defensive capability is enhanced when the program is engaged.

BATTLE PROCEDURES: OFFENSIVE ACTION

Target Lock-On: A series of programs which analyse courses, manoeuvres, and evasions of vessels in order to predict their future positions and so permit accurate fire control. Target Lock-On 1/2/3 programs are generally available, but Target Lock-On 4/5/6 programs are restricted to the military. When interfaced with Tactics and Battle Display programs, DMs for Tactics and Battle Display may be added to Target Lock-On DMs. Full Target Lock-On DMs are added to energy weapon hit probabilities, Missile 2/3 programs. Missile 1 programs add 'A the DRMs for Target Lock-On (rounding fractions down) if target is evading.

Director: A gunnery direction program which is required for each weapons battery on computerised fire control (Target Lock-On). Six batteries, for instance, would require six programs, as fire is by salvo to 'bracket' the target. When more than 10 batteries are involved, 10 programs will provide control.

CyberLink: A program allowing the gun layer of a weapon battery to interface his own expertise with computerised fire control.

Target Selection: A program allowing the gun component of a weapon battery to aim at a specific section of the target, but with reduced chances of hitting. Only PC gunners under independent control may use this rule. Critical hits penetrating the hull will strike sections aimed at.

Missile: A series of programs to effect control of missile launches. Missile 1 is comparable to launching torpedoes, and full Target Lock-On DRMs are applicable only if the target fails to evade. Missile 2 is a program requiring a pilot to guide the bomb once it has been launched, bringing pilot expertise and full Target Lock-On DMs into play, and also permitting evasive manoeuvres to avoid anti-missile fire. Only the largest and most sophisticated missiles may be piloted. Missile 3 is a program requiring a computer to guide the bomb after launch, with full Target Lock-On DMs being added to its hit probability. Using Missile 1, a maximum spread may be fired. Missile 2 and 3 permit control of 2 missiles under guidance.

Multiple Targeting: A series of programs permitting computerised fire control to engage more than one target. Each weapon battery may engage only a single target, but the computer can handle fire Control data to direct fire at as many targets as specified by its program number

Master Fire Control: A program incorporating Tactics, Identification, Battle Display, Target Lock-On 7/8. Director (10+ batteries), CyberLink, Target Selection, Missile 1/2/3, Multiple Targeting 10, Auto-Fire (see Defensive Procedures), and Anti-Missile (see Defensive Procedures). Tactics/Identification/Battle

Display are always operational at CDPC 4 and will automatically sound Battle Stations on detection of hostile ships or potentially unfriendly manoeuvres, and the ship will be brought to instant readiness or computer control. (ECM and Force Screens may also be interfaced.) The ship will engage on computers, if required, if the crew has not closed up to battle stations. Such systems are generally reserved for Heavy Cruisers, Battlecruisers and BattleStars.

BATTLE PROCEDURES: DEFENSIVE ACTION

AutoNav: Evasive: An auto-pilot program series which must be interfaced with a simultaneously running AutoNav program for computer control, or else which may be engaged with a **PilotNav**: Evasive program to augment the pilot's evasive manoeuvres.

PilotNav: Evasive: A series of programs run when a pilot has direct control of the ship and is maneuvering or evading enemy fire.

Auto-Fire: A program which instructs the computer to immediately return fire on any ship opening fire on its vessel. The program is used to provide defensive fire against incoming missiles or else offensive fire against an attacking ship, depending crew reaction.

Anti--Missile: A program permitting full computerised fire control on I, 2, or 3 incoming missiles. The program may be interfaced with Gunner Interact and Predict programs, but is designed to range missiles and cannot be employed as an offensive Multi-Target program. On the other hand, Multi-Target programs may function as Anti-Missile programs.

Force Screen: Program to monitor and control force screen operation. Often, the program is immediately activated when an unidentified ship comes into detector range.

ECM 1: Electronics counter-measures program which 'blinds' enemy detection apparatus somewhat and reduces their gunnery accuracy. Several ECM programs (up to 3) can be run simultaneously, but the gunnery of one's own ship is reduced when 2 or 3 are engaged.

ECM 2: Electronics counter-measures program which causes from 2 to 6 'echoes' to appear on enemy detector screens, with appropriate reduction in their gunnery. If more blips appear than are in the enemy's Predict programs number, the differences is added to the defensive DM. For example, suppose 5 'echoes' are created and the enemy's Predict program is No. 3. The defensive DM = 10% (number of echoes) + 5% (Predict 13) = -5%. However, if the enemy also has the system, he may employ it as an electronic counter-measure to penetrate the deception by rolling 1-6 on a 06 and subtracting his total from the defenders DMs. (Unless already activated, this counter-program must be activated in the following battle turn).

ECM 3: Electronics counter-measures program which jams enemy communications channels. It is effective according to the difference in EW levels, with a minimum probability of 1 per level of superiority. Roll 1d10. The number equal to or lower than the difference in EW levels = effective communications jamming. For example, if Tech difference is +2, 1 to 3 must be rolled. The minimum is always 1 chance in. 10. The counter-jamming program works in the same way, with superior EW systems always having the advantage.

5.3 MINICOMPUTERS

The minicomputer or MiniC is a miniaturised computer system about the size of a 20th century pocket calculator. The simplest models have all of the capacities of fully programmable scientific calculators today, plus calendar/time/stopwatch functions. More advanced models also have the capacity to store data chips with the equivalent of one or sometimes even several small reference books or technical manuals on specific subjects. The most sophisticated MiniC units can be pro-grammed to monitor and control equipment functions.

MiniC/1: A basic programmable calculator with advanced computational functions (calculus, etc.). A late Tech/6 unit.

MiniC/2: A programmable calculator with reference functions.

MiniC Model	MiniC/1	MiniC/2	MiniC/3	MiniC/4	MiniC/5	MiniC/6	MiniC/7
Mass	100 gm	100gm	125 gm	125 gm	150 gm	200 gm	250 gm
Powercell	1000 hr.	1000 hr.	1000 hr	1000 hr.	1000 hr.	1000 hr.	1000 hr.
CPU	-	1dpu	2dpu	3dpu	5dpu	5dpu	10dpu
databank	-	2dpu	5dpu	10dpu	20dpu	50dpu	100dpu
Breakdown No.	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Cost (CR)	40	100	250	500	1000	2000	3500

A 5cm x 10cm flip-up read-out screen displays the data contained on reference chips. Available in Tech/7 cultures.

MiniC/3: A programmable calculator with increased data storage capacity and a CPU able to run most mini-programs side by side (2 simultaneous programs). The MiniC/3 is thus ideal as a Tech reference unit, with the capacity to monitor and analyse equipment functions while the Tech is consulting his reference manual or making calculations. Available in Tech/7 cultures.

MiniC/4: A MiniC with twice the memory capacity of the MiniC/3, the MiniC/4 can be patched into a heads-up display system, making it very useful for space-suited personnel. Available in Tech/7 cultures.

MiniC/5-6: High-performance MiniCs with large memory capacities and multiple program capability, the Mini/5 and Mini/6 units are standard issue for Tech/8-II space suits, Power Armour, and other systems of a similar type; for they can automatically monitor and control a number of functions without interfering with calculation and reference functions.

MiniC/7: The ultimate in hand-held computers, the MiniC/7 not only has all of the functions of preceding units, with a greater CPU and data processing capacity, but it also has a voder box which can be used directly or patched through a Communicator to provide translation of foreign and alien languages. Available in Tech/9 cultures.

Data Chips: A large range of insertable data chips are available for use with MiniC/2-7 units:

Data Chips Available	Cost	CPU	Memory
Equipment Maintenance & Repair Manual	CR75	1dpu	1dpu
Equipment Monitoring Program	CR100	1dpu	1dpu
Equipment Monitoring & Control Program	CR 175	1dpu	3dpu
Multi-System Maintenance & Repair Manual	CR 250	2dpu	5dpu
Multi-System Monitoring Program	CR 350	2dpu	5dpu
Multi-System Monitoring & Control Program	CR500	2dpu	10dpu
General Reference (25 000 words)	CR50	1dpu	1dpu
Language Translation Program (1000 words)	CR250	1dpu	2dpu

5.4 BATTLECOMPUTERS

BattleComputers are relatively compact units designed for use in fighting vehicles and by Power Armour and spacesuited personnel. The units improve hit probabilities in fire combat.

HEAD—UP DISPLAY: Light BattleComp units are installed in Power Armour and high-quality spacesuits to provide a complete read-out on equipment status (projected on a screen on the inside of the helmet above the visor), to automatically control equipment functions, and to provide computer assistance in combat situations. A holographic target reticule is a projected on the visor which corresponds to the position at which a hand-held weapon is pointing. An integral laser or sensor rangefinder/target designator built into the helmet also provides target speed and corrects the projected aiming point accordingly. The system can also be used to improve Jump Pack and EVA Rocket Pack manoeuvring, as the system

'targets the destination and provides firing data for the propulsion unit. All units mass 5 kg.

HUD Model	HUD/1	HUD/2	HUD/3	HUD/4
Targeting Bonus	+5%	+5%	+7%	+10%
EVA Manoeuvring	+5%	+7%	+10%	+12%
BattleComp Mk.	Mk.1	Mk.1a	Mk.II	Mk.IIa
CPU Capacity	10dpu	12dpu	15dpu	15dpu
Data Bank	20dpu	30dpu	40dpu	50dpu
EW Range	1-7	2-8	3-9	4-10
Tech Level	7	8	9	10
Cost (CR)	5000	6500	8000	10,000

EW cost = CR 750 per EW point. See 5.11 Battle Armour for typical ratings. HUD units with EW capacity can control all Battle Electronics equipment (radar, sensors, etc.), and ECM mounted in the suit. Of course, the computers can provide other computational functions as well, as all MiniC programs may be used in them.

Targeting programs have a CPU of 3 dpu and a Data Bank capacity of 10 dpu. Cost = CR 500.

EVA Manoeuvring programs have a CPU of 3 dpu and a Data Bank capacity of 3 dpu. Cost = CR 250.

VEHICLE BATTLECOMPUTERS: Vehicle battlecomputers correspond to HUD units outlined above in all respects. However, Data Bank capacities are doubled, and costs are increased +25%. Very high-quality fighting vehicles may mount low Mk. MultiComputers with targeting bonuses of HUD/7 units.

5.5 MEDICAL SUPPLIES & EQUIPMENT

TKM THANOKALAMINE: The drug TKM will arrest decay of all body tissue, including the brain and nervous system, for a period of 24 hours after death. Repeated injections every 24 hours can continue the stasis effect until the victim is brought to a facility with Revival capability. A Telurgic Adept can produce the same effect in himself through a form of suspended animation. Styrette mass = 5gm or I kg per 200 styrettes. Cost = CR IC per styrette or CR 1750 per 200.

AB ANTIBIOTICS: Drugs capable of negating the chance of a wound becoming infected with Terrantypes of micro-organisms unless the wound is continually exposed to filth, etc. AB drugs have only a I0%-60% chance of protecting against alien micro-organisms. Styrette mass = 5gm or 1 kg per 200 styrettes. Cost = CR 1.50 per styrette or CR 225 per 200.

XAB XENO—ANTIBIOTICS: Drugs capable of combating infection by alien organisms. XAB Drugs have 60%-100% chance of protecting against alien micro-organisms unless the wound is continually exposed to filth, etc. Styrette mass = 5 gm or 1 kg per 200 styrettes. Cost = CR 3.50 per styrette or CR 550 per 200.

APD ANTI—POISON DRUGS (ANTIDOTES): Drugs capable of countering the worst effects of poison. The APD antidotes correspond to those in 6.20 Drug & Poison Effects in the weapons lists. Styrette mass = 5 gm or 1 kg per 200 styrettes. Costs are the same as the poison countered, as given in 6.20. When purchased in lots of 200, costs are 75%.

ADD ANTI—DRUG DRUGS (ANTIDOTES): Drugs capable of countering the worst effects of soporifics and other incapacitating drugs. The ADD antidotes correspond to those in 6.20 Drug & Poison Effects in the weapon lists. Styrette mass = 5 gm or 1 kg per 200 styrettes. Costs are the same as the drug countered, as given in 6.20. When purchased in lots of 200, costs are 75%.

PKD PAINKILLING DRUGS: A series of drugs which prevent shock and permit a character who has suffered up to 75% damage from wounds to function as normal in non-strenuous activities for 6 hours. Mass per styrette = 5gm or 1 kg per 200. Cost = CR 1.75 per styrette or CR 80 per 200.

BSO BURN SALVES & OINTMENTS: All BSO preparations act to prevent loss of body fluids and development of infections when burned. It also deadens pain on affected nerve endings. If the victim has suffered less than 50% damage from burns, BSO enables the character to function normally in non-strenuous activities for 24 hours. Mass = 100 gm per tube, covering 50 damage points of burns. Cost = CR 10 per tube or CR 80 for 10.

ARD ANTI—RADIATION DRUGS: A drug which increases the capacity of the body to withstand the effects of exposure to high radiation levels without suffering radiation sickness. Chance of sickness/death are reduced by 5.d6% by an application of ARD. Mass = 5 gm per styrette or 1 kg per 200. Cost = CR 4.50 per styrette or CR 725 per 200.

ORD QUICKTIME REGEN DRUGS: Quicktime regenerative drugs greatly speed healing (see 2.9 Wound Recovery Rate). The drug affects the DNA complex of the patient's cells and speeds up natural healing rates and body defences against infection. Mass = 5gm per styrette or I kg per 200. Cost = CR 35 per styrette or CR 5750 per 200. Only one dose is required per 3 recovery days or part thereof.

TEMPO: A high-energy drug which artificially restores all stamina levels for a period of 8 hours, Tempo is a powerful but potentially dangerous chemical. At the end of the 8-hour period, the user must roll a Shock CR minus 1d6 every hour for the next four hours. Failure of the CR means that he will be knocked unconscious for twice the usual sleeping time. If he is awakened from his exhausted sleep by a stimulant, there is a chance equal to 40% minus his Constitution that he will suffer a heart attack (25% fatality rate). Cost = CR 15 per pill.

EXPEDITOR: A short-term high-energy drug which restores 3d6 stamina points and prevents winding by reducing all wind costs to 1/2 normal. At the end of 1 hour, the character returns to normal and must roll a successful Shock CR to prevent his becoming unconscious for 1 hour because of the exertions and drain on his system caused by the drug. Cost = CR 4.50 per pill.

STIMULANTS: Drugs which can revive unconscious patients (caused by shock, stun beams, etc.) in 1d6 minutes after application, Stimulants are effective upon the victim's passing a Constitution CR. Each additional dose administered within an hourly period carries a 10% chance (cumulative) of producing a coronary arrest (25% fatality rate if not attended by a Physician). Mass = 5gm per styrette or I kg per 200. Cost = CR 1.25 per styrette or CR 200 per 200.

ANTI—AGATHICS: Anti-ageing drug, which acts by cleansing the body cells of ageing poisons. One dose negates the effects of ageing for one year. Cost = CR 2500 for one treatment, administered over one week at a Regeneration Centre.
IMMORTALITY BETA: An extremely rare anti-agathic dating to forerunner times which arrests ageing at 21 phsysio-years, reducing the patient's age by 1 year per month if he is over the 21 Terran year limit. Once administered, Immortality Beta remains effective for 20 Terran years. Cost = CR 50 000.

IMMORTALITY ALPHA: Even rarer than Immortality Beta, this anti-agathic stops ageing at 21 physio-years as well. Once administered the recipient will not age at all for an estimated 1000 years. Resistance to most diseases is total. Healing rates are tripled over normal values (but not for Quicktime). The recipient also has a 90% chance of regeneration after any death, unless the brain has been damaged or the body has been totally burned, disintegrated, etc. Such drugs are not readily available anywhere and must be 'found': Cost = CR 250 000+ on the open market, if available.

***AGEING:** The use of ageing is Space Opera is optional. Generally, after a PC has lived for 75% of the life span allotted to the average member of his race, he runs a 10% risk every 5 years thereafter that he will lose -1 point from one or more of his personal characteristics. The characteristics to be checked are: Strength, Constitution, Dexterity, Agility, and Intelligence. If a loss occurs, some body capabilities may have to be adjusted accordingly.

PMP PERSONAL MEDIPACK: About the size of a large package of cigarettes, the PMP is usable by anyone. It contains 1 large field dressing to staunch serious wounds, 6 bandages, 2 styrettes of PKD painkillers, 4 styrettes of AB antibiotics, and 2 packets of powered antiseptic. Mass = 40gm or 1 kg per 25 PMPs. Cost = CR 10 per kit or CR 200 for 25.

PXMP PERSONAL XENO MEDIPACK: Designed for service in alien environments, the PXMP is usable by anyone. It contains 3 large field dressings, 10 bandages, 5 styrettes of PKD painkillers, 20 styrettes of XAB Xeno-Antibiotics, 1 ARD anti-rad styrette, 1 tube of BSO burn ointment, 2 styrettes of Stimulants, and 1 Expeditor pill,

as well as a vial of antiseptic. Mass = 400gm. Cost = CR 75 or CR 675 for IC. PXMP kits are standard issue to most space borne personnel and combat troops.

PMS PERSONAL MEDISENSOR: A small, flat, strap-on wrist unit about the size of a large wristwatch, the PMS contains a miniaturised Medi-computer that constantly monitors the physical condition of the wearer. The display presents the medical information on a holographic readout screen on the face of the unit. Most of the data is capable of interpretation only by trained medical personnel. If the sensor detects any damage or disease present in the wearer, it will register a warning signal. The unit also contains a charge of TKM Thanokalamine which will automatically inject into the wearer if clinical death occurs. A PC can take a 2-week course in the use of the Medi-sensor, and can read off the data so that he is able to administer the correct antidote for poisons detected in the wearer or know when to administer ARD anti-red drugs, etc. The unit is, in effect, a diagnostic system of a limited type. Mass = 100gm. Cost = CR 1500. Breakdown 1/5. Tech/8+.

MEDIJECTOR: A contact injection unit capable of containing 100 doses of any drug, antidote, etc. Mass = 250gm. Cost = CR 250 + drugs. Tech/7+.

DMS DIAGNOSTIC MEDI—SENSOR: A mini-computer/sensor system capable of monitoring body functions and rendering a diagnosis of standard conditions. It can be patched into a ship's MediComputer if plugged into any communication device. Mass = 1.25 kg Cost = CR 10 000. Tech/7+.

FMK FIELD MEDIKIT: The Field MediKit contains 25 field dressings, miscellaneous bandages, a MediJector with 100 selected doses of drugs, 100 styrettes of PKD painkillers, 100 styrettes of AB anti-biotics, 50 styrettes of XAB antibiotics, 5 styrettes of each type of poison antidote (total of 45), 5 styrettes of each type of 'drug' antidote (total of 45), 10 tubes of BSO burn ointment, 25 styrettes of ARD anti-rad drugs, 10 styrettes of Quicktime, a tube with 20 Tempo pills, a tube with 20 Expeditor pills, 50 styrettes of and a DMS Diagnostic Medi-Sensor. A set of laser scalpels, standard scalpels, surgical gut, needles, and laser wound stitcher complete the kit, along with 5 sets of splints. Mass = 5 kg, Cost = CR 6000.

DISPENSARY & SICK BAY FACILITIES: Extensive medical support systems are available with the large medical units. Comprehensive diagnostic capability is typically provided by a MediComputer, with each bed thoroughly equipped with a variety of monitoring and life-support systems. To detail the equipment available would require a substantial amount of space. Suffice it to say that a good supply of standard drugs are available, excellent surgical facilities, and very effective intensive care units. Dispensaries are limited in capacity, usually 4 to 10 patients, but sick bays can be equivalent to small hospitals. There will always be a few quick-freeze units aboard a ship to preserve patients in critical condition who would not otherwise survive until still more effective medical aid is available.

5.6 VISION AIDS

I-R VISOR: The IRV is a visor or a set of goggles of heavy tinted plastic material that can be attached to a military helmet or simply worn like eyeglasses. The IRV has a passive infra-red receiving system which operates on locally available heat sources and converts infra-red radiation into visible wave-lengths. The IRV cannot distinguish between two objects if they are of about the same ambient temperature. Nor can a low temperature object be clearly seen against a high-temperature background unless it is also radiated some heat. Vision tends to be at 250m or less, but very hot objects can often be detected at greater distances. The same is true of warm objects in fairly cold environments. Dust, and blowing snow will greatly reduce the range, as such conditions result in the reflection of heat and can distort the visor picture with echoes and blurred images.

IRV Model	IRV/1	IRV/2	IRV/3	IRV/4	IRV/5	IRV/6	IRV/7	IRV/8
Mass	200 gm	200 gm	200 gm	200 gm	5kg	5kg	5kg	5kg
Tech Level	6	7-8	9	10	6	7	8	9-10
Range	100m	150m	200m	250m	150m	250m	350m	500m
Mode	personal	personal	personal	personal	vehicle	vehicle	vehicle	vehicle
Power	1 SECm	1 SECm	1 SECm	1 SECm	2 SEC*	2 SEC*	2 SEC*	2 SEC*
Duration	100 hr.	100 hr.	200 hr.	200 hr.	200 hr.	200 hr.	200 hr.	200 hr.
Cost (CR)	150	175	200	225	200	225	350	450
Breakdown No.	1/5	1/5	1/5	1/5	1/5	1/5	1/4	1/3

*Vehicle power is normally used. The system is attached to sighting equipment, vision screens, etc.

I-R PROJECTOR: The IRP is an infra-red projector similar to a spot-light. It can be used with an IRV to 'illuminate' objects under poor viewing conditions and to greatly extend the range of the

IRV. However, smoke, dust, and blowing snow can significantly reduce the range, as described for the IRV. The IRP can also be readily detected by anyone wearing an I-R Visor

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IRP Model	IRP/1	IRP/2	IRP/3	IRP/4	IRP/5	IRP/6
Mass	2000 gm	1000 gm	1000 gm	10kg	10kg	10kg
Tech Level	6	7-8	9-10	6	7-8	9-10
Range	400m	750m	1000m	1000m	1500m	2500m
Mode	personal	personal	personal	vehicle	vehicle	vehicle
Power	2 SEC	2 SEC	2 SEC	2 SEC	5 SEC	5 SEC
Duration	2 hr.	4 hr.	10 hr.	1 hr.	4 hr.	10 hr.
Cost (CR)	200	375	450	750	1000	1250
Breakdown No.	1/4	1/4	1/4	1/4	1/3	1/2

NIGHT VISOR: The Night Visor is similar in configuration to the IRV and can be attached to a helmet or worn as goggles. The Night Visor is a refined version of the early Terran 'starlight scope' and electronically amplifies what light is available in order to render normally darkened objects visible. On the equivalent of a full Terran moonlit night, the viewer can see up to about 1000m. On a starlit night, vision is about 250m. On a very dark night (cloudy. etc.). vision is about 100m. The system is very useful on worlds far removed from their primary as well as in night-time conditions. It may also be worn by races originating on planets with very high illumination levels, as conditions which a Terran might regard as adequate would be quite dim to such a being. The units correspond in all particulars except range to IRV/1-4 models.

BINOCULARS: The Binocular optical device is the familiar dual telescope system used to increase the effective range of daylight vision. All models are TEch/5+.

Binocular Model	BINOC/1	BINOC/2	BINOC/3	BINOC/4
Mass	100 gm	200 gm	250 gm	350 gm
Magnification	x10	x15	x20	x25
Cost	25	40	60	90
Breakdown No.	1/3	1/3	1/3	1/3

Night binoculars may also be purchased to increase vision range in poorly illuminated conditions. The lenses gather enough light to be effective in moonlit environments, especially if the object or area under examination is illuminated by the moonlight. The night binoculars cannot penetrate. shadows, etc. The cost of such glasses is about 35% to 50% higher than that of regular binoculars equipment.

ELECTRO—BINOCULARS: Advanced electronic/optic systems using semi-computerised amplification and definition-increasing elements will give 'unlimited' variable power to the normal range of vision. Atmospheric conditions permitting, high-power magnification is possible to the horizon on most planetary surfaces. In space, definition is good to about 10 000 kilometres for personal models, while vehicle/spacecraft models can be effective to much greater ranges:

Electro-Binoculars	ELECTROB/1	ELECTROB/2	ELECTROB/3	ELECTROB/4	ELECTROB/5
Mass	450gm	450gm	450gm	5kg	25kg
Tech Level	7+	8+	9+	7+	8+
Max. Range*	5000 km	10000km	25000km	25 LS	1000 LS
Magnification	x25	x50	x100	x500	xl000
Power	1 SEC	1 SEC	1 SEC	5 SEC**	10 SEC**
Duration	500 hr.	500 hr.	500 hr	500 hr.	200 hr.
Cost (CR)	150	200	250	2500	9000
Breakdown No.	1/3	1/3	1/3	1/3	1/3

*Ranges are optimum resolution distances; viewing ranges extend much farther, but detail will eventually be lost.
**vehicle and spacecraft units can be operated on vehicle power systems; SEC cells provide emergency power or portable power.

POLARISED VISOR: The polarised visor is fashioned of plastic material which can be adjusted to filter the amount of visible and ultra-violet light passing through It. PVC combat visors can also be set to provide instantaneous reaction to sudden flares of intense light, such as that produced by nuclear detonations, and bursts of high-level radiation. Variants are available In goggle form.

Polarised Visor	PV	PVC
Mass	200 gm	200 gm
Tech Level	7+	7+
Duration (SECm)	20 yr.	20 yr.
Cost (CR)	75	125
Breakdown No.	1/1	1/2

MULTI—VISION VISOR: The MVV is a high-technology visor of plastic material which combines the functions of an IRV/4, Infra-red Visor, a Night Visor. ELECTROB/3, Electro-Binoculars, and a PVC Polarised Visor (Combat). The system is normally a feature of superior quality spacesuits and Power Armour. Mass = 500gm. Duration = 1000 hours with 3 SEC. Cost = CR 1000. Tech/9+.

SENSOR VISOR: The SV is an ultra-high technology vision system of duridium alloy developed from a forerunner device discovered on Altanin XI. The Sensor Visor projects a TTDC sensor beam of low power to the horizon and converts the return signal into visible light for perfect viewing in all atmospheric conditions. The SV is often restricted to military and government personnel, but may be obtained for civilian use on some planets. The unit is rarely encountered in civilian use because of its rather high cost. Note: the TTDC sensor beam will not penetrate solid objects and only enhances vision. Mass = 500 gm. Duration = 1000 hours with 5 SEC. Magnification = x100. with space ranges of 1 LS. Cost = CR 7500. Breakdown No. = 1/6. Tech/l0+.

HBS HAND BATTLE SENSOR: Tech 7 sensor that picks up and identifies life forms, energy and heat sources, force fields, and radioactivity, giving a rough direction/distance. Range = 1.5 km. Mass = 1 kg. Runs on a powercell for 24 hours. Breakdown 2/2. Cost = CR5000 plus CR100 per EW rating.

ELECTRIC TORCH: The electric torch or flashlight is an illumination device which can be adjusted to give a beam of light which can be varied from 10 meters to 100 meters, with a duration of 100 hours on 2 MiniSEC power cells. The electric torch is about 150mm long and 20mm in diameter, massing 250gm. The beam will illuminate a circle 5m in diameter at 100m. Cost = CR 20. Tech/7+.

More primitive flashlights have a duration of under 24 hours and cast a beam about 20m. Cost = CR 5-8. Tech/5+.

All electric torches have a Breakdown No. = 1/2.

CHEMOFLUOR RODS: The ChemoFluors are small plastic rods containing chemically fluorescent materials that provide the equivalent of bright moonlight in a 5m radius for 6 hours. Length = 350mm. Mass = 100gm. Cost = CR 2.5. Tech/6+. The rods can be extinguished. Breakdown No. = 2/-. If the rods do not fluoresce (Breakdown rolled on 'ignition'), there is a flat 50% chance each turn that they will glow when attempt is made to 'ignite' them.

GLOW BULBS: These round illumination globes were developed from a forerunner device discovered on Agol VIII. Glow Bulbs fluoresce with an illumination level that can be varied from that of dim moonlight to the intensity of a 300 watt bulb. They will provide 24 hours of light at any intensity before they finally cease to operate. The bulbs will recharge in 3 hours by Electro-chemical action or they can be charged with a SEC power cell in 1 minute. The globes are 100mm in diameter and mass 50 gm. Illumination range = 10m. Cost = CR 20. Breakdown No. = 1/1, Tech/9+,

MAGNESIUM FLARES: Flares are meter-long rods with a self-igniting pull-tab on the flare tip. Magnesium flares provide brighter than light illumination for 20 minutes, even in a vacuum or under water, as oxidising chemicals are built into the flare materials. The light can be blinding to the unprotected eye at close range. The flares burn very hot and can be used as weapons to burn unprotected adversaries. They also serve as excellent incendiaries. Mass = 450 gm. Illumination range = 10m in atmosphere, 5m under water. Cost = CR 2.5. Breakdown No. = 2/-. If the flare does not ignite (breakdown occurs on ignition'), the PC must use a pocket flamer or some similar device because the self-igniter is defective. Tech/5+.

GAS LANTERN: The gas lantern is a butane/propane/kerosene lamp with a 6-hour fuel capacity. The lantern will illuminate a 5m radius or, if used with a reflector/lens attachment, can cast a beam for 10m to 15m. Mass = 750 gm. Cost = CR 10. Breakdown No. = 1/2.

5.7 COMMUNICATION SYSTEMS

COM/PC PERSONAL COMMUNICATIONS: The personal communicator is a miniaturised radio or radio/subspace transmitter-receiver about the size of a pocket calculator. Somewhat more compact models can be fitted into combat helmets and spacesuit helmets.

Com/PC Model	PC/1	PC/2	PC/3	PC/4	PC/5	PC/6	PC/7	PC/8
Tech Level	6	7	8	8	9	9	10	IC
Mass	125 gm	125 gm	125 gm	125 gm	125 gm	125 gm	125 gm	125 gm
Radio Channels	10	10	10	20	20	40	20	40
Radio Range*	10 km	15 km	25 km	35km	35km	50km	50km	100km
Sub-Space Channels	-	-	-	6	-	6	10	20
Sub-Space Range**	-	-	-	10k km	-	25k km	25k km	50k km
Powercell	120 mm.	120 mm.	120 mm.	180 mm.	180 mm.	180 mm.	240 mm.	300 mm.
Breakdown No.	4/3	4/3	4/3	4/3	4/3	4/3	4/3	4/3
Cost (CR)	50	65	75	150	85	175	200	275

*Ground-to-orbit and space-to-space ranges are x 5 radio range.
**Subspace communication is line-of-sight on the ground; transmission is by tight beam in PC/6, PC/7, and PC/8 models, if desired.

COM/BTC BATTLE TACTICAL COMMUNICATORS: The BTC is a command communicator issued to senior NCOs and Officers in the military services. It has double the radio and sub-space ranges of comparable PC models of personal communicators, with an additional IC radio and IC sub-space channels to permit 'conference communication between command personnel without being overheard by the troops. BTCs are in other respects similar to PCs. Cost PC unit cost + CR 150. The units are denoted BTC/— followed by the PC number: BTC/4, BTC/6, etc.

COM/VC VEHICLE COMMUNICATORS: The VC is a communicator installed in vehicles, aircraft, etc. They may be carried and serve as command communicators. All VCs are operable on vehicle power, but they also have self-contained PowerCells for portable mode communication. Advanced models also have televideo channels and computer link capacity. Some VC units can be set for tight beam radio transmission, with line-of-sight ranges on the ground and x25 radio ranges in space.

COM/VC Model	VC/1	VC/2	VC/3	VC/4	VC/5	VC/6	VC/7	VC/8
Tech Level	6	7	8	8	9	9	10	10
Mass	5kg	5kg	5kg	10kg	5kg	10kg	5kg	10kg
Radio Channels	10	20	20	40	40	100	40	100
Radio Range*	25 km	50km	75 km	100km	100km	250km	250km	500km
Tight beam Range**	625 km	1250 km	1875 km	2500 km	2500 km	6250 km	6250 km	12 500 km
Video Channels	-	-	10	10	10	20	20	40
Sub-Space Channels	.	10	10	20	20	40	40	10
Sub-Space Range***	-	25K km	50K km	100Kkm	1LS	5LS	10LS	25LS
powercell	240 mm.	300 mm.	300 mm.	600mm.	600mm.	600mm.	600mm.	600mm.
Breakdown No.	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Cost (CR)	200	400	500	650	750	875	1000	1250

*Ground to orbit and space-to-space ranges are x5 radio range.
**Line of sight on planetary surfaces.
***Line of sight on planetary surfaces; transmission is tight-beam, if desired.

COM/LC LASER COMMUNICATORS: The laser communicator is a high-powered, tight beam unit which is virtually un-jammable. It is a line-of-sight transmitter/receiver requiring precision alignment of the transmitter with the receiving 'dish' antenna. Alignment is achieved at 20% + 5% x level of Com/Tech expertise per 12 minutes minus expertise. If a Com/Tech is using a minicomputer with the system, he can achieve 99% correct alignment in 11 seconds minus expertise. The unit has ground-to-orbit capacity, with ranges from planetary surfaces and in space equal to IC LS x Tech level of the culture producing the laser com unit. The COM/LC has a duration of 60 minutes of continuous transmission on emergency PowerCells or can be operated on vehicle power. Mass = 25 kg - 2 kg per Tech level over Tech/6. Breakdown No. = 4/5. Cost = CR 250 x Tech level.

COM/BUG ELECTRONIC SURVEILLANCE DEVICES: Com/Bug 'spy' devices are as small and undetectable as advanced technology can make them. Most are voice-triggered. They transmit and/or record when voices are heard within range of the pick-ups. Maximum transmission range is 2 km for Tech/6 models, with +1 km per Tech level over Tech/6. Transmissions may be received by communicators set to the Bug's frequency. The Bug is negligible in size and mass, often no more than several grains and button size or smaller. All Bugs have 24 hours of transmission power. Breakdown No. = 1/10. Cost = CR 100. Tech/5 units are telephonic; Tech/6+ can use radio.

COM/SGM SHOTGUN MIKE: The SGM is a long-range listening device capable of picking up voices at ranges of 100m + 50m x Tech level over Tech/6. The unit is about 600mm long, with mass of 2 kg. It has a listening duration of 6 hours on PowerCells, but can use plug-in power. Breakdown No. = 2/5. Cost = CR 450.

COM/PM PARABOLIC MIKE: The parabolic mike is a sophisticated listening device capable of picking up voices at ranges of 200m + 100m per Tech level over Tech/6. The unit consists of a parabolic 'dish' receiver which concentrates sound waves that are amplified by the circuitry of the attaché-case sized control box. The system has a mass of 4.5 kg and a duration of 6 hours on PowerCells. It can also use plug-in power. Breakdown No. = 2/5. Cost = 1200.

COM/TV VIDEO SCANNER & RECEIVER: The ubiquitous T.V. is available in many models. Early Tech/5-6 units vary between the size of a large movie camera to a hand-held unit (with mass from 50 kg to 5 kg), requiring coaxial cable systems, video-taping devices, or elaborate broadcasting stations to transmit. Costs range from CR 4000 to many thousands of credits. Tech/7 systems are highly compact, with Video cameras massing several kilograms and containing line-of-sight transmitters to horizon range. Cost = CR 1000. Advanced Tech/ 8+ video cameras are as small as a package of cigarettes or even a matchbox. Tech/8+ units are capable of 3-D holographic projection. Cost of such units is under CR 1000. Breakdown No. = 4/7 for Tech/5-6 video cameras, and 2/5 for Tech/7+.

Video receivers in Tech/5-6 cultures can mass up to 40 kg, although smaller units are available. Prices range from CR 75 to CR 500. Breakdown No. = 3/6. Advanced Tech/7+ models range from CR 25 to CR 1000 in price, with cigarette-package to wall-screen size. Breakdown No. = 1/3.

Early video systems are UHF line-of-sight or coaxial systems. Advance systems are capable of sending/receiving radio tight beam (advanced microwave), laser transmissions, arid sub-space transmissions. Optic fibres typically replace coaxial cable hook-ups.

COM/SSC SPACECRAFT COMMUNICATORS: Spacecraft communicators and heavy ground communicators are large, high-powered transmitter/receivers with the general capacities noted for a VC units, but in a far greater magnitude because they are more sophisticated. All SSC units have a standard Breakdown No. = /3.

COM/SSC MODEL	SSC/1	SSC/2	SSC/3	SSC/4	SSC/5	SSC/6	SSC/7
Tech Level	6	7	8	9	9	10	11
Mass	50kg	50kg	25kg	50kg	100kg	250kg	25kg
Radio Channels	50	100	50	100	100	100	100
Radio Range	4000 km	1K km	10K km	10K km	10K km	10K km	10K km
Tight beam Range**	100 LS	350 LS	600 LS	700 LS	8CC LS	900 LS	1000 LS
Laser Range**	200 LS	700 Ls	1200 Ls	2500 LS	5000 LS	7500 LS	7500 LS
Video Channels	20	20	20	20	20	20	20
Sub-Space Channels	20	100	100	100	100	100	100
Sub-Space Range***	2000 LS	4000 LS	6000 LS	10KLS	1LY	2LY	3LY
powercell****	100 mm.	100 mm.	100 mm	100 mm.	100 mm.	100 mm	100 mm
Breakdown No.	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Cost (CR)	30 000	50 000	75 000	100000	150000	250000	500000

*Ground to orbit ranges. Space to space ranges are x5 radio range.
**Line of sight on planetary surfaces.
***Planetary ranges are 1/5 radio ranges.
****Emergency power only. Sub-space transmission over 1 LY uses 1 mm. of power x LY of signal transmission required for each minute of operation.

5.8 ELECTRIC COUNTER MEASURES

ECM/COMS COM SCRAMBLER: A Com Scrambler is a unit of about 10 gm mass designed to fit all communicators. Each unit has a code setting. Depending upon the model, the code setting may be 1-6, I-10, or 1-20, representing general scramble code patterns. Only communicators with scramblers set in the same code patterns will translate back into understandable speech. Others receive a signal which mimics natural static. Com/Techs and Crime/Techs will be able to tell the difference 60% of the time plus 3% x expertise level.

ECM Model	COMS/1	COMS/2	COMS/3
Mass	10gm	10gm	10gm
Tech Level	6	7-8	9-10
Code Setting	1-6	1-10	1-20
Cost (CR)	100	2CC	400
Breakdown No.	Com Unit	Com Unit	Com Unit

ECM/COMD COMMUNICATIONS DECODER: A Com/Tech or Crime/Tech can use a Decoder to unscramble coded communicator signals. A Tech receives one setting for each two Tech expertise levels he has — L/1-2 = 1 setting, L/3-4 = 2 settings, L/5-6 = 3 settings, etc. The Tech's player writes down the setting chosen, then the appropriate dice are rolled (1d6 for 1-6, 1d10 for 1-10, 1d20 for 1-20 codes), and if the result is the same as any of the settings chosen, the Tech has managed to unscramble the code setting. If he's using a minicomputer, he obtains an additional setting for each Mk. of the MiniComp. The Tech has a 5% chance x expertise plus 5% x computer Mk. to unscramble the message in 1d10 minutes once the code setting is determined.

Basic decoding requires 1d10 minutes (1 listening watch), after which a decoding roll is made. Message decoding requires a further 1d10 minutes one the basic signal code has been determined. The message can be learned sooner or later. Thus, PCs and NPCs alike probably use code words and phrases to protect their communications from prying eavesdroppers.

The mass of a Decoder is 4 kg, the unit being about the size of a attaché case. It has 3 SEC power cells for an operating duration of 600 minutes. Decoders can be obtained in Tech/6+ cultures at a cost of CR 5000 minus CR 500 per Tech level over Tech/6. Breakdown No. = 2/5.

ECM/BUGD 'BUG DETECTOR: A Com/Tech or Crime/Tech can use a Bug Detector to find hidden spy devices. A Bug Detector has a 2S% chance of detecting a bugging device if used by a non-Tech. A Com/Tech or Crime/Tech has a 40% chance + 5% x expertise level. Each check will cover an area 5m x 5m, whether floors, ceilings, walls, etc. It must be held within 2m of the bug to register its presence. A check takes 1 minute. Success percentages assume that an 'active' bugging device is present: if the bug is not operating, detection chances are reduced by -20%. The ECM/BUGD is about the size of a package of cigarettes, with 125 gm mass. It is powered by a SEC power cell and has a duration of 50 checks. Cost = CR 450. Breakdown No. = 2/5.

ECM/BUGJ 'RUG' JAMMER: A Bug Jammer is designed to defeat eavesdropping activities. It can transmit 'white noise' into an electronic 'bug' so that it re-transmits silence. Alternatively, it sends a pre-recorded signal (usually a bogus conversation, sleeping noises, etc.). The Jammer must be placed within 25 cm of the bug to be effective. There is a 20% chance minus 1% x expertise of the Com/Tech or Crime/Tech jammed (checked when Jammer is activated). The Jammer is the size of a small box of matches and masses about 25 gm. It includes a wire recorder and has a mini-cell which powers the unit for 1d6 hours. The unit is available in Tech/6+ cultures at a cost of CR 375. Breakdown No. = 2/7.

ECM/SSDI SENSORSCAN DETECTOR: The SensorScan Detector detects a sensor beam directed into its vicinity. There are two basic types:

ECM/SSDI Detectors are the size of a package of cigarettes and may be operated by all personnel. The powercell has a 300 hour duration. The SSDI beeps softly when a sensor beam is picked up, with a flat 60% chance that detection will occur for each minute the scan endures. This 125 gm device can be obtained in any Tech/7+ culture at a cost of CR 500. Breakdown No. = 3/5.

ECM/SSD2 Detectors are sophisticated units about the size of a portable tape recorder and mass 1000 gm. They must be operated by a Crime/Tech or Com/Tech. The Tech has a 60% chance + 5% x expertise of detecting a sensorscan. If a sensor beam is detected, the Tech has a 25% chance plus 5% x expertise of detecting the direction and approximate range of the sensor unit if it is within 2500 meters (only direction if beyond 2500 meters). The unit has a power cell with a 300 hour duration. The device can be obtained in *any* Tech/7+ culture at a cost of CR 4000 minus CR 500 per Tech level over Tech/7. Breakdown No. = 2/6.

ECM/SS SENSORSCREEN: The SensorScreen is a forcefield generator which blocks sensorscans. It contains an ECM/SSD2 connected to a minicomp Mk.I and automatically cuts in a blocking screen to prevent a detailed scan. The screen has a coverage of IC meters in every direction, but coverage can be reduced to a single person. The unit is slightly larger than a tape recorder, with mass of 2000 gm. It can be obtained in any Tech/9+ culture at a cost of CR 10 000 minus CR/500 per Tech level over Tech/9. Breakdown No. = 2/6. Duration is 300 hours on 2 power cell.

ECM/SSDS SENSORSCAN DEFENCE SYSTEM: The SensorScan Defence System is about the size of a small attaché case massing 5 kg. It contains an ECM/SSD2 connected to a minicomp Mk.II and can not only block a sensor bean but also detects its source Detection range is line-of-sight, and the minicomp can compute very long-range scan distances by analysing beam frequency and strength. The screen has a coverage of 10 meters in Tech/7+ culture at a cost of CR 17 500 minus CR 500 per Tech level over Tech/7. Breakdown No. = 2/6. Duration is 300 hours on power cell. Larger units are also available which can cover offices, buildings, even large spacecraft and ground installations. These vary in cost, but usually run CR 50 000 + and are powered by heavy generators, power piles, etc. Such units are often run continuously.

ECM/SSS SOUND SUPPRESSION SYSTEM: The Sound Suppression system is a 'white noise' generator which produces a field around the unit which blanks Out the voices and other sounds produced within the 3m 'bubble' of silence that extends outward in all directions. The unit renders most listening devices ineffective if they are outside the suppression field, It also has a 90% chance of stopping the effects of any sonic disrupter fired at a range greater than 25m. The unit can be obtained in any Tech/7+ culture at a cost of CR 3500. It is about the size of a tape recorder and masses 1500 gm. Breakdown No. = 2/5. Duration is 100 hours on 2 power cell, at continuous use.

ECM/RDF RADIO DIRECTION FINDER: The RDF is a device designed to obtain a 'fix' or bearing on a radio transmission. Usually, two or three bearings will be required. The chance for each minute (or Portion) of obtaining a successful bearing is 40% + 6% x expertise of the Com/Tech operating the RDF unit minus 7% x expertise of the Com/Tech operating the radio being monitored. Each additional minute that a radio is operated within 100m of the original position increase the chance of successful ranging and direction by 10%. Experienced Com/Techs avoid continuous transmission, modify signal strength, and switch frequencies to throw off RDF. Regular users of Com sets are rarely so proficient, and cannot reduce detection odds unless they are Com/Techs. They also have a chance of transmitting overly long: an Intelligence CR must be rolled to see if they exceed 1 minute, with failure meaning at least a 2-minute transmission. Military or Police training eliminates this possibility, as radio discipline is a major feature of their training. The RDF is the size of a large suitcase, with an extending antenna, the whole massing about 7.5 kg. Power is from vehicle systems or else from power cells with 100 hours duration. The unit can be obtained in any Tech/5+ culture at a cost of CR 3500. Breakdown No. = 2/4.

Small RDF units of 250 gm are available in Tech/7+ cultures and permit homing in on continuous signal radio beacons.

RJ RADIO JAMMER: The RJ unit jams radio transmissions. It is the size of a large suitcase and weighs 7.5 kg. It has a chance of 40% of jamming any given radio frequency (plus or minus 5% per Com/Tech expertise of the jammer/jammed radio operator). It has a power-cell good for 6 hours transmission or can be used on vehicle power. The unit is available in Tech/5+

cultures. Breakdown No. = 3/5. Cost = CR 1500. The unit has a range of about 25 km in all directions, and 10 radio channels can be jammed per Tech level, beginning at Tech/5 at any one time.

BRJ BATTLE RADAR JAMMER: The BRJ unit is designed to foil a radarscan of a protected vehicle. The BRJ has a basic 50% chance of jamming the return signal, plus or minus 5% per skill level of the Com/Tech operating the jammer/per skill level of the Com/Tech operating the radar. Available in Tech/6+ cultures. Mass = 5-10 kg. Power = vehicle or 24-hr. powercell. Breakdown No. = 2/4. Cost = CR 5000.

BRD BATTLE RADAR DETECTOR: The BRD is a 'passive' radar system which automatically detects any radar transmissions (subject to the same restrictions applying to radar sets), and it is generally undetectable when operating. Available in Tech/5+ cultures. Mass = 2 kg. Power = vehicle or 24-hr. powercell. Breakdown No. == 2/2. Cost = CR 500.

5.9 BATTLEFIELD EQUIPMENT

BFR BATTLEFIELD RADAR: A vehicle-mounted radar unit designed to scan at ground level for moving targets at ranges up to ten thousand meters. Ground-scan radar cannot detect motionless targets, and the scan is blocked by buildings, hills, patches of woods, etc. Search and detection is limited to line-of-sight. Sandstorms will seriously impair their efficiency, however. Some units have 6-hour PowerCells, but vehicle-mounted units typically use vehicle power. Groundscan battlefield radar is available in late Tech/6 cultures and higher. Mass is about 50-75 kg. Range - 10 000 meters in line-of-sight. Breakdown No. = 3/4. Cost = CR 10 000 + CR 1000 per EW rating factor.

PAR POWER ARMOUR RADAR: A ground-scan battlefield radar set designed for Power Armour systems, The units have a range of about 5000 meters. Mass is 3 kg. Breakdown No, = 3/4. Cost = CR 7500 + CR 600 per EW rating factor. The units are available in Tech/8+ cultures and may also be mounted in armoured space suits. EW ratings will be no higher than the Tech level of the producing culture minus 2.

ACR AIRCRAFT COMBAT RADAR: An aircraft or vehicle-mounted radar unit designed to scan for any airborne object more than 100 meters above the ground. Such radar units have a range of 40 km plus 10 km per Tech/level over Tech/6. The scan can activate aircraft transponders to identify 'friends' and 'foes' in early models, while Tech/8+ units can obtain an accurate picture of the general configuration of an aircraft and so identify it. Mass is about 50-75 kg. Range = variable, depending on Tech/level, but generally over 40 km. Breakdown No. = 3/4. Cost = CR 15000+ CR 1000 per EW rating factor.

SVD SEISMIC VEHICLE DETECTOR: A sensing unit which detects whee!ed and tracked vehicles and infantry by ground vibrations. It cannot detect stationary targets. However, it can 'see' through-some kinds of obstacles in that it registers vibrations travelling through the ground. Tracked vehicles can be detected up to 10 000 meters, wheeled vehicles can be detected at 5000-6000 meters, and infantry and hover-craft can be detected at 1000 meters, provided the ground is firm. Ranges are reduced on sand. Movement across swampy or soft ground significantly reduces SVD ranges. Precision pinpointing is not possible, but a general bearing can be obtained, with a range +10% for -10%. The SVD also detects movements up to 200 meters underground if the probe is made through solid rock. The SVD is used by driving a 2000 mm metal probe into the ground to take readings. SVDs are available from Tech/7 Onward. Mass = 10 kg. Powercell = 24 hr. Breakdown No. = 2/4. Cost = CR 5500.

SSB SENSOR SCANNER (BATTLE): A high technology detection and scanning system which can be vehicle or aircraft mounted. The SSB penetrates solid Objects up to several meters thick, but BattleScreens, durasteel, plasteel, and collapsium armour are impenetrable, as are lead and irridium. A Sensorscan will reveal the visible features of any target, including those 'under the skin' if the target is unshielded. The system must be employed with a BattleComputer. Tech level = Tech/7+. Range = horizon, in general line-of-sight. Mass = 50 kg. Breakdown No. = 1/5. Cost = CR 20 000 plus CR 2000 per EW point. The SSB has the ranging capacities of radar, plus the capacity to give a visual picture and various technical data--including temperature, mass, general composition, etc.

SSPA SENSOR SCANNER (POWER ARMOUR): A Tech/9+ development which gives Power Armour personnel the capability to use sensorscanning equipment as an integral part of their fighting armour. Mass = 4.5 kg. Powercell 48 hours. Range = 750Cm. Breakdown No. = 2/5. Cost = CR 12 500 plus CR 1000 per EW point. EW ratings are equal to the Tech level producing the unit.

WATCHDOG: A specialized local security unit which can be programmed to detect any approaching mechanical or biological presences up to 100 meters distant. The Watchdog will set off a loud, audiable alarm or a silent visual alarm the moment that the intruder breaks the pre-set barrier field. Watchdog units are available in Tech/8 cultures. Mass = 1 kg. Powercell = 96 hours. Range = 10-100m. Breakdown No. = 2/4. Cost = CR 750.

SILENCER: A device which damps the sound of a firearm (cartridge-firing pistol or 5MG). The noise is eliminated, but at a -5% penalty 'to hit' the target. Available in Tech/5+ cultures. Mass = 250-500gm. Breakdown No. = 2/10. Cost = CR 75.

SNEAKSUIT: A suit of electronically simulated chameleon camouflage effects which enables the wearer to take on a semblance of the exact colouring and pattern of whatever terrain or surface he is up against. He has a -25% chance of being spotted and a -20% penalty against visually sighted weapons firing on him whenever the camouflage effect is operating. Available in Tech/7+ cultures. Mass = 1.5 kg. Powercell = 12 hr. Breakdown No. = 1/6. Cost = CR 10 000.

SCOPESIGHT: An optical sighting device usable in daylight illumination which can improve hit probabilities (see small arms hit tables). Available in Tech/5+ cultures. Mass = 500 gm. Breakdown No. = 1/8. Cost = CR 100.

TARGETSCOPE: An advanced version of the ART system, the TargetScope is a rangefinder/target designator that can be attached to any small arm carbine or rifle to provide a +5% bonus in addition to basic scopesight bonuses given in the hit tables. The unit is usable in daylight illumination. However, an additional CR 100 expenditure fits the system for use at night in conjunction with IR Visors and Projectors or NightVisors. Available in Tech/7+ cultures. Mass = 500 gm. Powercell = 100 hrs. Breakdown No. = 2/6. Cost = CR 550.

TECH/9 BSU BELT SCREEN UNIT: The BSU/9 is a small forcescreen generator about the size of several packages of cigarettes and is worn on one's belt, It generates a standard screen capable of defending against projectiles and energy weapons. Mass = 1 kg. Powercell = 6 hr. continuous operation. Breakdown No. = 3/6. Cost = CR 8000.

PBS, PORTABLE BATTLESCREENS: Beginning with Tech/7, Portable BattleScreens are available for installation in personal armour. The Units are about the size of two cartons of cigarettes and give 'standard' screen protection against penetrations by projectiles and energy bolts. Assault Powered Armour has +1 BattleScreens (others have 'standard' screens.) Mass = 5kg. Powercell = 24 hrs. of continuous use. Breakdown No. = 2/6. Cost = CR 10,000.

VEHICLE BATTLESCREEN: Vehicles will have battlescreens rated from standard power to as much as -4-10 on the Terran 'Orge' class Mk.IV Continental Seige Units. The cost of vehicle battlescreens is CR 25 000 plus CR 15 000 per +1 increment in field strength over standard power. See for typical ratings of military vehicles of various technological levels and starcultures for a guide as to what screens are appropriate to a particular vehicle. All such Units have a mass of 25 kg plus10 kg per +1 increment in screen power. Breakdown No. = 2/4 for Tech/7-9 units, and 1/3 for Tech/10+ units.

NOTE ON ALL BATTLESCREEN: All screen Units have a chance of breaking down whenever they have been penetrated. Roll the Breakdown check on 1d20.

5.10 MISCELLANEOUS EQUIPMENT

SCIENCES/ENGINEERING SENSOR: The SES is designed to sense/analyze energy sources, life forms, force fields, electromagnetic emissions, geological structures, etc. it enables a Scientist PC to detect anything related to his field and to correctly analyze it, with a 40% chance of accurate assessment plus 6% x level of expertise. The unit contains a MiniC and can

be patched into the Ship's Computers through a Com link.

SES Model	SES/1	SES/2	SES/3	SES/4	SES/5	SES/6	SES/7
Mass	1kg	1kg	1kg	1kg	1kg	1kg	1kg
Powercell	24 hr.	24 hr.	24 hr.	48 hr.	48 hr.	72 hr.	96 hr.
Range	5m	10m	25m	50m	75m	100m	500m
Breakdown No.	2/5	2/5	2/5	2/5	2/5	2/S	2/5
Tech Level	7	8	8	9	9	10	10
Cost (CR)	7500	8000	8500	9000	9500	10000	12500

CRIME/TECH IDENT KIT: The CIK is the size of a portable tape recorder and contains a MiniC programmed to analyze currency, etc. It contains a sensoscanner which compares fingerprints, retinal patterns, and voiceprint codes on identity cards with those of the person carrying the card. It performs basic analysis of clues found at the site of a crime. A CrimeTech has a chance of 40% plus 6% x level of expertise to accurately assess data, and a similar chance of detecting a result that is inaccurate. The time required for analysis will vary, depending on the task, so the StarMaster must use discretion. Available in Tech/7+ cultures. Mass = 3 kg. Powercell = 50 analyses. Breakdown No. = 2/4. Cost = CR 7000.

A large variety of program chips are available at CR 75 each. A list of possible functions can be developed by the StarMaster and players to suit their needs and the scope of CrimeTech work anticipated. Negative percentages can be imposed to reflect 'difficult' procedures.

CRIME/TECH POLYGRAPH: The polygraph is the standard 'Lie Detector.' The unit has an 80% minus Intelligence of the subject as a chance of detecting whether or not a character is lying. It only tells whether the subject believes what he says, not whether what he is saying is a fact. Telergic Adepts subtract -5% from the polygraph's chances per level of Telergy attained, and a Telergy/10 Adept can defeat it 99% of the time because of his control over his body reactions. The success chance assume a fully trained level/10 Crime/Tech or Psychologist is operating the equipment. Subtract -3% from the success chance for each level the operator is below level/10. Available in Tech/6+ cultures. Mass = 3 kg. Powercell = 50 questions. Breakdown No. = 5/1 (a breakdown may give 'false' readings and does not mean that the unit has ceased to function; a tech has a 7% chance x expertise of detecting a malfunction during an examination). Cost = CR S000.

CRIME/TECH TRUTH SERUM: The Crime/Tech has a variety of 'truth drugs' available to compell a subject to answer. These drugs correspond to those in 6.20 Drugs & Poison Effects, and are rated as Dl, D2, etc., with similar costs. Resistance is based on an Intelligence CR. Telergic Adepts are rated as Transhumans, with +1 to the CR for each level of Telergy attained above level/5. Antidotes are also available to counter truth drugs. A total of 1d6 questions may be asked, and the Crime/Tech or Psychologist asking the questions has a chance equal to 7% x expertise level of phrasing the question that a subject answers truthfully. The player operating a PC will see the dice roll made by the StarMaster, but a PC acting as an examiner will not know the result. This introduces uncertainty because a PC cannot be sure that the answer is truthful. On the other hand, a PC subject can know precisely when he can get away with a lie. Only one dose can be administered in a 6-hour period. A second dose has a 90% chance of knocking out the subject for up to 6-hours. Each time a truth drug is administered within 48 hours of a previous injection of the same drug, the subject builds up temporary immunity, represented by a +3 increase in his CR level.

THOUGHT MASK: The Thought Mask is a Terran invention which has seen many versions developed throughout the known galaxy, The unit masks the wearer's thoughts behind the amplified PSI emanations from a Mink brain preserved in nutrient fluid—a primal pain/hunger! kill code. A Telepath has a 5% chance x Telepathy level of penetrating such a barrier. If he fails (a Mental- Attack is required), he cannot attempt to penetrate that screen again. Available in Tech/7+ cultures. Mass = 500 gm. Cost = CR 5000. The unit has a Breakdown chance of 2/— when a Mental Attack strikes it. If the attack is successful, the unit malfunctions until repaired (always a class/4 malfunction).

THOUGHT SCREEN: The Thought Screen is an electro-mechanical device which totally blocks all forms of Telepathic eavesdropping and Mental Attacks against the wearer. Available in Tech/7+ cultures. The personal model is a mesh cap which fits the head quite closely. It has a powercell good for 1000 hr. use and a mass of 500gm. Breakdown No. = 1/3. Cost = CR 7500. Larger units massing 5 kg to 50 kg are available for vehicle and even building coverage at a cost ranging from CR 12 500 to CR 50 000, depending on the volume to be protected. However, once inside such a barrier, Telepathic powers will be effective.

INERTIAL MAP LOCATOR: The Inertial Map contains an electronically generated inertial frame of reference that projects onto its viewscreen a map of the surrounding countryside, with a central dot marking the unit's position. As the unit/carrier moves, the map moves to simulate the movement of the unit/carrier. There are two versions: the IML/HUD is designed for mounting in Heads-Up Display systems, with a 100 km x 100 km map chip; and the IML/V vehicle-mounted unit which has the capacity to store a planetary surface in its data bank. The IML/HUD massess 500 gm and has a powercell good for 1000 hr. operation. The IML/V masses 1.5 kg and has a powercell good for 2000 hr. operation (the unit can be detached and carried) or it can run on vehicle power. Both units have a Breakdown Number = 1/5. IML/HUDs cost CR 500, and IML/Vs cost CR 2000. Both models are available in Tech/7+ cultures.

INERTIAL COMPASS: The Inertial Compass is a wrist watch-sized electronically maintained system which will always give True North (as set from a base point), so that any form of dimensional shift or teleport will not require it to be reset, and also the bearing to the original base point. Available in Tech/7+ cultures. Mass = 75 gm. Breakdown No. = 1/1. Cost = CR 200.

AUTOPILOT: The AutoPilot comes in a ground and an air version. Both allow a vehicle to operate on a pre-set course under computer control as if a driver/pilot of skill equal to the programmer were operating the vehicle or aircraft. However, it cannot cope with nonroutine situations. It must be connected to an Inertial Compass or an IML/V Inertial Map Locator and to at least a MiniC/4 programmed to operate a vehicle or aircraft. Available in Tech/7+ cultures (Tech/5-6 units are capable merely of holding an aircraft on a pre-set compass bearing or radio beam). Mass = 2 kg. Breakdown No. = 2/2. Power = vehicle power. Cost = CR 3500.

TRAFFIC AVOIDANCE RADAR: The TAR system has the ability to pick up airborne objects up to 2000m. Its primary function is to be linked up with an AutoPilot or to some visual/audible warning system to help any airborne craft to avoid a moving or stationary traffic hazard, It has no value in combat situations. Available in Tech/6+ cultures. Mass = 5-10 kg. Power = aircraft power. Breakdown No. = 3/1. Cost = CR 3000.

GEIGER COUNTER: A device which indicates the presence and intensity of radioactivity. Tech/5+ equipment. Mass = 1 kg in Tech/5-6 models; 0.5 kg in Tech/7 models; 0.25 kg in Tech/8+ models. Cost = CR 150.

MECH TOOL KIT: A large suitcase-sized kit containing basic tools required to repair and service mechanical equipment. A Tech obtains +3 to repair chances when using a full set of tools. Mass = 15 kg Cost = CR 1000. Tech/5+. Repair advantages are -1 per Tech level the equipment to be serviced is above level of the Tool Kit equipment.

HEAVY MECH TOOL KIT: A chest-sized kit containing tools required to cut and shape metal and for welding. A Tech obtains +3 to repair chances when using a heavy tool kit to make major repairs (battle-damage, for example) or to modify vehicles, etc. Mass = 50 kg. Cost = CR 4500. Tech/5+. Repair advantages are -1 per Tech level the equipment to be serviced is above level of the heavy Tool Kit. The kit includes a small lathe to machine parts from raw metal.

ELECTRONIC TOOL KIT: A small suitcase-sized kit containing basic tools required to repair and service electrical and electronic equipment. A Tech obtains +3 to repair chances when using a full set of tools. Mass = 7.5 kg. Cost = CR 2000. Tech/5+. Repair advantages are -1 per Tech level the equipment to be serviced is above level of the Tool Kit equipment.

CARPENTRY TOOL KIT: A chest-sized kit containing tools required to cut, shape, and build with wood. Mass = 25 kg. Cost = CR

1500. Tools include power saw and lathe, as well as usual hammer, hand saws, drills, etc.

ARMOURER'S TOOL KIT: A chest-sized kit containing mechanical and electronic tools required to service weapons and make repairs. A Tech obtains +3 to repair chances when using the kit. Mass = 25 kg. Cost = CR 5000. Tech/5+. Repair advantages are -1 per Tech level the equipment to be serviced is above level of the Tool Kit equipment.

CHAIN SAW: A motorized mechanical device for felling, cutting, and shaping trees. Mass = 5-8 kg, Power = gasoline motor (2 hr.) or power-cell (24 hr.). Breakdown No. = 2/4. Cost = CR 300.

VIBRO SAW: A monofilament vibratory saw with same functions as a chain saw, only far more efficient. Mass = 5 kg. Power = powercell (24 hr.) Breakdown No. = 1/4. Cost = CR 750. Tech/7.

MOBILE WORKSHOP: A well-equipped repair shop designed for mounting in a vehicle, with repair capacities as outlined for Heavy Mech and Electronic Tool Kits, plus full carpentry capacity. Military versions also include Armour facilities. Mass = 1 tonne. Cost = CR 25 000. Tech/5+. Serious multi-system repairs have penalties which Workshop facilities can counter. See 4.23 Multi-System Breakdown. Normal repairs are reduced by -25% of repair time usually required.

HEAVY FIELD WORKSHOP: A superbly equipped repair shop capable of handling most maintainance and repair tasks. A Tech obtains +4 to repair chances under all circumstances, and repair times are reduced to 50% of usual repair period. Mass = 10 tonnes. Cost = CR 100,000. Tech/7+.

LOCKSMAN'S KIT: A tool kit which allows a character to pick most ordinary locks on a roll of 12+. rolled on 3d6. A Mech/Tech or Electronics Tech will enjoy a -1 reduction of the CR level for each expertise level attained over expertise/4, depending on whether the lock is mechanical or electronic in nature. Penalty DMs (positive values: +1, +2, etc.) will be added to the dice roll for locks of greater than normal difficulty. A check can be made every 12 seconds (2 melee turns). Mass = 250gm. Cost = CR 350. Tech/5+.

JACKING EQUIPMENT: Jacks can be acquired in 1t. increments, with a hydraulic jack massing 4kg for 1-5t, and an additional 1 kg. per tonne of lifting capacity after that. Once over 10t capacity a baseplate massing 10 kg is required so that the jack will be properly supported, so add that to the mass of the jack. Cost = CR 5 per tonne of lifting capacity added to a base price of CR 20. The jack may be rated up to 100t. Breakdown No. = 1/4.

5.11 BATTLE ARMOUR, SPACESUITS, & JUMP BELTS

All forms of protective garments, including armour and spacesuits, are classified according to the armour protections they provide to the wearer. All armour protection factors are stated in the form F/E/F, G/F/F, etc. The first notation represents protection against melee weapons. The second notation represents protection against archaic missile weapons, firearms, and explosions of a chemical nature. The third notation represents protection against energy weapon fire. For example, C/B/D means protection 'C' against melee weapons, protection 'B' against missiles and projectiles, and protection 'D' against energy fire. The triple armour classification makes it possible to differentiate between the relative protective qualities of certain types of armour. For instance, the synthetic reflective cloth, Insular, is highly resistant to energy fire but can be easily penetrated by hand-held weapons or missiles and slugs. To rate the material at a single protection factor simply avoids the fact that it is not the same in protective quality in all instances.

The parts of the body protected by a given type of armour or garment will also be given, as the location of a hit has far-reaching consequences.

ARCHAIC ARMOUR: All early forms of armour protection (pre-Tech/5) are included in this grouping. Hide, leather, and cloth 'armour also includes everyday garments made of such material which are reasonably thick. Heavy fur coats, for instance, are equivalent to Coat/1 hide armour. Similarly, heavy winter cloth coats could be classed as roughly equivalent to quilted cloth armour. Such protection can be obtained in early cultures or may be manufactured to order in advanced societies.

Armour Model	Jerkin/1	Jerkin/2	Jacket/1	Jacket/2	Coat/1	Coat/2	Cuirass/1	Cuirass/2	Cuirass/3
Tech Level	0	1	0	1	0	I	2	2	2
Material	hide/	quilted	Hide/	quilted	Hide/	quilted	hardened	bronze	leather &
	leather	cloth	leather	cloth	leather	cloth	leather	plate	banded iron
Head	-	-	-	-	K/K/K*	K/K/K*			-
Arms	-	-	K/K/K	K/K/K	K/K/K	K/K/K			
Torso	K/K/K	J/K/K	J/K/K	J/K/K	J/K/K	J/K/K	I/I/K	H/H/J	H/I/J
Abdomen	-	-	K/K/K	K/K/K	J/K/K	J/K/K	I/I/K	H/H/J	H/I/J
Thighs	-	-	-	-	K/K/K**	K/K/K**			
Lower Legs	-	-	-	-	K/K/K**	K/K/K**		H/H/J*****	
Mass	1.5 kg	2 kg	2,5kg	3kg	4-6kg	4kg	4 kg	6 kg	5kg
Cost (CR)	15	20	25	30	40-60	50-70	175-225	300-350	225-250

Armour Model	Cuirass/4	Cuirass/5	Cuirass/6	Hauberk	Full Chain	Early Plate	Maximillian
Tech Level	2	2-3	3-4	2-3	3	3	4
Material	leather &	chain	steel	chain mail	chain mail	plate & chain	plate & chain
	iron scale	mail	plate	-	-	-	-
Head	-	H/J/I***	-	H/I/J**	H/H/I***	G/G/H******	F/F/H******
Arms	I/J/I****	H/J/I	-	H/J!I	H/H/I	H/G/H	GIG/H
Torso	H/H/I	H/H/I	G/G/H	H/H/I	H/H/I	G/G/H	F/F/H
Abdomen	H/H/I	H/H/I	G/G/H	H/H/I	H/H/I	GIG/H	G/F/H
Thighs	-	-	-	H/H/I	H/H/I	H/G/H	G/G/H
Lower Legs	-	-	-	-	H/H/I	H/G/H	G/G/H
Mass	6kg	7kg	9kg	15 kg	20kg	25kg	20kg
Cost (CR)	250-300	300-350	350-400	550	700	900	1500

* Hooded winter wear. **Trousers or leggings. ***Mail coif. ****Sleeves are 'optional,' and some units may be sleeveless.
*****Greaves (hoplite armour). Note: Helmets are typically worn with a cuirass, and shields may be carried as well. ******Helm.

Helmet Model	Leather	Classical 1*	Norman**	Bascinet	Crusader	Visored
Tech Level	1	2	2-3	3	2-3	3-4
Material	Hard leather	bronze	iron	steel	steel	steel
Mode	open face	open face	open face	open face	closed	visor
Armour	H/I/J	H/H/I	H/H/I	G/G/H	F/F/H	F/F/H
Mass	1kg	1.5kg	1.5kg	1.75kg	2kg	2kg
Cost (CR)	20	65	60	80	90	110

*On Greek and Roman models. **Conical helm with nasal protector.

Shield Model	LtShield/1	Lt.Shield/2	Hoplite	Roman	Chivalric/1	Chivalric/2
Tech Level	0-I	1	2	2	3	3-4
Coverage	body part*	body part*	Cuirass**	Hauberk***	Hauberk***	cuirass**
Armour	I/I/K	H/I/K	H/H/I	G/H/I	H/H/I	H/G/I
Mass	2 kg	2.5 kg	3.5kg	3•5 kg	3.5 kg	3 kg
Cost (CR)	15	20	40	50	45	55

*Any one part of the body is covered, plus arm.
**Coverage from shoulder to abdomen.
***Coverage from shoulder to knee.

LBA LIGHT BODY ARMOUR: LBA is personal armour designed to protect the torso and abdomen from small arms fire and sometimes from edged weapons in early Tech/5-6 versions. Later models also provide protection against energy fire. Early types are comparable to the rather bulky and heavy 'bullet proof vests' and flak jackets of the 20th century on Terra. With Tech/7 technology, a widespread use of lightweight synthetic fibres like Kevlar made fairly compact and effective body armour a possibility:

IRA Model	LBA/1	LBA/2	LBA/3	LBA/4	LBA/5	LBA/6	LBA/7
Tech Level	5	5-6	6	7	8	9	10
Arms	-				G/E/F	G/E/F	G/E/F
Torso	H/E/G	H/F/H	H/E/H	G/D/G	G/D/F	G/D/E	G/C/D
Abdomen	H/E/G	H/F/H	H/E/H	G/D/G	G/D/F	G/D/E	G/C/D
Mass	8kg	5kg	4kg	3kg	3kg	3kg	3kg
Cost (CR)	550	375	600	750	900	1000	1250

LBA/1 is equivalent to the bullet-proof vest, made of nylon reinforced with titanium steel plates'
LBA/2 is equivalent to the standard flak vest of the 1940s-1950s, made of ballistic nylon.
LBA!3 is an early Kevlar model, reinforced with ceramic or light metal plates.
LBA/4 is an improved Kevlar model, reinforced with plates of high tensile strength alloy.
LBA/5 is a Nemourelon ballistic cloth model, reinforced with light, strong plates of Titanallay and rather resistant to energy fire.
LBA/6 is an improved Nemourelon model coated with Insular to yield improved anti-energy protection.
LBA/7 is a model of woven Durallay coated with Insular to yield good anti-energy protection.

CBA COMBAT BODY ARMOUR: All CBA is personal combat armour designed to protect the entire body under battlefield conditions. Some forms utilize a cuirass similar to the LBA types, with a lighter armour protecting the arms and legs. Helmets are also included, but these can be purchased separately at about CR 25 plus 10% of the cost of the whole unit.

All CBA units have the possibilty for optional features to be built in at added cost:

Sealed Armour: For CR 1000, the armour is sealed against the outside environment, effectively converting it into an armoured pressure suit proof against toxic gases and liquids, law pressure conditions, etc. Like support and breathing apparatus must be purchased separately.

Rad Shielding: For CR 750 per rad factor, CBA can be shielded to the levels indicated in the tables below. The mass of the unit is Increased by +2 kg per rad factor of protection.

Other equipment-com gear, vision aids, jump packs, etc,—can be added at additional expense, It should be noted that the overall mass of the armour will quickly increase as optional features are installed and battle efficiency will eventually be impaired by overloading.

CBA Model	CBA/1C	CBA/2C	CBA/3C	CBA/4C	CBA/5C	CBA/6C	CBA/7C
TechLevel	7	7	8	8	9	10	II
Made*	Combination	Combination	Combination	Combination	Combination	Combination	Combination
Head**	G/D/F	F/D/D	E/D/D	D/D/C	C/C/C	B/B/C	B/A/C
Arms	H/H/H	H/H/G	G/G/G	G/F/G	G/G/F	G/F/G	F/E/F
Torso	G/D/G	G/D/F	G/D/E	F/D/D	F/C/D	E/C/D	E/B/B
Abdomen	G/D/G	G/D/F	G/D/E	F/D/D	F/C/D	E/C/C	E/B/B
Legs	H/H/H	H/H/G	G/G/G	G/F/G	G/F/G	G/F/G	F/E/F
Rad Shield	to -2	to -2	to -3	to-3	to.3	to-4	to-4
Mass	7kg	8kg	8kg	9kg	10kg	10kg	10kg
Cost (CR)	2500	3000	3500	4000	4500	5500	6500

CBA Model	CBA/1E	CBA/2E	CBA/3E	CBA/4E	CBA/5E	CBA/6E	CBA/7E
Tech/Level	7	7	8	8	9	10	11
Mode	Exoskeleton	Exoskeleton	Exoskeleton	Exoskeleton	Exoskeleton	Exoskeleton	Exoskeleton
Armour	E/E/E	E/D/D	E/C/D	D/C/C	C/B/C	C/B/B	B/A/A
Rad Shield	to -4	to -5	to-5	to -6	to -6	to -7	to-8
Mass	8 kg	10 kg	10 kg	12 kg	12kg	12kg	12 kg
Cost (CR)	4500	5250	6000	7500	8500	10 000	13500

*Combination employs a cuirass of good resistance with lower armour level arms and legs. The Exoskeleton is a rigid armour type with flexible joints.

SPACE SUITS & VACUUM SUITS: All suits designed to sustain personnel in low pressure, vacuum, and toxic atmospheric conditions are essentially the same as the Combat Body Armour Units, except that they contain oxygen breathing apparatus. Provision for rad shielding, com gear, vision aids, minicomputer and HUD systems, etc., is made at extra expens:

SS—VS Model	SS—VS/1	SS—VS/2	SS—VS/3	SS—VS/4	SS—VS/5	SS—VS/6	SS—VS/7
CBA Equiv.	CBA/1C	CBA/2C	CBA/3C	CBA/4C	CBA/5C	CBA/6C	CBA/7C
Cost (CR)*	5500	6250	7000	8500	9500	11 000	13 500

*Oxygen breathing apparatus is extra—at least CR 450 for 6 hr. duration at a mass of 5 kg. See 5.1 Survival Equipment. Life support systems cost CR 500 +CR 50 per hour of duration (heating/cooling system, waste reclamation, self-sealing system) and are sustained by a powercell, with a maximum 96 hr. duration.

Combat Body Armour exoskeleton types can be converted into sealed units (armoured space suits) at a basic expenditure of CR 1000 plus oxygen and life support systems.

ANTI—RADIATION SUIT: A space suit may be modified for heavy radiation environments at a cost of CR 10 000. Protection is total so long as a Breakdown No. (2/4) is not rolled. A failure (first number) occasions a second roll. A second failure means the special force field has collapsed, and only the basic suit shield is effective. Roll for Breakdown every 1d6 minutes that one is in a radiation level above the basic suit shielding factor.

PAPA POWER ASSISTED PERSONAL ARMOUR: Some of the earliest forms of Power Armour to appear in science fiction are the battle armour types in 'Doc' Smith's Lensman series. Robert A Heinlein's Starship Troopers and Joe Haldeman's Forever War provide more recent and detailed examples. Power Armour is a heavily armoured exoskeleton employing servomechanisms to magnify the wearer's strength. The result is that the CAP (Combat Armour, Powered) Trooper becomes, in essence, a one-man tank. Since the PAPA unit itself provides the power for normal actions, with the wearer providing control rather than 'muscle,' heavy activity can be performed for a considerable period of time before the wearer becomes fatigued. When the powercell is exhausted, the wearer will be unable to move the suit by himself.

All PAPA units should be considered as armoured vacuum suits or armoured space suits with mech strength. It is fully self-contained, with electrically powered life support systems capable of operation for up to 5 times the period indicated if the suit powercell is replaced or recharged. Life support systems include a heating/cooling unit to maintain livable conditions inside the suit in all environments, waste reclamation of recycle water and dehydrate solid wastes, air purifiers and a 4-hr. emergency oxygen tank, self-sealing system to close hole and leaks (some units have 'nipper' joints which can completely close points on the limbs when sections are totally blown away, while cauterizing the end of an amputated arm or leg), and food and water for designed suit duration (5x powercell duration). Food is in the form of concentrated ration pellets, while water is recycled except for a 2 liter emergency tank.

Power Armour divides into 3 basic classifications: Scout, Marauder, and Assault BattleArmour. Scout PAPA units are typically used as 'light' reconnaissance armour by the military. Civilians may be able to obtain Scout armour as well. A degree of protection is sacrificed in the general interest of speed and endurance. Marauder armour is standard BattleArmour typically issued to Mobile Infantry. Assault BattleArmour is extra-heavy Power Armour developed for very specialized use by the Terran SpaceForces and the IPA. Armour protection in such Units may attain heavy tank levels. However, Assault PAPA units are exceedingly costly and therefore will never be encountered as general issue items.

PAPA	'C,	'B'	'A'
Specification	Scout	Marauder	Assault
Armour Class	C/B/C	B/B/B	A/A/A
BattleScreen	standard	standard	+1
Rad Shield	-6	-7	-8
Y-Rack G.L.	No	Yes	Yes
C-G Harness	AAA	AA	A
Strength Mag.	x3	x3	x4
Polarized Visors (1)	PVC	PVC	PVC
IR Visors (1)	IRV/3	IRV/3	IRV/3
NightVisors (1)	yes	yes	yes
ElectroBinoc	E lectroB/2	Electro/B2	ElectroB/2
BattleRadar (2)	PAR	PAR	PAR
SensorScanner	(3)	(3)	(3)
Communicator	BTC/4	BTC/4	BTC/4
Inertial Map	IML/HUD	IML/HUD	IML/HUD
MediSensor	PMS	PMS	PMS
Life Support	48 hrs.	48 hrs.	48 hrs.
PowerCell	48 hrs.	48 hrs.	48 hrs.
Hand-to-Hand Factor	100	120	140
EW Factor (4)	7	7	7
Cost (CR)	125,000	150,000	175,000
Mass	75 kg	100 kg	125 kg

(1) Polarized/IR/NightVisor equipment may be replaced with Multi-Visors at Tech/9+.
(2) BattleRadar is available at Tech/8.
(3) SensorScanners are available at Tech/9.
(4) EW equipment Costs CR 1000 + (CR 1000 x EW Factor).
Tech/8 units may have EW 8, Tech/9 can have EW 9, etc.

Heads-Up Display: HUD units are purchased separately, with capabilities and costs appropriate to the Tech level of the producing culture. Tech/7 = HUD/1; Tech/8 = HUD/2; Tech/9 = HUD/3; etc. See 5.4, Battle Computers.

Powercell masses 1 kg and costs 750 CR. Spares are usually carried to extend duration and life support. All units are supplied with 10% of cost in spares and parts. Maintainance of powered armour must be carried out every 168 hours of service, with a +2% multi-system breakdown chance per hour over that. Maintainance time = 4 hrs.

SEC STANDARD ENERGY CELL: Energy cells for all types of equipment come in two sizes; SECs and mini-SECs. Costs are CR 25 for the SEC or CR 10 for the mini-version. Both are rechargeable powercells and the cost of a recharge is CR 2.5 for the SEC or CR 1 for the mini-SEC. SECs mass 100 g. while the minis mass in at 50g. The smaller variant holds only 50% the charge of the full size version.

At Tech/6+ there are available Chemical Power Cells or CPCs. These mass the same as SECs but cost only 10% of the cost of the SECs. Unlike SECs, the CPCs cannot be recharged and only hold 1/5 the charge of the Standard Energy Cells.

JUMP BELTS/GRAV BELTS: The Jump Belt is worn on the back and is attached to a person with a harness similar to that of a para-chute. The Jump Belt operates under certain restrictions which should be noted by all operators:

1. The Jump Belt can 'nullify' a maximum of 225 kg 1495 lbs.), A 'jump' may be made if the total mass in the field does not exceed 225 kg. If a greater load is placed within the field, it will collapse In 1-3 minutes—with a 20% chance that the null.grav generator will burn out, Balrad and Saurian units can 'nullify' 275kg.
2. An interruption of the gray-field lines generated by the Jump Belt will result in complete loss of lift. If in the air, the wearer will fall as gravity reasserts itself. Interruption is caused by the 'interpenetration' of another Jump Belt or GraySled field (within 2m) or the 'immediate proximity' (within 2m) of a large, fixed object such as a building, wall, cliff face, etc. An operator can 'synchronize' his Jump Belt with that of another in 30 seconds (5 combat turns) so that both fields will be compatable as long as physical contact is made. This permits several Jump Belt troopers to effect a 'pick-up' on a fallen comrade.
3. Because of its low power, the Jump Belt can operate only within a large gravity field, Such as that of a planet, 'riding the magneto-gravitic lines of force of the planetary body it-self. Remember: the 2m proximity rule applies, so 'flight' must be at least 2m from the ground. The higher one goes, the greater the power consumption. All Jump Belts have a powercell with 100 'charges' which can be expended at the following rates:

One Hour At:	**Power Consumption**
2m-500m	1 charge
501m-l000m	2 charges
1001m-2000m	4 charges
2001m-4000m	8 charges
4001m-8000m	16 charges
8001m-l6000m	32 charges
To Climb To:	**Power Consumption**
2m-500m	0 charge: Simple 'iump' + field
501m-l000m	I charge
1001m-2000m	2 charges
2001m-4000m	4 charges
4001m-8000m	8 charges
8001m-l6000m	16 charges

The cost to climb to a given altitude must be met as well as the cost to remain at that altitude for one hour. Each altitude level counts separately. Thus, to climb to 700Cm from the ground requires expenditure of power to attain 500m, 1000m, 2000m, 4000m and finally 7000m, for a total of I + 2 + 4 + 8 = 15 power charges. Fractional times spent at altitude may be divided into (5-minute segments. That is, for each 15 minutes or portion thereof which are spent at a given altitude, 1/4 of the power expenditure occurs (minimum of 1 charge in any event). Thus it will cost 1 charge to remain at 500m for 15 minutes. It would also cost 1 charge to remain at 600m because the 1-charge minimum rule applies.

4. Jump Belts are also capable of powered flight at low

speeds. Power consumption is 1 charge per hour to maintain a standard speed. Max. speed = 1/4 max jump speed.

The standard technique used to move with a Jump Belt is a series of short jumps which do not take the user very far from the ground (usually 2m to 4m off the ground) and covering a distance of 10m to 25m per jump so that an over-all speed approaching that of a running man is produced. The effort requires some gymnastics, and a fatigue rate equal to about half that of normal running occurs. The user jumps parallel to the ground to avoid hanging in the air. Gravity will not do it for him. This procedure tends to make a series of short jumps look like a tumbler doing somersaults and deciding not to do the roll at the last minute, rather continuing his horizontal jump for a considerable distance then kicking down to land on his feet.

This requires training and practice. (see 4.6 Armsman Skills for Jump -Belt training). Untrained personnel almost always make long, rather high jumps, rather than the more difficult short, low lumps (1.4 chance on 1d6). Green troops have a 1 in 6 chance of making such a mistake. Regular and veteran troops will almost never be so clumsy.

Jump Belts never suffer a 'serious' breakdown in the air unless it is the result of powercell failure. The controls will give ample warning in time to reach the ground (usually a matter of simply falling to low altitude, then kicking in the field at full power in the last few meters, similar to opening a delayed-action parachute). On the ground, a breakdown means that the unit refuses to lift at all. Minor breakdowns are merely inefficiency in power utilization, with double power consumption; serious breakdowns are total malfunctions.

As a final note, most terrain will not affect .Jump Belts. Rough terrain cuts the allowed movement by -25% because of the added hazards in landing. Woods and swamps cut movement by -50%, and dense woods by -75%. Jump Belt equipped personnel can jump over obstacles such as water, woods, etc., provided the obstacle is not more than 1/2 normal jump belt movement in clear terrain. Vertical jumps can be 1/4 the distance of normal jump belt movement in clear terrain. Any farther requires that the 'climb' function be cut in, which requires 6-20 seconds to set. Troops jumping over water and unable to clear it will find that their Jump Belts will not lift them out of water. The Jump Belt cuts in automatically to act like a parachute when a 20m drop has occurred. This function may be overridden to allow a free-fall drop or may be activated after 10m (allowing for react10m time) if a person accidently falls.

All Jump Belt powercells cost CR 75 each and mass 250gm. They can be recharged with 100 charges of power in about 1 minute, at a cost of CR 30. IRSOL powercells are triple-charge units, also massing 250gm but costing CR 175. They can be recharged with 100 charges in 3 minutes at a cost of CR 90. Jump Belts themselves mass 5 kg, and have a breakdown on 1/4. Costs = CR 3500 for type 'A', CR 2750 for type 'B', and CR 2000 for type 'C'. See combat movement for speeds.

CONTRA—GRAVITY HARNESS: The CG Harness is a heavy-duty version of the Jump Belt, capable of lifting 500kg total mass. The unit is also called a Flying Belt, for it is fully powered by a small TurboGray or reaction (rocket) pack. Since the drive provides the motive power, use of Flying Belts is not fatiguing. However, under power, the user must either stay in the air and make himself a good target, or he must attempt to fly 'nap of earth' like an aircraft. Nap of earth flying requires extreme concentration and can cause a crash. The units may be employed to make short jumps, as described for Jump Belts. All Jump Belt rules and restrictions apply, except that the Abbot null-grav unit is no longer affected by inter-penetrations and proximity problems because it is effectively damped like a GraySled unit.

CG Harness Model	Max. Speed 1 Hr. (km/h)	Power Consumption (Charges)@	Cruising Speed (km/h)@@	Power Consumption (charges)@
CG 'AAA'	216	3	72 (.33)	1
CG 'AA'	189	3	60 (.32)	1
CG 'A'	162	3	54 (.33)	1
CG 'B'	135	3	48(.36)	1
CG 'C'	108	3	45 (.42)	1

@Power consumption is per 15 minutes of powered flight, This expenditure is in addition to basic Jump Belt consumption rates. However, climbs under power are made at 1/2 Jump Belt costs plus Max. Speed CG consumption rates. Flight at altitude can be made at CG rates, which are more economical than Jump Belt rates.
@@Cruising Speed is maximum economical speed with a CG Harness. The decimal factor in brackets is the multiplier which can be used to convert any of the speeds to scale speeds. For example, 72 km/h = .33 of 216 km/h. Speed in 6 minutes covers .33 x 21,600 = 7128m. Six second scale = 14.4 x .33 = 4.75 scale measure units (either inches or cm.)

All CG Harness units come equipped with a standard 200 charge power-pack, which masses, along with reaction fuel, 10 kg. Cost = CR 300. Recharge costs CR 75. Double-duty units can be had with mass 20 kg at CR 550, and recharge CR 150. Note: The reaction fuel is included in the concept of 'charge' to simplify bookkeeping and game mechanics.

All CG Harnesses themselves mass 15 kg. Cost = CR 10,000 for CG 'C', with each class above that costing an additional CR 2500. CG 'AA' may be worn with armour no heavier than class 'C' energy armour (light Scout Powered Armour, for instance). CG 'AAA' cannot be worn with armour heavier than class ~D' energy armour: this is topflight spacesuit JetPack gear. Breakdown of all CG Harness is on 1/2.

5.12 ROBOTS

'Robots' are cyberneticized machines that will act exactly as programmed and ordered. Robotic positronic 'brains' can control a vehicle, a gun, a suit of Powered Armour (Battle or War Robot), or even an entire StarShip.

The MekPurrs are the masters of the science of Robotics, partially because that feline race is rather limited in numbers and must augment itself with semi-sentient cybernetic equipment, both on the battlefield and in general society.

SERVICE MEK: A 'robotic' device designed to perform routine maintainance and repair functions under the direction of a positronic MiniComputer/7 (these are available in Tech/7, unlike the 'normal Mini/7, but are restricted to cybernetic equipment), the Service Mek can be programmed with any of the MiniC Data Chips as described in 5.3 MiniComputers. The Mek is an 'idiot' specialist in the function for which it is programmed. The Mek is purely functional; thus it is not humanoid in shape. Depending on whether it is designed for heavy work or light work, it will range from 50 kg to 1000 kg in mass. The Mek will be fitted with servo 'arms' and manipulators appropriate to its overall functions. Locomotion is typically on rubberized treads, although some units have GrayPods or Hover capability. Speed tends to be at the pace of a man Or slightly faster when in motion. The following types are generally available:

Specification	Mech/Tech	Hv. Mech/Tech	Com/Tec	Power/Tech	Servant	Household	Medi/Tech
Mass	250 kg	1000 kg	100 kg	350 kg	100 kg	50kg	200 kg
Damage Cap.*	35	50	25	40	25	20	50
Armour	F/F/F	E/E/E	F/F/F	C/C/C	F/F/F	F/F/F	B/B/B
Red Shield**	-8	-9	-7	total	-5	.3	-9
Locomotion	Tracked	Tracked	Grav	Tracked	Grav	Grav	Grav
Speed	MekPurr	MekPurr	MekPurr	MekPurr	MekPurr	MekPurr	MekPurr
Duration	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.
Recharge Cost	CR 200	CR 500	CR 200	CR 500	CR 200	CR 100	CR 200
Maintainance	1000 hr.	1000 hr.	1000 hr.	1000 hr.	1000 hr.	1000 hr.	1000 hr.
Time Maintain	6 hr.	8 hr.	8 hr.	8 hr.	8 hr.	5 hr.	8 hr.
Breakdown No.	2/4	2/4	2/4	2/4	2/4	2/4	2/4
Expertise**	2-7	2-7	3-7	3-7	3-7	3-7	3-7

*Body point equivalent, If damage exceeds the capacity, the unit must be repaired as if a single system Breakdown class/7. The unit will continue to function if lesser damage is sustained, but a Breakdown roll will be made every 1d6 hours it is operating after being damaged. Repairs can be made by rolling on the breakdown table to find out the extent of the damage. If damage exceeds double damage capacity, the unit is damaged beyond repair.

**Positronic 'brains' are sensitive to radiation. If the rad level reaches +1 over the unit's limit (for instance, a -7 means that it can withstand rad/7, as 7 - 7 = 0; but rad/8 is beyond the limit), roll for break. down. Each rad level above the unit's shielding factor adds +1 to the Breakdown No., and also to the repair roll. If 21+ occurs on the repair roll, the positronic brain has been destroyed. Check every 1d6 hours exposed.

***The expertise range indicated is that possible for the Mek to perform when programmed. The cost of the Mek, in part, depends upon the maximum expertise level built into the unit.

Mech/Tech Mek: 250 kg: A mechanic Mek designed to service mechanical equipment. It can lift masses up to 250 kg with its servos. Basic Cost = CR 25 000 for expertise/2 capacity. An additional CR 2500 per expertise level over Mech/2 buys an improved model. Equipment includes a Mech tool kit.

Hv. Mech/Tech Mek: 1000 kg: A heavy-duty mechanic Mek designed to perform welding and metalwork jobs, erect structures, cut trees, etc. It can lift up to 2000 kg with its servo arms, and has hydraulic jacks to lift masses up to 100t to replace tracks, wheels, etc., as required. Basic Cost = CR 35 000 for expertise/2, and an additional CR 3500 per expertise level over that. Equipment includes a heavy Mech tool kit.

Com/Tech Mek: An electronics Mek designed to service and maintain all electrical equipment except computers. Its servos can lift up to 75 kg. and its manipulators are capable of very fine work if needed. Equipment includes an electrical toolkit. Cost = CR 25 000 for expertise/3 plus an additional CR 5000 per expertise level over that.

Com/Tech Computer Mek: An electronics Mek designed to service and maintain computers. It is the same in specifications as a standard Com/Tech Mek, but all costs are doubled. It can also perform Com/Tech operations if necessary.

Power/Tech Mek: A Mek designed to work with high-voltage electricity and to service nuclear reactors, StarDrives, etc., where it is dangerous for living personnel to go. Equipment includes an Electrical, a Mech, and a Heavy Mech tool kit. Its servos can lift 250 kg, and it has jacking equipment which can raise up to 5000 kg if necessary. Cost = CR 50 000 for expertise/3, plus CR 5000 per expertise level over that. The unit is particularly useful when the servomechanisms in a StarShip Power and StarDrive systems break down, and it can rectify the trouble without requiring the presence of a man.

Servant Mek: A Mek designed to perform such functions as valet, waiter, cook/chef, etc. It has about the same capacities as an average man. Cost = CR 20 000 for expertise/3, plus an additional CR 2000 per expertise level above that. Each expertise level adds +3% to a base 80% chance of performing an assigned 'servant' task. Failure means that the unit mixed the Martini with too much gin, spilled the soup in a special guest's lap, burned the roast, or failed to sew that loose button on, etc.

Household Mek: A Mek designed to perform routine cleaning and other related tasks, relieving one of the drudgery of such unpleasant activities. Cost = CR 5000 for expertise/3, plus an additional CR 1000 per expertise level above that. The unit can also perform routine maintainance and repair on household appliances, for which the expertise is used. Occasional emergencies like a toaster burning out or a leaking faucet can be called on by the StarMaster to activate this 'Mother's Helper.'

MediTech Mek: A Mek designed to work alongside a Physician as a replacement for a trained MediTech. If operating alone, it has only 2/3 of its normal capacity. Cost = CR 40 000 per expertise/3, plus CR 4000 per expertise level over that. It cannot perform operations, etc., but contains such facilities for use by a Physician. It also contains a FMK Field MediKit.

BATTLE ROBOTS: A Battle Robot or War Robot is nothing more nor less than a cybernetically controlled suit of power armour capable of performing various combat functions if given precise orders.

There are three models of War Robot, based upon the standard MekPurr design:

Light Infantry Robot: Equivalent to Scout Powered Armour. Hand-to-Hand Combat factor = 110. The unit has no jetpack. Movement is equal to Powered Armour 'A', with units being either tracked or 'legged.' EW = 7, with HUD/1. Each Tech/level above Tech/7 adds +1 EW, and +1 to HUD rating. Expertise equivalent with weapons and Hand-to-Hand combat = level/5. Rad Shield = .8. Breakdown No, = 2/4. Mass = 250 kg. Damage Capacity = 65. Cost = CR 150,000. Standard Armament = Blast LMG.

Support Robot: Equivalent to the Light Infantry Robot, but with a hand-to-hand combat factor = 115. The unit will be armed with a Blast MMG and a Lt. PML. It may be issued with a Flame MG in place of the PML.

Heavy Infantry Robot: Equivalent to Marauder Powered Armour. Hand-to-hand combat factor = 135. The unit has no jetpack. Movement is equal to powered armour 'A', with units being either tracked or 'legged.' EW = 7, with HUD/1. Each tech level above Tech/7 adds +1 EW, and +1 to HUD rating. Expertise equivalent with weapons and hand-to-hand combat equals level/6. Red Shield = -9. Breakdown No. = 2/4. Mass = 350 kg. Damage Capacity = 100. Cost = 250,000 CR. Standard Armament = Blast HMG.

Brain Screen: CR 10 000 units can be equipped with a +1 anti-aprobdif positronic 'Brain Screen.'

Rad Shield: All Battle Robots have 'total' anti-radiation shielding.

Heavy Assault Robot: Designed in Tech/10 levels by MekPurr armament engineers, the Heavy Assault Robot is equivalent to Assault Powered Armour. Hand-to-hand Factor = 140. The unit has no jet pack but is equipped with anti-grav to permit it to cross water, swamps, etc. Normal movement is on tracks. Movement is Power Armour 'A' on tracks or anti-grav. EW = 10, with HUD/4. Expertise equivalent with weapons and hand-to-hand combat = level/8. Red Shield is total. Anti-APROBDIF 'brainscreen' = +2, and a +3 can be fitted for an additional CR 25,000. Mass = 500 kg. Damage Capacity = 135. Breakdown No. = 2/4. Cost = CR 350,000. Standard Armament is a Blast HMG, a hand flamer, and a stun pistol. The unit can handle other weapons as issued. Only MekPurr personnel can operate these

robots.

ROBOTIC VEHICLES: The MekPurrs have installed positronic 'brains' in combat vehicles, usually on the Terran model. EW = 9 in Tech/7, and graduating upward by +1 per Tech level thereafter. Cost = CR 125 000 to cybernetize the vehicle, so add to the basic vehicle cost. Robotic units are used to provide support for manned MekPurr armour, with the SabreTiger' MBU typically acting as a Command Vehicle. Expertise of Robotic fighting vehicles = expertise/7. They all have +3 positronic 'Brain Screens' and full radiation protection.

COMMAND CONTROL UNIT: MekControl units are available for CR 25 000. These consist of a wiremesh 'helmet' connected to a MiniComputer. The 'helmet' converts brain waves directly into electronic signals by the MiniC, and these signals are then beamed out by radio and sub-space communications to the Robots and Meks under the controller's charge. Mass = 500 kg. Range = range of communicator to which the system is linked. Breakdown = 1/2 (direct hit only). Duration: 5000 hr. powercell. Tech/7+ MekPurr device. Cost = CR 25 000 x 20.d10% for non-MekPurr races. The MekPurr unit cannot be easily overridden by foreign MekControls, as it is totally integrated with the Robotic systems it commands.

5.13 CIVILIAN AIRCRAFT

The aircraft fall into a number of categories:
Light Plane: Light, subsonic aircraft which are usually prop-driven or jet-powered.
Light SST: Light supersonic transport, roughly comparable in size and function to light planes.
Medium Transport: Medium, subsonic aircraft which are usually prop-driven or jet-powered. These are passenger/cargo typical of those used by commercial carriers.
Medium SST: Supersonic version of the Medium Transport.
Heavy Transport: Large, high-capacity passenger and cargo carriers, again either prop-driven or jet-powered.
Heavy SST: Supersonic version of the Heavy Transport.

In addition, there are a number of terms which players need to understand:

TurboGrav: An advanced propulsion system which enables an aircraft to perform inside of atmosphere or in low orbit. They combine air-breathing TurboRam jet engines with anti-gravity field drives to permit maximum performance at low, middle, and very high altitude, with the TurboJets yielding to the RamJets at high altitude, then the RamJets yielding to GravDrive when the atmosphere is too thin to permit the jets to function. Cost of fuel = CR 10 per 100 km/t. An aircraft is rated by the first number in its mass entry: a 10t (4t) aircraft with 7500 km range would require 10 x 10 x 75 = CR 7500 worth if fuel to top off the tanks. The second (bracketed) mass entry is the weight of the aircraft under grav field, which is used to compute range in vacuum conditions. That is, our aircraft with 7500 km range in atmosphere would have 7500 x 10/4 = IS 750 km range on an airless planet using GravDrive. Also, an orbital insertion requires the expenditure of 500 km worth of fuel.

Prop: The standard IC or turboprop driven propeller system used in many contemporary subsonic aircraft. Cost of fuel = CR 6 per 100km

Jet & FanJet: The standard turbine-compressor jet engine. Cost of fuel = CR 8 per 100t/km.

TurboRam: A combination TurboJet and RamJet engine which is capable of delivering good performance at low, middle, and high altitudes. Cost of fuel CR 9 per 100t/km.

STOL: Short Take-Off and Landing capability, a capacity to operate from limited runways. The distance required is usually 20% of the 'Run' or runway distance given for most civilian craft. Some aircraft will have a notation like 'STOL: 250m,' which means that they have a 250m run to land or take off under STOL conditions. STOL burns up 100km worth of fuel per take off or landing.

VTOL: Vertical Take-Off and Landing capability, a capacity to rise or descend vertically (no horizontal movement) at a cost of 250 km worth of fuel per take-off or landing, or to hover at a cost of 100 km worth of fuel per minute or part thereof. Helicopters and AirCav/Sky Cycle units effect a take-off, landing, or hovering at a cost of 10 km worth of fuel.

Breakdown: See the notes on vehicle breakdowns (section 5.11). Aircraft have a chance of becoming non-operational just before a mission/flight, so roll the Breakdown No. when attempting to start engines. Otherwise, malfunctions will occur only when improper maintainance has been done or when battle damage is sustained.

Pressurization & Sealing: All Tech/6+ aircraft are assumed to be pressurized and sealed. They have 24-hr. life support for the maximum crew and passengers for which they are rated. When carrying less than maximum personnel, the duration is 32-hr. maximum. Life support systems may be installed, however, to increase the time, as outlined for vehicle in 5.11.

Air-to-Air: All aircraft are rated for their dogfighting capability. This will be dealt with in the publication Space Opera Ground & Air Equipment, a reprint of BRINT military intelligence reports which have come into the possession of FGU. The air-to-air factors are included here only for reference and have no bearing on basic role games.

CIVILIAN AIRCRAFT

The following civilian aircraft are 'common' to all races except the 'Bugs,' who have only military craft.

Costs are retail prices on major planets. Wholesale prices at 65% of retail may be obtained from the manu'scturer upon a Merchant character's making a Merchandizing CR. Otherwise, he will have to 'Dicker' on the price. On 'backwater' planets, the cost. will be raised by an additional 10% x 1d10 to account for transportation costs, etc., such price being based on the retail value.

All civilian aircraft come supplied with 10% of cost in the form of spares and parts.

AIRCRAFT SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Type	Lt. Plane	Lt. SST	Lt. Plane	Lt.SST	Lt. Plane	Lt. SST	Mdm.Transport	Mdm.Transpor
Tech Level	5-6	7+	5.6	7+	5-6	7+	5-6	6+
Mass	1t	1t	3t	3t	6t	6t	35t	6Ct
Crew	1+6	1+6	2+12	2 + 12	2 + 12	2 + 12	3 + 100	4+ 150
Cargo	1t	1t	2t	3t	4t	6t	3Ct	40t
Powerplant	I Prop	2 TurboRam	2 Prop	2TurboRam	2 Jet	2 TurboRam	4 TurboProp	4 FanJet
Speed	350 kmh	1500 kmh	400 kmh	1500 kmh	1000 kmh	2500 kmh	600 kmh	950 kmh
Ceiling	5000m	15000m	8500m	15 000m	12 000m	15 000m	12 00Cm	IS 00Cm
Range	1000 km	2500 km	2000km	3500 km	4000 km	7500 km	6000 km	8500 km
Landing Mode	STOL: 100m	RUN: 1500m	RUN: I000m	RUN: 1500m	RUN: 1000m	RUN: 1500m	Run: 150Cm	Run: 250Cm
Maintainance	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.
Breakdown %	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.	+2%/+l hr.	+2%/+l hr.
Time Maintain	4 hr.	8 hr.	5 hr.	8 hr.	6 hr.	10 hr.	8 hr.	10 hr.
Breakdown No	2/4	2/4	2/4	2/4	2/4	2/4	2/4	2/4
Damage Cap.	4	5	6	7	7	8	9	10
Red Shield	-1	-2	-1	-2	-1	.3	.1	-2
Armour	G/G	D/D	G/G	D/D	G/G	D/D	F/F	F/F
Cost (CR)	17500	50000	30000	125000	95 000	275 000	125 000	250 000

AIRCRAFT SPECIFICATION	COMMON	COMMON	COMMON	COMMON
Type	Mdm. SST	Hv.Transport	Hv.Transport	Hv. SST
Tech Level	7+	5-6	6+	7+
Mass	50t	115t	50t	100t
Crew	3+100	4+200	4+ 300	3 + 100
Cargo	50t	80t	100t	100t
Powerplant	4 TurboRam	4 TurboProp	4 FanJet	4 TurboRam
Speed	2000 kmh	750 kmh	950 kmh	2000 kmh
Ceiling	20,000m	12 000m	15 000m	20 000m
Range	10,000 km	9000 km	12 000 km	15 000 km
Landing Mode	Run: 2500m	Run: 2500m	Run: 3000m	Run: 3000m
Maintainance	50 hr.	50 hr.	50 hr.	50 hr.
Breakdown %	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.
Time Maintain	10 hr.	10 hr.	10 hr.	10 hr.
Breakdown No.	2/4	2/4	2/4	2/4
Damage Cap.	10	12	12	12
Rad Shield	-4	-l	-2	-4
Armour	D/D	E/E	E/E	D/D
Cost (CR)	450,000	425 000	600 000	950 000

Aircraft costs include basic avionics: communicators, air traffic radar, RDF for homing in on radio beacons, and inertial maps in Tech/7+ aircraft. All aircraft rated at more than 500Cm service ceiling are pressurised.

Amphibians cost an additional +10% for light aircraft, +15% for medium aircraft, and +20% for heavy aircraft.

Flitters are fitted with anti-gravity pods for an additional +15% of cost. Aircraft converted to Flitter capabilities have VTOL landing mode and an additional +25% speed and range. Note: all jet aircraft types can be converted to Flitters. Air-to-Air factor is increased by +1.

STOL capability can be given to all aircraft at an additional +10% of cost. Take-off and landing distance is reduced to 20% of 'Run' distance required for runway take-off's and landings.

AIRCRAFT SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Type	Light Helicopte	Light Helicopter	Medium Helicopter	Medium Helicopter	Heavy Helicopter	Heavy Helicopter
Tech Level	5-6	7+	5-6	7+	5-6	7+
Mass	750 kg	750 kg	6t	10t	60t	50t
Crew	1+3	1+3	2 + 30	2 + 30	3 + 50	3 + 50
Cargo	500 kg	1t	5t	12t	40t	50t
Powerplant	Jet/Rotor	TurboRotor	Jet/Rotor	TurboRotor	Jet/Rotor	TurboRotor
Speed*	250 kmh	500 kmh	250 kmh	600 kmh	250 kmh	400 kmh
Ceiling	4500m	6000m	4500m	7500m	4000m	7500m
Range**	500 km	1 500km	750 km	2000km	750 km	1 500 km
Landing Mode	VTOL	VTOL	VTOL	VTOL	VTOL	VTOL
Maintainance	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.	50 hr.
Breakdown %	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.	+2%/+1 hr.
Time Maintain	4 hr.	4 hr.	6 hr.	6 hr.	12 hr.	12 hr.
Breakdown No.	2/4	2/4	2/4	2/4	2/4	2/4
Damage Cap.	4	6	8	10	10	12
Rad Shield	-1	-3	-1	-3	-1	-3
Armour	F/F	D/D	F/F	D/D	F/F	D/D
Ait-to-Air	(5)	(8)	(4)	(6)	(I)	(4)
Cost (CR)	17 500	25 000	75 000	125 000	150 000	225 000

*Speed of Tech/7+ helicopters will increase with Tech Level. Add +100 kmh per Tech level above Tech/7.
**Range of lech/7+ helicopters will increase with Tech level. Add +250 km per Tech level above Tech/7.

Aircraft costs include basic avionics. Military helicopters will be fitted out with EW equipment equivalent to current 'Utility' class flitters at an added +20% of cost, with such avionics including Battle-Radar, Sensors, Sensor Defenses, etc. Also, armour class is raised to AFV/AFV in Tech/7+ military helicopters. Armaments are installed at additional cost, and can include light Blast Cannon (Blast 25) in Medium and Heavy Helicopter models, such heavy guns acting as, nose-mounted anti-tank weapons. PMLs, AGM air-to-ground missiles and MG weapons can be mounted in weapon pods.

5.14 CIVILIAN VEHICLES

A wide range of civilian are available for use in Space Opera. The units are all rated so that they will be compatable with the system in Space Marines if those rules are used for a military

campaign.
Vehicles fall into the following categories:
Ground Cars: Wheeled cars and trucks designed for on-road operation. Off-road performance is drastically limited (usually 1/2 slow wheel movement).

ATV All.Terrain Vehicles: Four and six-wheel drive vehicles designed specifically for off-road operations. ATVs usually are equipped with heavy-duty balloon or solid tires and are amphibious (they 'swim' across streams, etc.).

HoverCraft: GEM or 'ground-effects machines' with superb cross-country performance. All GEM units utilize an air-cushion 'flotation' system which requires a reasonably decent atmospheric pressure if the hoverfans are going to pressurize the air 'bubble' upon which the vehicle rides. GravPods may be fitted at an additional +10% of cost (minimum CR 7500), or the unit may be fitted with slow tracks a +10% of cost or medium tracks at +15% of cost (minimum CR 5000), giving it the capability to function in low pressure and vacuum environments. Note: only HoverCruisers and HoverShips are suited to operations over considerable distances in open waters. Lighter craft will have a chance of breaking down under high seas conditions.

Crawler: All vehicles mounted on caterpiller tracks are referred to as crawlers.' They are very dependable, heavy-duty ATVs capable of operations in a wide variety of conditions. At an additional cost of +10%, they may be made amphibious.

GravSled: A vehicle utilizing GravPods to hold the craft a meter or so off the surface of the ground or water. The craft cannot fly, as such: rather, it 'floats' off the ground. Since the propulsion system is by field propagation, it can readily operate in vacuum as well.

Motor Boat: A light, IC internal combustion engined craft utilizing a propeller to move it through the water at fairly high speeds. Advanced versions may use Hydrox-TurboElectric engines.

JetBoat: A Hydro-TurboElectric powered craft which uses high. pressure jets of water to propel it at high speeds.

HydroFoil: A boat or ship which uses hydrofoils to raise the hull Out of the water, giving it high-speed performance in open water. The hydrofoils will not operate under 50 kmh, so at slow speeds or in closed waters, speeds are limited to Motor Boat performance levels.

HydroSkimmer: A light boat with a very shallow, saucer-shaped, enclosed hull which uses turbojets to propel it at very high speed, even in closed waters. It is excellent for operations in inland waters and shallow seas.

Submersible: A relatively small craft with GEM and GravSled capabilities on the surface of the water and on land, the Submersible is in effect a submersible HoverCraft. It is capable of diving to a depth of 1000m and can remain submerged for 480 man-hours (divide by number aboard for the duration), before having to surface to replenish air. Life support systems can be installed for a longer duration. It is air-locked for underwater access/egress.

CargoSub: A large submersible which is actually a full-fledged Ship, the CargoSub is capable of transporting a significant amount of goods, equipment, men, and even vehicles for a substantial distance. It is not a true land-going HoverCraft, and can operate Only on a smooth shelving beach or very level land at 1/2 GEM speeds, but in the water it has full GEM capability, It is air-locked and has life support systems good for maintaining the occupants for 1100 man-days (divide by the number aboard) before replenishing from stores or from surface air.

AFV: Armoured Fighting Vehicles, a term used to distinguish all military armoured vehicles.

In addition to these general classifications of vehicles, there are a few other terms which players will need to understand.

IC Internal Combustion Engine: The standard gasoline/diesel motor typical of lech/5-6 cultures. Cost of fuel = CR 5 per 100m/t. That is, a vehicle of I tonne mass will travel 100 km on CR 5 worth of fuel. A vehicle of 5t mass will travel 100/5 = 20 km on CR 5 worth of fuel.

Hydro-Turbo Engine: A turbine-driven unit which uses hydrogen fuel or some chemical equivalent, and which can consume hydrocarbon fuel (gasoline, oil, natural gas, propane, etc.) if it is necessary. For an additional 10% of the cost of the vehicle (maximum CR 75 000), a rechargable PowerCell operated motor can also be installed, with the same range as given for the Hydro-Turbo engine. Cost of fuel = CR 2.5 per 100 km/t. The hydro unit is self-contained (not air breathing).

FRU Fusion Reaction Unit: A fusion/plasma reactor which generates electrical power to drive the vehicle. FRUs cost 20% of the vehicle cost. The FRU will not break down if properly maintained and serviced. Cost of fuel = CR 500 + CR 100 x mass of vehicle in tonnes, for 1000 hr. of operation. Note: minimum cost of a FRU CR 100 000.

Hydrox Fuel: Hydrogen/Oxygen fuel can be produced from water by electrolysis. Such units may be obtained at CR 10 000, and since they can be sun-powered, 'free' fuel is possible. Such a unit will provide 1000 km/t of fuel in one hour. Nuclear-powered units can be acquired which cost CR 75,000 and can refuel any vehicle in 10 minutes. Such units require CR 5000 worth of fuel every 500 hrs. of operation. Both units have a breakdown no. of 1/4,

Breakdown & Time Maintain: Entries in the vehicle data section include the distance or operation time after which a maintainance check-up tune-up/ overhaul is required. The Breakdown % entry gives time cumulative chances that a multi-systems breakdown will occur at each given distance over the rated limit before a maintainance check should be made. The Time Maintain entry gives the period required by a Tech/5 to maintain the unit; increase by 1 hr. for each expertise level the Tech is under expertise/5. Also increase maintainance and repair time by 20% for each Tech level that the Tech is under the Tech level of the equipment. Note: a Tech level/4 mechanic could not repair or maintain Tech/5+ equipment; he would simply not know enough to do the job.

Breakdown No. Each vehicle is assigned a breakdown number so that start-up problems can be 'engineered' by the StarMaster. Also, a breakdown might occur when a vehicle is being driven hard in adverse conditions. For instance, a blow-out or thrown track is very likely when an ATV or Crawler is being 'pushed' on very rough or rocky ground. Such breakdowns will invariably apply to the motive systems.

Rad Shield: Each vehicle is rated for its protection capability against hard radiation. Usually, -1 rad factor is sufficient to screen against most background radiation, fall-out, and solar storms on planets with thin atmospheres and/or limited or non-existent Van Allen Belts. Civilian vehicles may be protected to -5 at a cost of CR 500 per tonne of vehicle for each -1 rad factor. Add 5% of vehicle mass per unit of rad protection.

Armour: The armour rating is the defense of the vehicle against projectile and energy weapon penetrations. The armour rating is given in the form A/A. +3/+1, etc. The first armour rating is against missiles, projectiles, shaped charges, explosions, flame, and nuclear blasts beyond ground zero range. The second armour rating is against energy weapons (lasers, blasters, fusion guns, scramblers, etc.) and nuclear blasts at ground zero or direct hit ranges. Attacks with hand-held melee weapons, etc., are rated +2 levels higher in projectile protection. That is, a +1/A to AFV (armoured fighting vehicle) armour levels at a cost of CR 500 per tonne of vehicle mass. For instance, a 12t Crawle rated at B/B, (2 levels below AFV; see the Penetration Tables in the ground combat section) could be upgraded to AFV/AFV at a cost of 500 x 12 x 2 = CR 12 000. Each +1 armour level rise also adds 50 kg per tonne of vehicle mass, so the 12t unit would now weigh an additional 50 x 2 x 12 = l.2t, which has an effect on fuel consumption. Maximum upgrading is +2/+l.

Sealed Vehicles: All Military vehicles are assumed to be sealed from the environment. Civilian vehicles can be sealed at a cost of CR 250 per tonne of vehicle mass. A Life Support system can be mounted at 50 kg per man to be provided for (reduce cargo capacity accordingly) at a cost of CR 250 per man-day of capability. To seal a 12t crawler and provide 5 man-days' survival for a maximum crew and passenger load of 13 would cost 250 x 12 x 250 x 5 x 13 = CR 19 250. This will effectively make

the Crawler an 'alien environments' vehicle.
Amphibious Vehicles: All vehicles except groundcars and trucks designed for on-road operation only are assumed to be amphibious and can either 'swim' across water or glide across on GEM or grav-field.

Movement: Movement is classified by type of vehicle. See the combat rules for details.

Cost of Vehicles: Vehicle costs are given at the retail rate on a major planet. Wholesale costs (available at the manufacturer or government armoury) are at 55% of retail, and these may be had by a Merchant character if he is successful in a Merchandizing CR (See 10.5) for civilian vehicles or by a military character (retired) seeking equipment for his mercenary band, ships, etc., from a parent military force (25% chance + 5% per rank level over rank/grade/6, and normal 'discounts' apply in addition). On 'backwoods' planets, however, where such equipment has to be shipped in at some expense, costs may be 10% x 2d6 above the retail rate.

Spares & Parts: All vehicles purchased at retail rates include 10% of purchase cost in the form of spares and parts. Wholesale purchases do not include spares, which must be acquired separately at 10% of retail cost of the vehicle.

ANTI—GRAV FLOATER: The 'Floater' is an unpowered grav sled rides about 1m above the ground and can be pushed along by men on foot or towed behind a vehicle. It is the Tech/7+ equivalent of the trailer. All Units have a Breakdown No. of 1/4. Units which come in various sizes and carrying capacities:

Floater	Mass	Lift Capacity	Powercell	Tech Level	Cost (CR)	Skill Required	Vehicle Required
AGF-1	50kg	250kg	1000 hr.	7	2500	none	none: men may push/pull
AGF-2	100kg	500kg	1000 hr.	7	3750	none	none: men may push/pull
AGF-3	275kg	1t	1000 hr.	7	5000	Semi-Truck/I	Lt. Vehicle (car, etc.)
AGF-4	500kg	2t	1000 hr.	7	6500	Semi-TruckI2	Lt. Truck
AGF-5	750kg	3t	1000 hr.	7	7500	Semi-Truck/3	Mdm. Truck
AGF-6	1250kg	5t	1000 hr.	7	8750	Semi-TruckI4	Mdm. Truck
AGF-7	2000kg	10t	1000 hr.	7	10000	Semi-Truck/6	Hv. Truck
AGF-8	5000kg	25t	100 hr.	7	15 000	Semi-Truck/7	Hv. Truck
AGF-9	9000kg	50t	100 hr.	7	20 000	Semi-Truck/8	Hv. Truck

All AGFs have 'G/G' type hull armour, but they can be upgraded as described later in the Vehicle section (see 5.14). AGF-1 to AGF-3 have a vehicle damage capacity of 3. AFG-4 to AGF-7 have a vehicle damage capacity of 4, and AGF-8 and AGF-9 have a vehcile damage capacity of 7.Powercells cost CR 100 per tonne of mass in Life Capacity. An AGF-1 would cost only CR 25 to recharge.

All units must receive a maintainance check of 2 hours every 5000 km.

VEHICLE SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Vehicle Type	GroundCar	GroundCar	Lt.Truck	Lt.Truck	Hv.Truck	Hv.Truck	ATV Carrier
Tech Level	5-6	7+	5-6	7+	5.6	7+	5-6
Mass	2t	2t	3t	3t	6t	6t	2t
Crew	1+5	1+5	1+11	1+11	1+21	1+21	1+4
Cargo	500 kg	500 kg	2t	3t	St	8t	1t
Travel Mode	Fast Wheeled	Fast Wheeled	Fast Wheeled	Fast Wheeled	Mdm.Wheeled	Mdm.Wheeled	Mdm. Wheeled
Engines	IC	Hydrox-Turbo	IC	Hydrox-Turbo	IC	Hydrox-Turbo	IC
Range	500 km	1500 km	500 km	1500 km	500 km	5500 km	500 km
Maintainance	2000 km	5000 km	2000 km	5000 km	2000 km	5000 km	2000 km
Breakdown %	I%/+10 km	I%/+20 km	I%/+10 km	I%/+20 km	I%/+10 km	I%/+20 km	+2%/+10 km
Time Maintain	3 hr.	3 hr.	3 hr.	3 hr.	3 hr.	3 hr.	3 hr.
Breakdown No.	2/4	1/4 .	2/4	1/4	2/4	1/4	2/4
Damage Cap.	5	8	7	9	9	12	7
Rad Shield	-1	-2	-1	-2	-1	-2	-1
Armour	G/G	E/E	G/G	E/E	G/G	E/E.	G/G
Cost (CR)	5000	6500	6000	7500	9000	10500	7500

VEHICLE SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Vehicle Type	ATV Carrier	ATV Lt. Truck	ATV Lt. Truck	ATV Hv. Truck	ATV Hv. Truck	HoverCar	HoverLorry
Tech Level	7+	5-6	7+	5-6	7+	7+	7+
Mass	2t	5t	5t	10t	10t	3t	6t
Crew	1+4	1+9	1+9	1+18	1+18	1+5	1+12
Cargo	1t	10t	10t	30t	30t	1t	6t
Travel Mode	Mdm. Wheeled	Mdm. Wheeled	Mdm. Wheeled	Slow Wheeled	Slow Wheeled	GEM	GEM
Engines	Hydrox-Turbo	IC	Hydrox-Turbo	IC	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo
Range	1500 km	500 km	1500 km	500 km	1500 km	1500 km	2000 km
Maintainance	5000 km	2000 km	5000 km	2000 km	S000 km	4500 km	4000 km
Breakdown %	+2%/+20 km	+2%/+10 km	+2%/+20 km	+2%/+10 km	+2%/+20 km	+3%/+10 km	+2%/+10 km
Time Maintain	3 hr.	3 hr.	3 hr.	4 hr.	4 hr.	5 hr.	5 hr.
Breakdown No.	2/4	2/4	1/4	2/4	1/4	1/4	1/4
Damage Cap.	10	9	12	12	16	8	12
Rad Shield	-2	-1	-2	-I	-2	-2	-2
Armour	E/E	G/G	E/E	G/G	E/E	E/E	E/E
Cost (CR)	9000	12000	15000	57500	22500	10000	17 500

VEHICLE SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Vehicle Type	HoverCarrier	HoverTruck	HoverCruiser	HoverShip	Lt. Crawler	Lt. Crawler	Mdm. Crawler
Tech Level	7+	7+	7+	7+	5-6	7+	5-6
Mass	10t	1St	50t	100t	3t	3t	6t
Crew	1+18	1+30	1+50	1+100	1+6	1+6	1+12
Cargo	10t	1St	50t	100t	3t	5t	10t
Travel Mode	GEM	GEM	GEM	GEM	Mdm. Wheeled	Fast Tracked	Mdm. Tracked
Engines	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	IC	Hydrox-Turbo	IC
Range	2000 km	2000 km	5000 km	7500 km	500 km	1500 km	500 km
Maintainance	4000 km	4000 km	5000 km	7500 km	1000 km	3000 km	1000 km
Breakdown %	+2%/+10 km	+2%/+10 km	+2%/+20 km	+2%/+20 km	+2%/+10 km	+2%/+10 km	+2%/+10 km
Time Maintain	5 hr.	5 hr.	5 hr.	5 hr.	4 hr.	4 hr.	5 hr.
Breakdown No.	1/4	1/4	1/4	1/4	2/5	2/5	2/5
Damage Cap.	12	15	25	35	9	12	12
Rad Shield	-3	-3	-5	-5	-1	-3	-1
Armour	D/D	D/D	A/A	A/A	B/B	AFV/AFV	B/B
Cost (CR)	25 000	35 000	100 000	185 000	12500	17500	20000

VEHICLE SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Vehicle Type	Mdm. Crawler	Hv. Crawler	Hv. Crawler	CargoTrak	Lt.GravSled	Mdm.GravSled	Hv.GravSled
Tech Level	7+	5-6	7+	7+	7+	7+	7+
Mass	6t	12t	12t	50t	2t	5t	10t
Crew	1+12	1+20	1+20	1+40	1+5	1+12	5+20
Cargo	10t	20t	20t	50t	3t	8t	18t
Travel Mode	Mdm. Tracked	Slow Tracked	Slow Tracked	Slow Tracked	GravSled	GravSled	GravSled
Engines	Hydrox-Turbo	IC	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo
Range	1500 km	500 km	1500 km	2500 km	2000 km	2000 km	2000 km
Maintainance	3000 km	1000 km	3000 km	5000 km	4000 km	4000 km	4000 km
Breakdown %	+2%/+10 km	+2%/+10 km	+2%/+10 km	+3%/+15 km	+2%/+10 km	+2%/+10 km	+2%/+10 km
Time Maintain	5 hr.	6 hr.	6 hr.	10 hr.	6 hr.	8 hr.	8 hr.
Breakdown No.	2/5	2/5	2/5	2/5	1/4	1/4	1/4
Damage Cap.	15	16	20	35	2	4	6
Rad Shield	-3	-1	-	-5	-2	-2	-2
Armour	AFV/AFV	B/B	AFV/AFV	AFV/AFV	D/D	D/D	D/D
Cost (CR)	25000	37500	45000	100000	50000	22000	35000

VEHICLE SPECIFICATION	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON	COMMON
Vehicle Type	Motor Boat	JetBoat	JetBoat	HydroFoil	HydroFoil	HydroSkimmer	Submerible	CargoSub
Tech Level	5+	7+	7+	7+	7+	7+	7+	7+
Mass	1-3t	2t	10t	5t	25t	2t	25t	100t
Crew	1+5	1+5	2+18	1+12	3+30	1+5	2+8	5+50
Cargo	1t	1t	10t	5t	25t	1t	10t	100t
Travel Mode	Motor Boat	HydroJet I	HydroJet II	HydroFoil I	HydroFoil II	HydroSkimmer	Sub I/GEM	Sub II/GEM
Engines	IC	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	Hydrox-Turbo	FRU
Range	200 km	5000 km	2500km	5000 km	5000 km	5000 km	5000 km	2500 km
Maintainance	1000 km	3000 km	2500 km	3000 km	5000 km	2000 km	10 000 km	10 000 km
Breakdown %	+2%/+10 km	+2%/+10 km	+2%/+10 km	+2%/+I0 km	+2%/+10 km	+3%/+10 km	+3%/+20 km	+2%/+20 km
Time Maintain	2 hr.	3 hr.	6 hr.	3 hr.	8 hr.	3 hr.	12 hr.	24 hr.
Breakdown No.	2/5	1/4	1/4	1/4	1/4	1/5	1/4	1/4
DamageCap.	3	4	12	8	15	5	25	60
Rad Shield	-	-	-1	-1	-2	-	-6	total
Armour	H/H	D/D	C/C	D/D	C/C	E/E	+3/+3	+4/+4
Cost (CR)	3500	9000	40000	2S000	90000	10000	550000	1500000

MOVEMENT TABLE: VEHICLES

		Terrain Type Vehicle is Traversing								
Travel Mode	**Turn**	**Road**	**Clear**	**Down slope**	**Up slope**	**Rough**	**Woods**	**Swamp**	**Ford**	**Water**
Fast Tracked Vehicle	6s	135m	90m	60m	60m	60m	25m	10m	10m	10m
	km/h	81	54	36	36	36	15	5	5	5
Medium Tracked Vehicle	6s	115m	70m	60m	60m	60m	25m	10m	10m	10m
	km/h	68	41	36	36	36	15	5	5	5
Slow Tracked Vehicle	6s	75m	50m	40m	30m	60m	25m	10m	10m	10m
	km/h	45	32	23	18	36	15	5	5	5
GEM (Hovercraft)	6s	225m	225m	75m	75m	10m	10m	225m	225m	225m
	km/h	135	135	45	45	5	5	135	135	135
Powered GravSled	6s	I35m	135m	I35m	135m	70m	25m	I3Sm	I3Sm	I35m
	km/h	81	81	81	81	41	15	81	81	81
Fast Wheeled ATV	6s	180m	90m	60m	60m	60m	25m	10m	10m	10m
	km/h	108	54	36	36	36	15	5	5	5
Medium Wheeled ATV	6s	135m	90m	6m	40m	60m	25m	10m	10m	10m
	km/h	81	54	36	24	36	15	5	5	5
Slow Wheeled ATV	6s	I20m	60m	30m	25m	60m	25m	10m	10m	10m
	km/h	72	36	18	15	36	15	5	5	5
Fast Wheeled Car	6s	375m	90m	30m	25m	25m	-	-	10m	-
	km/h	225	54	18	15	15	-	-	5	-
Medium Wheeled Truck	6s	270m	90m	30m	25m	25m	-	-	10m	-
	km/h	162	54	18	15	15	-	-	5	-
Slow Wheeled Truck	6s	225m	60m	25m	25m	25m	-	-	10m	-
	km/h	135	36	15	15	15	-	-	5	-

Water Travel Mode	**Turn**	**Water**	**Swamp**	**Sea**	**Sub.**
Sub I/GEM	6s	135m	70m	135m	135m
	km/h	81	41	81	81
Sub II/GEM	6s	I35m	-	135m	75m
	km/h	81	-	81	45
HydroSkimmer	6s	270m	270m	225m	-
	km/h	562	162	135	-
Motorboat	6s	90m	40m	75m	-
	km/h	54	24	45	-
HydroJet I	6s	270m	60m	270m	-
	km/h	162	36	162	-
HydroJet II & HydroFoil II	6s	225m	-	225m	-
	km/h	135	-	135m	-
HydroFoil I	6s	330m	60m	270m	-
	km/h	198	36	162	-

6.0 PERSONAL WEAPONS

The following section provides a comprehensive listing of light, man-portable weapons ranging from archaic melee and missile weapons to the most advanced energy weapons.

Caution: If one attempts to employ everything at once, some confusion and plain difficulty in managing the weapon types will occur. Typically, individual players will develop preferences for certain weapons and will tend to ignore others. The same is true of entire cultures, as will be seen later. Thus, in any given adventure, one should not expect to see too many different weapon types being used.

Space Opera, as should be obvious by now, attempts to provide a spectrum or range of equipment in a number of categories to reflect characteristic technological development at given levels. This permits simulation of science fiction settings and gives some continuity to game play in that the players (and the StarMaster) will have some chance of predicting the type of weaponry and other equipment they will have appearing in a given scenario. The weapons should be employed with this concept in mind.

Breakdowns are relatively rare with weapons. However, when the character is in the immediate vicinity of a large explosion, there is a 2/4 chance that most weapons will malfunction. Also, if desired, a hit in the arm (the character is holding the weapon) may affect the weapon if the Breakdown No. (2/4 on 1d20) is rolled. If a Breakdown occurs, the weapon was struck. Add the wound modifier to the second Breakdown No. to represent the seriousness of the hit. In some cases, a weapon may be damaged, but the character will come out unscathed.

Costs or weapons in this section, and also cost of ammunition, are retail values. Military veterans may purchase arms and

ammunition from a government arsenal at 75% of listed value. The same is true of Merchants who make a successful Merchandising CR when purchasing from a manufacturer. Retail costs are based upon purchase on a major planet. In 'backwater' areas, costs will be 150% + 10.d10% to reflect transportation costs, etc. Also note that Military veterans may apply discounts to 75% value purchases from government arsenals if buying from an arsenal of their 'parent' Service.

6.1 ARCHAIC MELEE WEAPONS

Archaic melee weapons include those personal arms which would be encountered in cultures of low technological development. They typically employ force of impact and perhaps some kind of cutting edge or piercing point to cause damage to an opponent. Against advanced armour, most of these weapons will have limited effects. There will be a slight chance, however, that even high grade advanced armour will be penetrated by archaic weapons—representing the possibility that an edge or point has found a chink or joint in the armour.

DAGGER: A small, knife-like weapon with a flat, two-edged blade and thrusting point. Tech/I weapon. Mass = 350-500gm. Length = 350-400mm. Cost = CR 10. Skill required = Daggers, et. al.

KNIFE: A short version of the dagger, often balanced for throwing at opponents at ranges of 15m or less. The knife may be of the folding jack-knife or switchblade type, or it may be a fixed blade. Tech/1 weapon. Mass = 150-250gm. Length = 200-300mm, Cost = CR 10. Skill requires Daggers, et. al.

STABBING SWORD: A 'classical' short sword on the Roman model, with a flat, two-edged blade and thrusting point. Most versions have a guard on the hilt. Tech/1 weapon. Mass = 1000-1500gm. Length = 500-600mm. Cost = CR 25. Skill required = Daggers, et. al.

SWORD: The standard long-bladed weapon, with a flat one or two-edged blade. Most swords have some form of guard, either a cross-piece or a basket hilt. Tech/1 weapon. Mass = 1500-2000gm. Length = 900mm. Cost = CR 35. Skill required = Sword, et. al.

BOARDSWORD: A heavy weapon designed for one or two-handed use. It has a long, fairly thick blade with a double edge, a cross-piece hilt guard, and a point which is almost impossible to use because of the weapon's balance. Its 'charm' lies in its

effectiveness against archaically armoured opponents. Tech/2 weapon. Mass = 2500-3500gm. Length = 900-1000mm. Cost = CR 50. Skill required = Sword, et. al.

GREATSWORD: A massive, two-handed blade with a double-edge, a wide cross-piece hilt guard, and a point almost never used, except when the weapon is held like a spear in the charge (very rare). The weapon is most effective against mounted enemies and heavily armoured opponents. Mass = 4000-5000gm. Length = 1200-1800mm. Cost = CR 65. Skill required = Sword, et. al.

FOIL: Any 'rapier' weapon is classed as a foil. The foil is a remarkably light weapon with a long, thin, dull-edged blade and depends upon a thrust for its deadliness. Its only drawback is its tendancy to shatter (1 to 10) when parrying heavier weapons or thrusting through the joints of good armour. Tech/3 weapon. Mass 500 to 700 gm. Length = 1000 mm. Cost = CR 50. Skill required = Foil.

SABRE: A long, single-edged slashing weapon with a slight curve to the blade along its length, terminating in a rarely used point. The hand is protected by a basket hilt or a cross piece. Tech/2-3 weapon. Mass = 1000-2000gm. Length = 900-1000mm. Cost = CR 50. Skill required = Sabre.

KATANA: A (Japanese) slashing sword with a long, single-edged blade that curves slightly along its length. The weapon has no tapered point, while the hilt guard is only a slightly raised band separating the blade from the handle. It can be used with one or two hands. Few slashing weapons are more dangerous, and only a foil is its match in combat. Tech/2-3 weapon. Mass = 1000-1500gm. Length = 1000mm. Cost CR 75. Skill required = Katana.

BATTLE AXE: The Battle Axe has several variant models. The light Norman war axe resembles a wood axe and is used as a throwing weapon as well as a hand-held weapon. The Nordic Broad Axe is slightly heavier and double-bladed. The great War Axe is a very heavy double-bladed weapon used against plate armour with good effect. Skill required = Battle Axe, et. al.

	MASS	LENGTH	COST
Tech/1 Norman Axe:	2000-2500gm	950-1100mm	CR 25
Tech/1 Nordic Axe:	3000-3500gm	1000mm	CR 35
Tech/2-3 War Axe:	4000-4500gm	1200-1400mm	CR 50

MACE: A heavy impact weapon with a massive metal head on a wooden shaft.The iron head is either a knobby ball or a spiked ball (sometimes called a 'Morning Star'), and sometimes a more complex triangular shape (base to shaft) with a number of sharp-edged flanges ('Martel'). The mace is designed to crack armour and smash bones. Tech/1-2 weapon. Mass = 2500-4000gm. Length = 900-1100mm. Cost = CR 40. Skill required = Battle Axe, et. al.

MORNING STAR: A mace-variant with one to three iron balls attached to the wooden shaft by a chain. The shaft is about 800—900 mm long, with about 400mm of chain beyond that. Tech/2 weapon. Mass = 3000-4000 gm. Length = 1200-1 300 mm. Cost CR 50. Skill required is Battle Axe, et. al.

FLAIL: A large version of the Morning Star, with one heavy iron ball attached to the shaft by a 500mm chain. It is used two-handed on foot but can be used one-handed on horseback if swung overhead in a steady circular motion. Tech/2 weapon. Mass = 4000-5000gm. Length = 1500-1800mm. Cost = CR 65. Skill required = Battle Axe, et. al.

SPEAR: The standard infantry weapon of many early cultures, the spear is a pure thrusting weapon. It is simple enough to be readily fashioned or repaired by anyone. Tech/0 weapon. Mass = 1500-2500gm. Length = 2000-3000mm. Cost = CR 10. Skill required = Spear, et. al.

JAVELIN: A 2000mm throwing version of the spear which can be cast 25-35m with accuracy and some penetrating force. Mass = 1000-1500gm. Length = 2000-2500mm. Cost = CR 10. Skill required = Spear, et. al. See Archaic Direct Fire Weapon, 6.4.

PIKE: A long polearm of up to 5500mm length with a fairly long metal tip. Pikes are effective when used in densely-packed infantry formation to produce a hedgehog of spears. As an individual weapon it is very unwieldly and can easily be evaded by an opponent closing in for hand-to-hand combat. Tech/1-2 weapon. Mass = 3000-4500gm. Length = 4000-5500mm. Cost = CR 15. Skill required = Spear, et. al.

LANCE: A long spear used from the back of a mount, often at a full charge to obtain maximum effect from the speed and momentum of the mount as it bears down on the target. The short lance (3500mm) can be used couched under the right arm or overhanded as a thrusting spear, while the long Chivalric lance must be couched. Tech/1-3 weapon. Mass = 2500-4000gm. Length = 3000-4500mm. Cost = CR IS. Skill required = Spear, et. al.

HALBERD: A heavy polearm that combines the features of a spear and a battle axe. Tech/2-3 weapon. Mass = 3000-4500gm. Length = 2500-3000mm. Cost = CR 50. Skill required = Spear, et. al.

OUARTERSTAFF: A weapon that is little more than a shaft of wood, although it can be metal-shod. The weapon is rarely capable of doing serious injury to armoured opponents, but it can stun or kill lightly armoured enemies. It is also excellent as a defensive weapon. Tech/0 weapon. Mass = 1000-2000gm. Length = 2000-2500mm. Cost = self-made. Skill required = Unarmed Combat.

CLUB/CUDGEL: Any improvised weapon from ready-to-hand materials is classified as a 'club.' If the character has StreetFighting or Unarmed Combat skill, he may apply bonuses when using such improvised weapons. Anything from a bottle to a chair to a long stick will qualify, as will a long gun such as a rifle, carbine, or SMG used to club an opponent.

BAYONET: A stabbing sword-like weapon which can be attached to the muzzle of a long gun to convert it to a polearm. The 'spear' so developed has the length of the weapon plus the bayonet. Alternately, it can be employed as a stabbing sword (that skill is required) in hand-to-hand combat. Tech/3+ weapon. Mass 1000-1500gm. Length = 500-600mm. Cost = CR 25. Skill required Stabbing Sword for hand-to-hand and Spear for bayonet work.

COMBAT USE: The method of using the various weapons listed above is detailed in the ground combat rules for hand-to-hand or melee action.

6.2 ADVANCED MELEE WEAPONS

With advanced technology, hand-to-hand combat weapons became remarkably efficient, so that even high-grade battlearmour was anything except immune to them:

MonoFilament Blades: Any edged weapon type can be a MonoFilament Blade--typically a knife or sword, although spears might also be so tipped. A monofilament wire stiffened by a forcefield renders the edge capable of sheering through most substances with greater ease than steel. Weapons so fitted are used in the usual way, but have MonoFilament penetration. Cost = CR 750. Powercell = 200 charge minicell at 100gm mass and CR 50. The powercell runs continuously, so it must be replaced every 10 weeks. A hit exhausts 1/2d6 charges. The MonoFilament is a Tech/7 weapon.

VibroBlades: The VobroBlade is a knife or sword with 'power steering.' Hypersonic vibrations are set up in the duralloy blade which causes it to cut extremely well. Cost = CR 1250 to fit it to a standard blade. The Powercell has 200 charges, with 1/2d6 charges expended each time the blade sheers through something. The minicell is the standard 100gm unit at CR 50. Tech/8 weapon.

ForeceBlades: The ForceBlade consists of a 200mm hilt containing a 500gm Powercell with 200 charges. The total unit weighs 1000gm. The forcefield generator inside the hilt will propagate a beam of energy that can be varied from 500mm to 1500mm in length which will cut through almost any material substance in time, unless it is forcefield reinforced. (That is why penetration is not automatic). Cost = CR 3000. Each hit exhausts 1 charge. The Powercell costs CR 200 to replace or can be recharged for CR 75. Tech/8 weapon.

Coagulators: The Coagulator is a 1000mm long rod massing 500gm. It contains a 500gm Powercell with 100 charges. The tip of the rod for about 250mm from the end farthest from the hilt has a VMXT forcefield generator which will scramble living tissue whenever the tip touches flesh or the field penetrates armour. The weapon is traditionally used like a Foil. It causes horrible wounds (double healing time, With Quicktime also increased to x3 normal) and has a +4 wound factor. The weapon is totally banned for civilian use throughout the known galaxy, but though there have been attempts to have the weapon outlawed as too horrible for use in war, it remains one of the most effective hand-to-hand weapons against Bugs and Klackons. It is, however, quite useless against silicate life forms and cold planet life forms. Cost = CR 4500. Each hit will exhaust 1d6 charges. The Powercell costs CR 200 to replace and can be recharged for CR 75. Tech/7 weapon.

Neuronic Whip: The Neuronic Whip is developed from a ForeRunner device discovered on Agol VIII. Technically, it is a non-lethal weapon, but most beings would probably prefare to be hit by a blaster bolt. The Neuronic Whip causes extreme pain by directly stimualting the nervous system and can bring unconsciousness by overloading the nervous system with ravening pain impulses. The effect is exactly as described for PainBlast (4.15 Telepathy). The 'Whip' is not effective against Bugs and Klackons, however, and Silicates and Cold Planet species are also immune. This 750mm rod, massing 1000gm, is issued to trusted Azuriach Officers and Officials as a badge of Authority in the State, and it is used at a punishment for insubordinate conduct, etc. It is utterly banned in the Terrain Union and other civilized nations, with possession bringing very heavy punishment. Actual use of such a terrible device may be subject to perpetual banishment or even the death penalty. The device is powered by a 100gm mini-cell with 100 charges, at a cost of CR 50. Each application of the rod exhausts 1d6 charges. Tech/7 weapon, used like a Foil.

Paralysis Rod: The Paralysis Rod is a 1000mm baton massing 1500gm. It contains a 100gm Powercell with 100 charges. The rod will temporarily paralyze the area of the body it touches and is similar in effect to a Stunner. It is general issue to Police as a Riot Control weapon. Each hit exhausts 1d6 charges from the powercell. Cost = CR 500. Tech/7 weapon, used like a Sabre.

LaserSword: The LaserSword consists of a 300mm hilt containing a JL57 continuous laser projector which will produce a focused laser beam of 500mm to 2000mm length. The 500gm KKK PowerCell contains 100 charges, one of which will be expended each time a hit is scored. The KKK can be recharged at a cost of CR 200 at any power main. The total weapon masses 1250gm and has the penetration power of a Laser HMG, and also its wounding factor. The weapon is used like a Katana., but has a speed factor of 10 and an effective length of 9. If it strikes a weapon other than a ForceBlade, LaserBlade, or LightSword, it has a 25% chance of sheering through it. When activated, the Laser'Blade' is a brilliant blue-white or red in colour. Cost = CR 12 500. Tech/8 weapon. When not in use, the laser beam is turned off.

LightSword: Of all the weapons developed for hand-to-hand combat, the LightSword is the most powerful. Only a Katana/10 Adept can use it to good effect. When so armed the Adept is the equivalent of 3 expertise levels higher than his opponent. The LightSword consist of a 300mm hilt massing 1250gm. It contains a PPK500 continuous TMTX forcefield (akin to a Blaster bolt) which has the penetration power of a Blast HMG, and also its wounding factor, The unit is developed from an artifact found on Formalhaut V by the Terran archaeologist Dr. T. M. Steiger in A.D. 2245, and it appears to have been one of the most prized melee weapons of the ForeRunners. The LightSword has a speed factor of 11 and an effective length of 9, for it can reach from 500mm to 2000mm. The powersource is a KTAM Klysestron 7c anti-matter powercell which will effectively activate the unit for its normal span of use. If it strikes a weapon other than a ForceBlade, LaserSword, or LightSword, it has a 50% chance of sheering through it. When activated, the LightSword is a deep violet •mauve colour. Cost = CR 35 000. Tech/9 weapon. When not in use, the TMTX field is turned off.

6.3 ARCHAIC MISSILES WEAPONS

BLOWGUNS: A blowgun is a Tech/1 weapon consisting of a lightweight hollow tube, usually of bamboo or some similar material, which projects a dart by the force of one's breath. Such a weapon typically employs a drug or poison on the dart tip. (See 6.20, Poisons.) The 1500mm blowgun is capable of moderate ranges, but short versions of several hundred millimeters' length have ranges of up to 10m. In a gravity field over l.25G, most blowguns are useless. Cost = CR 5. Length = 1500mm, Mass = 250gm.

SLINGS: A sling is a Tech/1 weapon consisting of a leather thong with a 'pocket' to hold a small stone or lead bullet which is cast by the force of one's arm. The weapon is deadly against lightly armoured targets. The extreme range (ER), given in the Weapon Table, is based on a PC or NPC Strength of 10-11. Characters under the base Strength lose 5m of range from the ER per point under Strength 10, and characters over Strength 10 gain 5m range to the ER per point over. Gravity will also effect the extreme range. Cost = CR 5. Length = 500mm. Mass = 100gm.

SLINGSTAFF: A slingstaff is a Tech/2 weapon consisting of a sling attached to a wooden pole to provide greater throwing power and range. Otherwise, it is the same as a sling, described above. Cost = CR 10. Length = 200mm. Mass = 1000gm.

SHORT BOWS: A short bow is a Tech/1 weapon easily manufactured from materials found in the environment. The short bow is characteristic of many aboriginal societies and while effective against animals and lightly armoured personnel, it has little penetration power and is defeated by good armour. Reduce extreme range by 5m per point deficient if firer is under Strength 10. Cost = CR 20. Length = 750mm. Mass = 500-750gm.

COMPOUND BOWS: A compound bow is a Tech/2-3 weapon requiring some skill and time to fashion. It is made from several layers of laminated woods carefully warped to provide increased striking power and range. The weapons can be tailored to the Strength of the user, unlike short bows, as the amount of tension is determined by the manner in which the bow is fashioned. Advanced technologies can produce similar weapons with ease, often employing synthetic materials in light hunting and archery bows. The extreme range (ER) is based on Strength 11. Characters under the base Strength lose 5m of range per point deficient; characters over the base Strength gain 5m per point above, if the bow is of equivalent power. Also, characters with Strength 18+ can gain some penetration power, so reduce 1d20 scores to penetrate vulnerable armour by -2 at PB and SR (point-blank and short range). Cost = CR 50. Length = 750mm, Mass = 750-1000gm.

LONGBOWS: The longbow is a Tech/2-3 weapon fashioned from very resilient wood capable of imparting high tension. Skill and time is required to fashion such a weapon, while Strength 13+ is required to draw it. All modifications for range and penetration noted for compound bows, described above, apply here as well. Tech/3 societies will also be able to fashion the much shorter composite bow, which has the dimensions and weight of a compound bow but the firing characteristics of the longbow. These weapons are intricate melding of layers of woods and synthetic materials. Costs of composite bows are usually 2 to 3 times Longbow costs. Cost CR 50. Length = 1500mm. Mass = 1000-1250gm.

ARROWS & QUIVERS: Of course, bows fire arrows, which may be purchased or made in the field. A quiver and 20 arrows will mass about 0.5 kg to 1.0 kg and cost CR 10-20.

CROSSBOWS: The crossbow is a missile weapon with a stock and resembles a rifle when viewed from the side. It is aimed and fired like a rifle as well. The bow is usually fashioned from tempered steel and will require some form of mechanical cocking or winding to bring the weapon under tension so that it can fire a quarrel. Firing is effected by pulling a trigger similar to that of a firearm. This Tech/ 3-4 weapon can be easily duplicated by advanced technologies, and weights can be brought into line with conventional medium and heavy firearms. Extreme ranges for heavy crossbows are standard ranges in the Weapon Tables. More costly weapons may have ranges up to 400m. Cost CR 75. Length 850mm. Mass = 5000gm.

CROSSBOW QUARRELS: Crossbow fire quarrels or short, heavy arrows. A quiver and 20 crossbow quarrels (also called bolts) will mass 1.0 kg and Cost CR 20. Advanced technologies will also have dart ammunition available which injects a drug or poison into a target. Cost = CR 150. Length = 1100mm. Mass = 7500gm.

JAVELINS: The javelin is a Tech/1 hurled missile. It is an almost universal weapon among aboriginal peoples and can be used as a combination missile weapon and close combat thrusting spear. It is easily fashioned and, with some practice, skill in its use can be quickly gained. The extreme range (ER) is based on a Strength 11 score. Characters with lower Strength will subtract -3m from their extreme casting range for each point deficient. Characters with higher Strength will add +3m to their extreme casting range for each point above. Also, characters with Strength 18+ gain in penetration power at PB and SR (Point-blank and short range), so reduce the 1d20 score to penetrate vulnerable armour by -1 at close ranges. Cost = CR 10. Length = 2500mm. Mass = 1500gm.

ATLATL: The Tech/1 atlatl or spear-thrower is a long piece of wood grooved to hold the javelin in place and serves to increase the length of the thrower's arm. Extreme ranges with a hurled javelin are raised by 15m when using an atlatl. Cost = CR 10. Length = 1000mm. Mass = 1000gm.

THROWN AXES, DAGGERS, STONES, ETC.,: Axes and daggers are Tech/1 melee weapons. If balanced for throwing, they can serve as short-range missile weapons. Stones, obviously, are available for the picking up and are Tech/0 weapons requiring no skill, just a good eye and a strong arm. Characters will have extreme range corrections as outlined for javelins, above.

6.4 TECH/3-4 FIREARMS

Firearms include a wide range of weapons from the archaic match-locks muskets of Tech/3 cultures just emerging from a 'chivalric' age to the most advanced automatic weapons of a Tech/7 star-culture. All employ a chemical charge to propel a slug at high velocity.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Tech Level	Cost (CR)
Matchlock	.85	ML:8	1	1200mm	6500gm	3	85
Matchlock	.75	ML:8	1	1100mm	5000gm	3-4	75
Musket	.75	ML:4	1	1000mm	4000gm	3-4	90
RifleMusket	.615	ML:5	1	1000mm	3750gm	3-4	125
RifleMusket	.40	ML:5	1	1100mm	3500gm	3-4	110
MusketPistol	.40	ML:4	1	225mm	750gm	3-4	65
MusketPistol	.40	ML:4	1/1	225mm	1250gm	3-4	90
Duel Pistol	.40	ML:5	1	225mm	7S0gm	3-4	125

ML: Muzzle-Loaders: Each barrel of the muzzle loader can be fired once. The reloading time is denoted by a number following the colon (:) after the 'ML' designation. For example, M:4 means that the weapon can be fired and then reloaded at the beginning of the 4th turn following. In other words, including the firing turn, a total of 4 full combat turns or 24 seconds would be needed to reload the piece. Cartridges (oiled paper tubes with ball and powder) can be used in musket weapons, reducing the reload time by -1 turn or 6 seconds.
Note: All long guns must be reloaded in a standing or kneeling position; if lying down, increase the reload time by -*2 combat turns because of the awkwardness of the procedure.

Matchlock: The matchlocks date back to the late 5th or 6th centuries on Terra. They were developed to smash heavy armour plate. The matchlock uses a burning fuse and are unreliable at best, with a miss-fire 3 times in 10 in good weather, and 9 times in 10 during damp/wet weather. A forked firing support is used to steady the weapon when firing. The .75 calibre weapon is able to accept a bayonet.

Musket: The 'muskets' are all flintlocks and are reliable in good weather, with 1 failure to fire in 10. This malfunction probability increases to 5 in 10 during damp/wet weather. However, during early Tech/4 development, the weapons were adapted for percussion caps, and they effectively fire every time. The .75 smoothbore is the famous British 'Brown Bess,' in service for well over 100 years. The .615 rifled musket is the 'Baker Rifle,' used by the 95th Rifles and the King's German Legion at Waterloo. The .40 rifle musket represents a range of 'Kentucky Long Rifles' of various calibre's. The musket pistol is either a single or a double-barrel smoothbore handgun with limited range. The duelling pistol is a rifled handgun with good accuracy at close ranges.

Cost of ammo is:		
Calibre	Mass of 100 Rounds	Cost (CR)
.85 ball & powder	5000gm	5
.75 ball & powder	4250gm	12
.615 ball & powder	3000gm	10
.40 ball & Powder	2000gm	8

Cost of powder and shot is based upon a character's casting his own lead shot, using bar lead and a bullet mould which comes with the weapon. Cost of purchased ammunition will be + CR 5. The powder is carried in a sealed powderflask (20 charges), and the ball ammo is carried in a leather pouch fixed to the belt or to the shoulder strap holding the powderflask. Spare flints (CR 0.50 each) are carried as well, as a flint is good for only 20-25 discharges before it has to be replaced or adjusted.

6.5 SHOTGUNS, TECH/5-6

Shotguns are smoothbore descendants of the musket and the blunderbuss. All muskets could fire shot as well as solid ammunition, and thus these Tech/3 weapons appear here as well.

The 'standard' shotgun is a Tech/6 automatic shotgun carrying 6 shells in the magazine, with a ROF of DA. Reloading is at the rate of 3 shells per combat turn or 1 shell and 1 shot per turn. Breech-loading single-barrel and double-barrel models (Tech/4-5) are also available.

When firing slugs, shotguns have musket-like ranges and accuracy.

When firing shot, a shotgun will be able to hit up to 3 targets standing within 2m to either side of the line of fire up to the limit of range. At range under 10m, a single target can have the full blast (2 hit determination rolls) fired into it for possible double damage. A Tech/6-7 flechette round is also available. Flechettes are slivers of metal which do a nasty job of tearing flesh and bone at scatter-shot ranges.

Cylindrical magazines containing 10 shells can be attached beneath a .12 or .10 gauge shotgun to increase their magazine capacity to 16 shells. The mass of the auxiliary magazine is 500gm and it Costs CR 35.

shotgun	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
slug	.10	2	6	1000mm	3750gm	150
shotshell	.10	2	6	1000mm	3750gm	150
flechette	.10	2	6	1000mm	3750gm	150
slug	.12	2	6	1000mm	3750gm	135
Shotshell*	.12	2	6	1000mm	3750gm	135
flechette	.12	2	6	1000mm	3750gm	135

All shotguns receive a +2 penetration bonus at PB and +1 at SR with slug and flechette rounds. All rounds have a -1 penalty on penetration at ER.
*Also fired by .85 and .75 matchlocks, and by .75 muskets.

Ammo Type	Mass/100 Rounds	Cost/100 Rounds
.12 slug shell	3500gm	CR 30
.12 shotshell	3250gm	CR 25
.12 flechette	3500gm	CR 35
.10 slug shell	3750gm	CR 35
.10 shotshell	3500gm	CR 25
.10 flechette	3750gm	CR 35

Note: Single and double-barrelled shotguns will be used in Tech/ 4-5. These cost CR 100 and CR 150 for 1 and 2 barrel versions. Mass is comparable to that of the automatic shotguns. ROF is 1 for single barrel shotguns, while double barrel models may fire at 11/2.

6.6 TECH/4-5 FIREARMS

All Tech/4-5 firearms represent a considerable step forward over the muzzle-loaders in that they employ a brass percussion

cartridge and breech-loading mechanisms. The result was a weapon that has a much higher rate of fire and greater reliability under all weather conditions.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
Derringer	.32	1	2	75mm	250gm	50
Revolver	.38	11/2	6m	200mm	750gm	100
Revolver	.44	11/2	6m	200mm	900gm	115
Revolver	.45	2	6m	200mm	900gm	125
Lt. Rifle	.22	1	I	1000mm	3250gm	75
Mdm. Rifle	.30	1	I	1000mm	4000gm	100
Mdm. Rifle	.30	11/2	10in	1000mm	4000gm	135
Mdm. Carbine	.30	1	I	750mm	3500gm	100
Mdm. Carbine	.30	11/2	10in	850mm	4000gm	135
Buffalo Gun	.30+	1	I	1000mm	4000gm	135
Elephant Gun	.500	1/1	2	1000mm	5000gm	175
Elephant Gun	.600	1/1	2	1000mm	6000gm	225

Tech/4-5 firearms represents a transitional period corresponding roughly to the late 19th century on Terra. The revolvers and pistols include the Derringer 'hold-out' pistol, a very short-range two-barrelled weapon, a more-or-less standard .30 revolver, the .44 Colt single-action 'Peace-maker,' and the double-action Smith & Wesson .45 service revolver. The light rifle is the old .22 single-shot bolt action still used by some for 'plinking.' The .30 rifles include a single-shot bolt-action model and a bolt-action rifle with a magazine (Lee Enfield), although it can also represent lever-action repeaters like the Civil War Henry. The .30 carbines include a single-shot model (like the Springfield) and a magazine weapon (Winchester3o. 30). The buffalo gun represents a range of big game rifles of various calibre's up to .65 cal. Finally, the two Elephant Guns represent the double-barrelled British 'Express' models widely used in Africa.

Pistols with a ROF of 1'A can be fired at ROF 2 by hand gunners with expertise/6-10, for they have mastered the art of cocking and firing the single-action weapon. Pistols with an ROF of 2 can be fired at ROF 3 by hand gunners with expertise/6-10, for they have mastered rapid fire techniques and the art of timed-rate fire.

Weapons with ROF 11/2 can be fired at 2 rounds and I round alternate turns.

Reloading of single-shot weapons is at 1 round and 1 shot per turn. Magazine weapons (m) can be reloaded at the rate of 6 rounds per combat turn; the shells must be loaded singly.

Calibre of Ammo	Mass of 100 Rounds	Cost (CR)
.32 Pistol	1000gm	10
.38 Pistol	1750gm	20
.44 Pistol	2000gm	25
.45 Pistol	2000gm	25
.22 Rifle	1000gm	10
.30 Rifle	2750gm	25
.30+ Rifle	3500gm	30
.500 Rifle	5000gm	40
.600 Rifle	5500gm	45

It should be noted that Tech/4-5 ammunition is often not compatible with later weapons of the same general calibre because of rechambering of later weapons, etc. Also, it is common to hand-load spent cartridges to save money. Hand-loading costs 2/3 the list prices of ammunition. A bullet mould for the calibre of the ammunition may be obtained at CR 25.

The .30 cal. rifles should be regarded as the standard military arms. They will therefore be capable of using a bayonet and will also be fitted with a shoulder sling in the military versions. Scopesights are only at an experimental stage and will be unavailable to both military and civilian versions of the weapons.

6.7 TECH/5 FIREARMS

Tech/5 firearms represent a further increase in general performance of small arms. Ranges of most rifles have increased, while many accept clip ammunition. A good range of handguns will be available, all of them double-action weapons with an excellent rate of fire. Military arms evidence a significant number of fully automatic weapons.

While the civilian rifles and pistols largely speak for themselves, the military weapons deserve some comment. The standard infantry arm is the semi-automatic M-1 rifle, while the M-4 carbine is a light, fully automatic weapon designed for use by officers, etc. Both will accept a bayonet. The machine pistol is a mini-submachine gun derived from the 9mm pistol. The SMGs are modelled after the Schmeisser and the Thompson. The Thompson .45 can also accept a 50c. The LMG or light machine gun is comparable to the U.S. BAR or the British Bren. When fired with bipod support, it has LMG range. Fired from the hip or shoulder, it has only an effective R.2 rifle range. The MMG medium machine gun and HMG heavy machine gun must be mounted on tripods or TE/Mech mounts. Tripods include vehicle pedestal/post mounts as well as actual tripods used for field mounts. The TE/Mech mount is a traversing and elevation mount or else a coaxial mounting in a weapon turret. Such mounts confer certain benefits with respect to accuracy over long range.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
Revolver	.22	2	6m	100mm	275gm	75
Target Pistol	.22	2	10c	225mm	750gm	175
AutoPistol	.32	2	6c	100mm	325gm	100
AutoPistol	9mm	2	6c	100mm	350gm	150
AutoPistol	9mm	2	8c	175mm	750gm	135
Service Rev.	.38	2	6m	175mm	750gm	135
'Special' Rev.	.38	2	6m	125mm	550gm	135
Service Rev.	.45	2	6m	200mm	900gm	145
AutoPistol	.45	2	8c	175mm	900gm	145
Lt. Rifle	.22	11/2	10m	1000mm	3500gm	110
Lt. Carbine	.22	2	20c	750mm	3000gm	125
Mdm. Rifle	.30	11/2	10	1000mm	4000gm	150
Mdm. Carbine	.30	11/2	10c	800mm	3500gm	140
H.P. Rifle	.30+	11/2	10c	1000mm	4000gm	200
H.P. Carbine	.30+	11/2	10c	750mm	3500gm	180
H.P. Rifle	.40t	11/2	10c	1000mm	4000gm	250
H.P. Carbine	.40+	11/2	10c	750mm	3500gm	225
H.P. Rifle	.50+	11/2	10c	1000mm	4000gm	350
M-I Rifle	.30	2	10c	1000mm	4000gm	165
M-4 Carbine	.30	2/10	20c	750mm	3000gm	185
MachinePistol	9mm	2/10	20c	225mm	1250gm	225
SMG	9mm	2/10	30c	600mm	3250gm	250
SMG	.45	2/10	30c	600mm	3500gm	250
LMG Bipod	.30	2/10	30c	1100mm	7500gm	450
MMG Tripod	.30	10	100b	1000mm	15 kg	750
HMG Tripod	.50	10	100b	1500mm	30 kg	1000

The cost and mass of ammo are:

Calibre of Ammo	Mass of 100 Rounds	Cost (CR)
.22 Pistol	750gm	10 CR
.32 Pistol	1000gm	10CR
9mm Pistol/SMG	1500gm	20 CR
.38 Pistol	1500gm	15 CR
.45 Pistol	2000gm	20 CR
.22 Rifle	1000gm	10
.30 Rifle	2500gm	20
.30+ Rifle	3000gm	30
.40+ Rifle	3500gm	40
.50+ Rifle	4000gm	45
.50 HMG	7500gm	45

6.8 TECH/6 FIREARMS

Tech/6 civilian weapons differ little from those of Tech/5. However. 4ilitary small arms have improved considerably.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
SAR 7.62	7.62mm	2	30c	1000mm	4000gm	200
ACR 7.62	7.62mm	2/10	30c	1000mm	4000gm	300
AR 7.62	7.62mm	2/10	30c	750mm	3250gm	275
AR 5.56	5.56mm	2/10	30c	800mm	3250gm	275
SMG	9mm	2/10	30c	500mm	2500gm	275
LMG (bipod)	7.62mm	2/10	100b	1000mm	6000gm	650
MMG (tripod)	7.62mm	2/10	100b	1000mm	12 kg	1000
HMG (tripod)	.50	2/10	100b	1800mm	30kg	1500
Magnum Rev.	.375	2	6m	200mm	900gm	200
AutoMag	.375	2	10c	200mm	900gm	240
Magnum Rev.	.44	2	6m	200mm	1000gm	250
AutoMag	.44	2	10c	200mm	1000gm	285

The SAR or semi-automatic rifle is the standard infantry arm in Tech/6 cultures. It is fitted with a shoulder sling, accepts a bayonet, and can be fitted with Scopesights, infra-red visors, night visors, and other specialised sighting equipment. It has a 30-round clip (30c) which can be inserted beneath the weapon to the front of the pistol grip/trigger guard. Reloading can be accomplished in 1 combat turn, and a rifleman with expertise/8-10 can even fire 1-2 shots as well in the same turn. Automatic rifles (ACR) are merely the fully automatic version of the SAR and can fire in bursts of up to 10 rounds in a combat turn. Assault rifles are shortened versions of the ACR, combining the lightness of the SMG with some of the accuracy of the carbine. The weapons these types are modelled after are the FN FAL. 7.62 and M-14 semi-automatic rifles, The FN Falo 7.62 and M-14 automatic combat rifles, the AK-47 and M-16 assault rifles, while the SMG is the Israeli 'Uzi.' The LMG is a modified automatic rifle, bipod stabilised and having a receiver for belt ammunition. The MMG it a NATO 7.62mm automatic support weapon, while the HMG is an improved .50 cal. with ranging machinegun long-range fire capabilities.

The Magnum handguns represent the latest in heavy revolver and automatic side arms. The AutoMag ranges are increased somewhat over actual performance to. reflect an improved weapon which does reach current target pistol accuracy. These become standard military and police issue in the later part of a Tech/7 development period.

The cost and mass of ammo are:

Calibre of Ammo	Mass of 100 Rounds	Cost (CR)
7.62mm Rifle	2500gm	20
9mmSMG	2000gm	25
.375 Magnum	2000gm	25
.44 Magnum	2250gm	30
.50 HMG	7500gm	46

6.10 TECH/7 FIREARMS

Tech/7 firearms represent the farthest advance in the development of the traditional small arm. Virtually all the rifle and carbine types are on the fully automatic rifle model and bear a close resemblance to the Tech/6 military weapons. The pistols are capable of delivering a considerable amount of hitting power and have excellent range and penetration power:

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
Sportsman	5mm	2	10c	200mm	750gm	300
Body Pistol @	5mm	2	10c	100mm	250gm	250
Enforcer	7mm	2/10	10c*	200mm	1000gm	375
Body Pistol @	7mm	2	10c	100mm	350gm	350
AutoMag	10mm	2	10c	200mm	1000gm	425
AutoFire	10mm	2/10	10c*	250mm	1150gm	500
Lt. Rifle	5mm	2	30c	900mm	3000gm	400
Lt. Carbine	5mm	2/10	30c	600mm	2500gm	400
Med. Rifle	7mm	2	30c	900mm	3500gm	450
AR7 AutoRifle	7mm	2/10	30c	1000mm	3750gm	525
AMG10 LMG @@	10mm	2/10	100c	1000mm	5000gm	1000
Hv. Rifle	10mm	2/10	30c	1000mm	3750gm	585
Hv. Carbine	10mm	2/10	30c	750mm	3500gm	565
H.P. Rifle	12mm	2	10c	1000mm	4000gm	650

@Body pistols are designed for concealment and may not appear on weapon detectors. A good physical search is often required.
@@Bipod mounted weapon.
*30c clips are also available.
The cost and mass of ammo are:

Calibre of Ammo	Mass of 100 Rounds	Cost (CR)
5mm	1500gm	25
7mm	2000gm	
10mm	2500gm	35
12mm'	3000gm	40

Ammunition of the same calibre is compatible in both pistols and rifles. Interchangeable ammo is part of the drive toward standardisation of armaments so that only the most effective types of weapons are produced. The result is that a pistol has the same hitting power at close range as a rifle does at longer ranges.

6.11 'RECOILESS' SERIES: ROCKET GUNS

The 'Recoiless' rocket-firing weapons are Tech/7 descendants of such experimental guns as the Gyrojet rifles and pistols developed on Terra during the middle of the 20th century. The ammo consists of small, spin-stabilised rocket rounds which gather speed as they accelerate away from the muzzle of the weapon.

Recoiless weapons have the advantages of 'no kick' or recoil, while the slugs themselves will attain very high .velocities and deliver excellent hitting power against the target once the shells have reached full velocity. A Recoiless weapon can be fired under water (50% range divisions). Recoiless small arms have enjoyed popularity as rocket shells are unaffected by smoke and aerosols, which attenuate Laserfire. They do not drop off in velocity, unlike slugs fired by cartridge weapons, because the rockets fire throughout their flight. They continue in use in some regular forces, numerous militias, and training units. Civilian use is widespread in some areas. Long guns are sometimes referred to as 'Cone Rifles' because of the generally conical shape of the racket rounds.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
GyroJet Pistol	5mm	2/10	10c	250mm	850gm	500
Gyro.Jet Rifle	5mm	2/10	30c	1000mm	3500gm	850
GyroJet Carbine	5mm	2/10	30c	750mm	2750gm	750
Cone Rifle	7mm	2/10	30c	l000mm	500gm	1000
Hv. Cone Rifle	10mm	2/10	'20c	1000mm	3750gm	1200
Lt. InfR @	10mm	10	200c	1000mm	15kg	2500
Mdm. InfR @@	20mm	10	200c	1500mm	250kg	15000
Hv. LnfR @@	40mm	10	200c	2500mm	600kg	27500

@Tripod weapon.
@@Vehicle mounted in cupola or turret.

Cost and mass of ammo is:

Calibre of Ammo	Mass of 100 Rounds	Cost (CR)
5mm Gyro	1000gm	40
7mm Gyro	1350gm	50
'10mm Cone	1750gm	60
10mm InfR*	10kg	200
20mm InfR*	50kg	1000
40mm InfR*	125 kg	3000

*Actual number of rounds is higher; Infinite Repeaters fire an effective 500 rounds per minute.

All recoiless weapons will have a reduced penetration capability at point-blank and short range because the rocket rounds have not attained maximum velocity and are still accelerating. The 20mm InfR and 40mm InfR rocket shells contain explosive charges, as these weapons are actually automatic cannons which were expressly designed for anti-tank and anti-aircraft fire. Infinite Repeaters actually put out a high volume of fire and only 'area' autofire is possible against infantry, while autofire is used to score hits on any vehicle Because of their good underwater performance, they are often mounted in submarines and submersibles as close range offensive armament.

6.12 GAUSS RIFLE

One of the lines of weapon development led to the application of the linear magnetic accelerator to accelerate non-metallic slugs encased in discarding steel sabots to hypervelocity's, often in excess of 5000m per second. The main thrust was toward the development of heavy anti-tank cannon, but the bipod heavy gauss anti-tank rifle was developed for use by infantry. The gauss 'rifle' is clip-loaded with 20 hypervelocity rounds. Each round contains a mini-cell which powers the accelerator field, so it is unnecessary to provide a powercell with the weapon itself.

Gauss weapons are exceedingly expensive and have a somewhat slow rate of fire. However, they are devastating against even well-armoured infantry, and even a light tank is not immune to its fire. The 20mm rounds can be obtained in 'solid-shot' and 'APDSV explosive' form. (APDSV = armour-piercing-discarding-sabot, hypervelocity round): A Tech/10 pistol version has been developed for the Terran Space-Forces, but it is not available to civilians.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
Gauss Rifle*	20mm	2	20c	1000mm	9000gm	22 500
Gauss Pistol	20mm	2	6c	300mm	1500gm	15 000

*firearm rifle range category
Breakdown No. = 3/3 rolled every 10th firing.

Cost and mass of ammo are:

Round	Warhead	Mass of 100 Rounds	Cost (CR)
APDSV	nil	7500gm	150
APDSVG	'G'	7500gm	1000
APDSVF	'F'	8000gm	2000
APDSVE	'E'	8000gm	3500

Gauss 'warhead' rounds explode upon penetration of vehicle and tank armour, and damage inflicted on a vehicle is that of an equivalent 'HE' warhead which has effected penetration. The actual penetration, however, is based upon the capabilities of the gauss weapon itself.

6.13 STAT RIFLE

The Stat rifle is a logical development of the Recoiless rocket guns. The Stat 'Penetrator' is designed for maximum projectile penetration of armour using a low velocity rocket shell with a shaped Viradex V explosive charge. The +2500°C gasses produced by the Viradex V detonation can effect a 'burn through' of the armour. The Stat Rifle is, in effect, a re-chambered heavy Cone Rifle using 15mm rocket rounds. The cost and general specifications of the Stat Rifle are the same as for the heavy Cone rifle (see 6.11). Ammo masses 3500gm per 100 rounds and costs CR 450. Note: Stat weapons are strictly military arms and rarely find their way into civilian hands. They are available in Tech/8 cultures.

6.14 TANGLEGUN

The Tanglegun is a Tech/7 police weapon about the size and general configuration of a SMG. It fires a burst of synthesilk fibre which wraps around a target and effectively ties him up. Synthesilk fibre cannot be snapped except by power armour (one turn doing so) because of its strength, but will readily 'relax' when a droplet of KMC is touched to a strand. A Tanglegun ammo capsule can be fitted in one combat turn.

Tanglestrands will continue to constrict a victim as long as he struggles, hugging tighter and tighter until no movement other than breathing is possible. Normally, such retraint is non-lethal, but a tangleround fired into a person's mouth (a nasty trick practised by some planetary police forces in autocratic cultures) will effectively strangle a victim because the tanglestrand will react to the swallowing and gagging reaction, forming a ball in the process which blocks the breathing passage.

Tanglerounds must be aimed at the upper or lower body, so a victim will either have his hands or his feet (or equivalent) restrained. Large creatures and silicate beings will probably require several rounds to restrain them. Amoeboid life forms can 'flow' through the strands and are thus unaffected by them.

Synthesilk is heat-sensitive, and thus a low-setting on a laser, Blaster, fusion gun, flamer, etc will readily melt the tanglestrands and release a victim. However, the technique should be restricted to personnel in armour protection classes C or higher.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
TanglePistol	2mm	1	10c	225mm	1000gm	300
TangleRifle	2mm	1	20c	750mm	2750gm	550

TangleAmmo costs CR 20 for a 10c capsule and CR 35 for a 2Cc capsule, with mass at 150gm and 350gm respectively.
KMC anti-tanglestrand catalyst can be obtained for CR 50 for a 20-application spray vial massing 50gm.

6.15 LASERS

The Laser enjoyed a short period of dominance as the chief battlefield weapon of late Tech/6 and early Tech/7 cultures before it was replaced with the Blaster. However, it can still be found in the armaments of many planetary defence force militia units, especially on colony planets, and it remains a very common civilian small arm.

Lasers suffered from a number of disadvantages. Smoke and light-dispersing gases can attenuate laserfire. The amount a laser beam is weakened depends on the type of smokes gas, fog, or anti-laser aerosol the beam travels through to reach the target.

The advantages of laser weapons almost outweigh the disadvantages. Lasers are silent. The beams cannot be readily detected unless it is dim or dark, or if there is dust or smoke in the air to reflect a portion of the beam and so render them visible to observers. Certain laser wavelengths are effective under water (all range increments at 50%), which makes them an effective submarine weapon. Their lack of recoil also makes them a preferred weapon for combat in low pressure atmospheres and airless conditions in low/null gravity fields. Because it is inadvisable to fill spacecraft with smoke from anti-

laser aerosol grenades, lasers remain a standard boarding weapon.

Lasers come in pistol, carbine (actually little more than an SMG), rifle, machine gun, and light and heavy cannon versions. Underwater lasers cost about 150% of standard models:

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
LaserPistol	3mm	2/10	20c	200mm	750gm	1000
LaserCarbine	5mm	2/10	3Cc	500mm	2000gm	1750
LaserRifle	5mm	2/10	3Cc	900mm	3250gm	2250
Laser LMG@	5mm	2/10	50c	1000mm	7500gm	3500
Laser MMG@@	7mm	10	100c	1250mm	15 kg	5000
Laser HMG@@	10mm	10	100c	1500mm	30 kg	7500
Hv. Laser @@@	20mm	10	200c	1800mm	200 kg	22 500

@Bipod mounted.
@@Tripod or TE/Mech mounted, often in a vehicle as a cupola or coaxial gun.
@@@Turret mounted vehicle weapon or aircraft/spaceship weapon: 25m Blast zone.

The powercells may be recharged at any power main in a time period (in seconds) equal to the calibre x no. charges. A 3m/20c powercell for a pistol, for instance, recharges in 60 sec.; a 20mm/200c heavy duty powercell recharges in 4000 sec. or 66.7 mm. or 1.11 hr. Of course, high voltage mains are available and cut the recharge time to 10%. Cost of a recharge = CR 0.50 per sec. The 20rnm/200c would therefore cost CR 2000 to recharge, while the 3mm/20c would cost only CR 30. Spare powercells can be carried. These cost an equivalent to one full recharge plus 125% and will mass 10gm per charge/ second. A 3mm/20c therefore costs CR 67.5 and masses 600gm, while the 20mm/100c costs CR 4500 and masses 40 000gm or 40 kg. Note: mass of powercell is in addition to weapon mass.

6.16 BLASTER'S

The moment Blasters appeared, they began to replace the Laser. Blasters fire a series of pulses of Nova-related energy (see Nova Guns in the Space Combat section).

Blasters are unaffected by smoke, haze, fog, aerosols, etc., except insofar as such conditions affect the firer's ability to see his target. Blasters also create 'fog' when their beams hit significant amounts of standing water (but not when firing through mere fog or rain). When fired at flammable targets, Blasters have a 5 to 20 chance of igniting flammable materials and will create plenty of smoke.

Blasters have a limited range under water (10% range increments) and comparable liquids. They have a slight but significant recoil, so only EVA/5-10 personnel may employ them in freefall without the possibility of 'tumbling' and other unwanted effects. The beams are plainly visible in all conditions as bolts of brilliant bluish-white or violet light. The position of a firer can be determined quite readily, making mobility a necessity. The Blaster emits a sound reminiscent of sharply torn cloth blended with the whining scream of a ricocheting bullet. Heavy weapons have the undulating howl of a banshee as the pulse-bursts of. energy tear across the intervening distance to the target.

Blasters are universally regarded as military weapons, but in a universe in which most spacefarers will serve as some form of naval auxiliary or reserve force, the Blaster is fairly easy to acquire. At the same time, many starcultures frown upon possession of such destructive weaponry by persons clearly not in the military or else 'approved' as responsible citizens. In autocratic nations like the Azuriach Imperium or the Galactic Peoples Republic, possession of Blast weapons is a serious offence unless licensed by the governing authority (a rarity).

Blast weapons come in pistol, carbine, rifle, and machine gun versions.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
BlastPistol	5mm	2/10	20c	250mm	1250gm	1500
BlastCarbine	5mm	2/10	30c	600mm	2250gm	2500
BlastRifle	7mm	2/10	30c	1000mm	3500gm	3500
Blast LMG@	7mm	2/10	50c	1200mm	7500gm	6000
Blast MMG@@	10mm	10	100c	1200mm	15kg	9000
Blast HMG@@	15mm	10	100c	1500mm	30kg	15000
Hv. Blaster@@@	20mm	10	200c	1800mm	200kg	32500

@Bipod mounted.
@@Tripod mounted or TE/Mech mounted, often in a vehicle as a cupola or coaxial gun.
@@@Turret vehicle weapon or aircraft/spaceship weapon: 25m Blast Zone.

All Blast weapons utilise a powercell to energise their firing systems. The capacity of the powercell is given in the ammo column. All other specifications are as given for Laser powercells in the preceding section.

6,17 NEEDLE GUNS & SPRING RIFLES

'Needlers' were developed as lightweight, 'tamper-proof' Tech/7 military weapons. Operated by a mechanical spring device wound by hand or with a small but powerful torque wrench supplied with the gun, the weapons are totally silent at distances over 10m. Thus the position of the firer cannot usually be determined by sound. All needle guns fire 3m flechettes at high velocity which do surprising damage. The flechettes are sharp-edged and spin furiously upon penetrating the target, slashing through muscle, sinew, and even bone with awesome violence. It is a popular hunting weapon in the colonies, however, because it has fully automatic capabilities and is relatively inexpensive to operate. Thus colonial militias will evidence a good number of such weapons. It is also an excellent personal defence weapon.

Drugged and poisoned needles are available, but these will not penetrate armour over class H (chain-mail equivalent). Thus their use is restricted to 'soft' targets in limited or no armour. See 6.20 Poisons & Drugs for details.

Needle weapons come in a pistol, carbine (SMG) and rifle version:

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
MiniNeedler@	3mm	2/10	10c	100mm	250gm	200
NeedlePistol	3mm	2/10	20c	200mm	750gm	250
RazorGun Carbine	3mm	2/10	50c	600mm	2500gm	450
NeddleRifle	3mm	2/10	50c	900mm	3250gm	550

@Hold-out weapon designed for concealment.
@@Use FireArm P.1 range.

Needle ammunition comes in 100-rounds lots (10c, 20c, or 50c clips) at CR 25 and at mass 500gm. Poisoned or drugged rounds are purchased at the costs indicated per 'dose' of chemicals, as given in 6.20 Poisons & Drugs.

6.18 DART GUNS

This Tech/6 weapon was originally developed to inject animals with a drug to pacify them without injury. It later became a popular hunting weapon in the colonies. The weapon fires a dart pneumatically, and it is therefore as hard to spot the firer from sound alone as it is to detect a needle rifleman.

Some darts are drugged or poisoned. Others are 'shock darts' (see below) which produce a deadly trauma through a combination of hydrostatic and electric shock to the victim's body systems.

Weapon Type	Calibre	ROF	Ammo	Length	Mass	Cost (CR)
Dart Rifle	10mm	1	10	1000mm	3500gm	250

The weapons are loaded round by round, with 3 rounds loaded in a combat turn or 1 round and 1 shot in a combat turn. The compressed gas capsule is good for 100 shots. Ammunition costs CR 2.5 per dart, plus appropriate drugs or poisons, or CR 7.5 per shock dart. One round of the 10mm dart ammunition weighs 15gm, complete with drug or poison. It should be noted that Crossbow quarrels can be modified to take a dart or shock-dart tip.

6.19 SHOCK DARTS

Shock Darts are 5mm projectiles designed to impart an electric and hydrostatic shock to the system of a victim. The Shock Dart projector is itself a 'hold-out' weapon, usually disguised as some innocent and functional personal item, such as a pen. Modified Shock Darts are also available for Dart Guns. 100 darts mass 500gm and cost CR 7.5 each. Shock Darts are available in late Tech/7 and early Tech/8 cultures.

The range of a Shock Dart is only 5m (point-blank range), but it can be affixed to a Dart Rifle round to a crossbow quarrel (giving it the range of the appropriate weapon delivering it).

6.20 DRUG & POISON EFFECTS

A wide range of drugs and poisons are available for use in Darts, Needle rounds, and Blowgun darts. In most instances, a Constitution CR is required, in which the victim must roll equal to or below his Constitution score on 1d20 to 'save' from the full effects of the drug or poison. However, this CR will be modified upward or downward according to the victim's body chemistry and its interaction with the chemical. Chemicals (drugs and poisons) are identified as D or P plus a number. Players can give whatever names they wish to the chemicals. Costs and effects are listed below:

Race Affected	Drug Type/Constitution CR Modifier														
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15
Humans	-8	-10	-4	NE	-3	-6	-3	-4	+0	IR	+0	NE	NE	NE	NE
Humanoids	-4	-3	-7	-7	NE	-3	-5	-4	-1	NE	+0	NE	NE	NE	NE
Felines	NE	-8	-1	-2	-5	-4	IR	-3	-1	NE	+0	NE	NE	NE	NE
Canines	-2	-2	-7	-4	-4	-6	-5	-3	-1	NE	+0	NE	NE	NE	NE
Pithicenes	-7	-10	-5	NE	-3	-3	-2	-4	-1	IR	+0	NE	NE	NE	NE
Ursoids	IR	-7	-5	IR	-3	-4	-1	-2	+0	+0	+0	NE	IR	NE	NE
Saurians	-3	+0	-6	-5	+0	-3	-1	-4	+0	-3	+0	NE	NE	NE	NE
Transhumans	-4	-2	-3	-4	-1	-2	-1	-1	+0	NE	NE	NE	NE	NE	NE
Arachnids	NE	-2	NE	+0	+0	-2	NE	NE	NE	-6	-2	-6	NE	NE	NE
Scorpionids	NE	-2	NE	+0	+0	-2	NE	NE	NE	-6	-2	-6	NE	NE	NE
Insectoids	IR	-3	NE	-1		NE	-5	NE	NE	NE	-6	-6	NE	NE	NE
Amoeboids	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-5	NE	NE
Icthyoids	-5	-6	-6	-7	-4	-4	-2	-3	-10	-3	+0	NE	NE	NE	NE
Silicates	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	-7	IR
Cold Planet	NE	NE	NE	NE	NE	NE	NE	NE	-5	NE	-3	NE	NE	NE	-7
Origin	N	M	M	M	N*	M	M	N	M	M	M	N	M	M	M
Effect	F	S	S	S	S	S	P	P	S	P	P	S	S	S	S
Cost (CR)	5	3	2	4	4	2	3	3	5	5	4	3	5	5	5

NE = No Effect: Body chemistry is able to absorb drug.
IR = Irritation: Victim may be roused to fury by the drug, and he will at least be surly.
N = Natural Source: Drug can be extracted from plants, etc., or can be purchased.
S = Sleep: Drug causes victim to became unconscious.
P" Pacify: Drug leaves victim awake but in a stupor which makes him capable of effective self-directed action. He is easily 'led.' The drug can also double for 'Truth' serums at x 5 cost.

Drugs will take 3-18 seconds to take effect (roll 3d6). If 0-6 seconds, effects will be immediate; 7-12 = effects occur at end of next combat turn; 13-18 = effects occur at end of second combat turn after shot. The effects last for a number of 1 minute tactical game turns equal to 2d6 plus the CR modifier (negative 'sign becomes positive). For example, a human affected by D1 soporific will sleep for 2d6 + 10 minutes unless given an antidote. At that time, a Constitution CR must be successfully rolled to awaken. If a failure to awaken occurs, another attempt may be made every 1d6 minutes thereafter.

The effects of a soporific are such that fatigue and wind levels will be at 50% of normal for 20 minutes minus Constitution score once the victim awakens.

Pacification drugs have effects which last over a longer period of time. Duration = 6 minutes x 2d6 x CR modifier for the drug.

An adjustment may be made for body size. Dosages are set for standard body mass of 200 kg or less. For each 200 kg over the standard body mass (or part thereof), an additional shot of the given drug may be required for any effects to occur. A 350 kg animal, for instance, will have to be shot twice for the drug to be effective at all. A 600 kg animal would have to be shot three times, etc. Once the required amount of drug has been delivered, one Constitution CR is rolled for the victim. Each shot delivered thereafter adds +1 Constitution CR roll. No creature can withstand the effects of more than 6 doses of a soporific. The effects will automatically take place if the drugs were all delivered within a 6-minute period.

Drug antidotes work in identical fashion to the drugs. There is a specific antidote for each drug, denoted AD1, AD2, etc. The antidote AD15 is a general antidote for all species marked 'N' and is available to registered Physicians only, as it has a flat 25% chance of destroying the nervous system if administered by anyone who is not a trained Physician or a MediTech/7-10. AD15 will counter the effects of all drugs listed.

For an antidote to take effect, a modified CR is rolled, with the negative modifier now a standard +5 across the board for all drugs. The antidote will arouse the victim in 10.d6 seconds (6-60 seconds), but will not counter the temporary fatigue and wind reduction associated with being drugged.

A Stunner charge will cause the same effects as a drug, only the effects will be instantaneous. A 'reverse' charge on a Stunner or the administering of the appropriate drug will arouse the victim. Failure to arouse a stunned victim will mean that the time period has been tripled because the victim is in deep coma.

	Poison Type/Constitution CR Modifier														
Race Affected	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**
Humans	-6	NE	-5	-5	-4	-4	-3	-3	-2	-2	-5	-3	NE	NE	-6
Humanoids	-6	+0	-5	-5	-4	-4	-3	-3	-6	NE	-3	-4	NE	NE	-6
Felines	-5	+0	-5	-4	+0	-3	-4	-4	-3	+0	-3	-3	NE	NE	-6
Canines	-6	+0	.5	-5	-4	-4	-3	-3	-2	-2	-5	-3	NE	NE	-6
Pithicenes	-6	NE	-5	-5	-4	-4	-3	-3	-2	-2-	-5	-3	NE	NE	-6
Ursoids	-4	-4	-4	.3	+0	-3	-1	-2	-I	-I	-6	-5	NE	NE	-5
Saurians	-3	-2	-2	-2	-6	-3	NE	-2	NE	-6	-4	-1	NE	NE	-5
Transhumans	-2	-2	-2	-2	-2	-2	-2	-2	NE	-2	-2	-2	NE	NE	-2
Arachnids	NE	NE	NE	NE	NE	NE	+3	+6	-5	NE	-I	NE	NE	-6	-6
Scorpionids	NE	NE	NE	NE	NE	NE	+3	+5	-6	NE	-2	NE	NE	-5	-4
Insectoids	NE	NE	NE	NE	NE	NE	+2	+4	NE	NE	-I	NE	NE	-6	-6
Amoeboids	NE	NE	NE	NE	NE	NE	NE	NE	-4	-1	NE	NE	-6	NE	-5
Icthyoids	-4	-4	-4	-4	-4	-4	-4	-4	-4	-3	NE	-6	NE	NE	-4
Silicates	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-4
Cold Planet	NE	NE	NE	NE	NE	NE	-6	NE	NE	NE	-3	NE	-4	NE	-0
Origin	N	M	M	N	N	M	M	N	M	M	M	M	M	M	N
Wound Effect	+4	+3	+3	+1	+2	+2	+5	+2	+4	+1	+3	+4	+3	+3	+4
Cost(CR)	3	3	4	1	3	4	0	3	5	4	5	3	5	5	25

NE = No Effect: body chemistry is compatible with the 'poison.'
N = Natural Source: poison can be extracted from plants, etc., or can be purchased.

Poisons will take 3-18 seconds to take effect (roll 3d6). If 0-6 seconds, effect is immediate; 7-12 effect occurs at end of next turn; 13-18, effect occurs at end of second turn after shot.

If the victim fails his Constitution CR, the full effects of the poison are felt; roll on the Wound Effects Table, adding the Wound Effect modifier to the result. If the victim 'saves' in his Constitution CR, only a 'light wound' is sustained. Any poison marked 'NE' is totally ineffectual.

Antidotes are available for poisons. Specific antidotes are marked API, AP2, etc. The antidote must be administered within 10 minutes for all poisons with a CR modifier of -3 or less, and within 7 minutes for poisons with a CR of -4 or greater. The antidote will reduce damage to 50%. There is also a Universal Antidote or UAP which can be administered prior to a situation which might involve poison. It has a duration of 6 + 10d6 minutes. If administered after a hit is suffered, the time factors noted for specific antidotes apply. The UAP will have a 50% chance of totally countering poison effects; otherwise, 50% damage is sustained.

Silicates have exceedingly tough hides, and drugs and poisons may not necessarily be delivered beneath the 'skin' because a dart does not penetrate. However, dart guns fire syringe-like projectiles which might spray the chemical onto the surface of a Silicate. In the case of D14 and P15, contact is sufficient to cause the effects to occur. Needles and blowgun darts are not effectual against Silicates, however, unless penetration occurs (which is highly unlikely).

Gases may be modelled on the drug and poison types presented above, and gas grenades, etc., can be produced with appropriate chemicals contained therein. Cost of such grenades is 10 to 20 times the cost of one dose of a drug or poison and will fill a volume equal to a smoke grenade of type 'F' or 'G', affecting everyone inside the zone. Most gases will be countered by gas masks or appropriate breathing apparatus, but some will be contact gases requiring air-tight protective clothing for protection.

Note: Roll for duration after exposure; that way, no one knows the 'immunity' status for sure until after the damage is done.

6.21 DISRUPTERS

Disrupters are weapons which interfere with the normal molecular resonation of matter;

Sonic Protein Disrupters are lethal versions of the sonic Stunner and require identical conditions to be effective. The weapons are effective against all hydrocarbon animal life forms but have no effect against silicate, cold planet, or other 'exotic' life forms. Nor will an SPD have any effect on a metal or plastic target. They work only in atmospheres over 250mm pressure.

Sonic Metal Disrupters are specifically designed to disrupt the circuits and servos of Robots, Power Armour, and electrical systems of lightly armoured or un-armoured vehicles. Upon a SMD penetration occurring, there is a 25% chance that the systems will 'go down' temporarily for 3d6 combat turns (18-108 sec.) until internal automatic resetting interlocks can restore the affected systems to normal function. Metal Disrupters will also affect silicate life in the same way that SPDs affect hydrocarbon life forms. They have sonic weapon limitations.

Energy Disrupters are beam projectors which combine all the functions of SPDs and SMDs, with the added advantage that they also affect cold planet and other 'exotic' life forms. When autofired, they have the added advantage of producing the equivalent of explosive effects if aimed at a single target (1 shot only in this instance) will cause the target to 'disintegrate' if its defensive capacity is exceeded. The ED weapons 'phased' to the molecular resonation of the target, and thus the weapons are called 'phasers' in some starcultures. For an additional +25% of cost, a Stunner setting can also be obtained. They are usable in vacuum,

Weapon Type	Model	ROF	Ammo*	Length	Mass	Tech Level	Cost (CR)
SPD Pistol	sonic	1	10c	200mm	1000gm	7	2750
SPD Carbine	sonic	1	20c	650mm	3750gm	7	3500
SPD Rifle	sonic	1	20c	900mm	5000gm	7	4250
SPD MG@	sonic	10	50c	1200mm	I5kg	7	6500
Hv. SPD@@	sonic	10	50c	1500mm	50kg	7	10000
SMD Pistol	sonic	1	10c	200mm	1000gm	7	3000
SMD Rifle	sonic	1	20c	650mm	3750gm	7	4500
SMD MG@	sonic	1	50c	1200mm	I5kg	7	7500
Hv. SMD	sonic	1	50c	I500mm	50kg	7	12500
ED Pistol	energy	2110	10c	125mm	400gm	9	4000
ED Carbine	energy	2/10	20c	650mm	3000gm	9	5750
ED Rifle	energy	2/10	20c	900mm	4000gm	9	7000
ED MG@	energy	10	50c	1200mm	I5kg	9	16000
Hv ED	energy	10	50c	1500mm	50kg	9	25000

*Powercells Cost CR 5 x charges. Recharge take I minute per 10 charges and cost CR 1.50 per charge. Mass of powercells is 10gm per charge.
@Tripod mounted.
@@Vehicle mounted only.
@@@Applied when firing on silicate life forms.

6.22 SLUG GUN

The Tech/7 'slug' gun is a uniquely Terran hold-out weapon. Usually disguised as some 'innocent' personal item, such as a fully functional pocket lighter, wristwatch, pen, etc., it will bear the closest scrutiny, short of a detailed internal examination. The slug gun expels a droplet of highly compressed CX2 gas, which has the property of expanding rapidly in the direction in which it is initially ejected from the weapon. The wave front of expanding gas literally 'puts the slug' on the target, as an ancient Terran saying goes, effectively delivering a massive punch which can shatter bones and inflict massive internal injuries. The slug gun loses power very rapidly with range, and thus it is typically used by Terran Intelligence and Security agents or by Police undercover agents. A few of the weapons have passed into civilian hands and might be obtained on Terran worlds from the Black Market. They may also be issued from time to time to government personnel for personal protection in situations in which the obvious armaments are

either too conspicuous for freedom of action or are forbidden by local governments.

The slug gun is responsible for the 'tough' reputation of the Terrans in a brawl. The weapon is characteristically held in the fist (pocket lighter models being very useful for this) and is fired as the PC appears to throw a punch at his opponent. The effects of such a Terran 'love tap' are truly spectacular, as few victims remain on their feet, no mater how big they are, unless they are of 'big game' size.

Weapon	ROF	Ammo	Length	Mass	Cost
Terran CX2 'Slug Gun'	1	10cap	50-100mm	0.10kg	CR 750

Range is point-blank at 5m.
Slug Gun ammo: 10gm CX2 capsule @ CR 10. Reload in I turn.

6.23 FUSION GUNS

Fusion guns are advanced energy weapons related to the Flamer and to the Blaster. They project an actively fusing plasma which will splatter when the bolt hits, producing secondary incendiary effects in the general vicinity when autofired.

Weapon Type	Calibre	ROF	Ammo	Wound Factor	Splatter Radius	Rad Level	Armour Penetration	Length	Mass	Tech Level	Cost (CR)
Fusion Pistol	10mm	2/10	20c	+2	2m	3	F.10	275mm	1500gm	8	3500
Fusion Rifle	15mm	2/10	30c	+3	5m	3	F.15	1000mm	4000gm	8	7500
Fusion MG@	20mm	10	100c	+5	10m	4	F.20	1200mm	18 kg	8	22500
Hv. Fusion Gun@	25mm	10	100c	+6	5m	5	F.25	1500mm	250 kg	8	27500

@The Fusion MG is a tripod-mounted support weapon, while the Hv. Fusion Gun is a regular light, turret-mounted, vehicle cannon.

Fusion weapons tend to be employed only by the Terran Union or the Azuriach Imperium. Some AFV with 20mm Hv. Blasters may substitute the 25mm Hv. Fusion Gun.

It should also be noted that the Fusion weapons produce hard radiation (Rad Level) at the surface of the target hit by the main bolt, but not the splatter. If a penetration occurs, this radiation will affect the personnel inside the target, whether in personal armour or in a vehicle. Armoured personnel in a vehicle may apply the armour protection against radiation to defend against this hard radiation.

All Fusion weapons employ a powercell to energise their firing systems. The capacity of the powercell is given in the ammo column. All other specifications are as given for Laser powercells in 6.15 Lasers.

6.24 STUNNERS

Stunners are Tech/7-8 weapons designed to incapacitate rather than to injure or kill, Stun weapons come in a sonic and an energy version. Sonic stunners will function only in an atmosphere between 260mm and 300mm pressure. The sonic vibration will also travel through water to other similar liquids for up to 100m. Energy Stunners fire a beam and are capable of functioning in low pressure and vacuum, but are ineffective under water.

Stunners produce effects corresponding to the 15 drug categories Outlined in 6.20 Drugs & Poisons. A weapon will have 5 settings built in (custom order). The weapon is placed at the desired stun setting and, upon penetration, has the same effect as the corresponding 'drug,' only the effect will take place instantly. The standard antidote to a Stun beam is a charge with the reverse setting. Targets roll a Constitution CR upon penetration to determine effects.

Weapon Type	Model	ROF	Ammo	Length	Mass	Cost
Stun Pistol	sonic	2/10	10c	175mm	750gm	300
Stun Carbine	sonic	2/10	30c	550mm	2500gm	475
Stun Rifle	sonic	2/10	30c	800mm	3250gm	550
Hv. Stunner	sonic	2/10	100c	1000mm	20kg	1000
Stun Pistol	energy	2/10	10c	175mm	750gm	450
Stun Carbine	energy	2/10	30c	550mm	2500gm	650
Stun Rifle	energy	2/10	30c	800mm	3250gm	800
Hv. Stunner	energy	2/10	100c	1000mm	20kg	1500

Stunners are standard issue to most planetary and interstellar police agencies. They are a very humane method of subduing criminals and rioters with a minimum of violence. The weapons come in pistols, carbine, rifle, and vehicle-mounted 'MG' versions:

Powercells cost CR 2 x charges for sonic stunners and CR 3 x charges for energy stunners. A recharge takes 1 minute per 20 charges and costs CR 0.50 per charge.

Note: Stunners are often used by civilians as personal defence weapons as they are non-lethal and will not bring serious penalties if a 'mistake' is made (usually only an 'assault' charge at worst). Criminals prefer the weapon for much the same reason.

6.25 APROBDIF PROJECTORS

APROBDIF projectors are Anti-Robot Positronic Brain Disrupter Field weapons used to disable the Positronic systems of robotic and other forms of computer equipment. Thus the weapons can be used to reduce the capacities of combat computers by knocking out special HUD targeting bonuses and reducing the computers to more-or-less standard functions. Combat use of mini-computers and multi-computers is thus necessarily limited in that personnel do not place full reliance on them and will resort to the least vulnerable of all fire-control and general decision-making systems, namely the well-trained Armsman.

APRO weapons come in pistols, rifle, support weapon (MG), heavy vehicle projector, and area defence generator versions. All portable weapons and the heavy projector fire a beam of positrons which disrupt the higher level 'discretionary' functions of a Positronic brain,' reducing it to a standard computer which must be directed to perform actions which it previously could decide for itself. In other words, a Robot affected by an APRO hit will still function if direct control is taken by its controller ('Move 50m forward. Fire weapon at Target 'X'. Assume prone position. Five rounds grenade fire at bunker 'V'. Assume standing position. Withdraw at 'A' speed.') In effect, a controller will be able to operate only 1 unit per level of expertise he possesses in Military Programming. etc. (See 5.12 Robots), and all bonuses for targeting, as well as all combat 'expertise' possessed by the robotic equipment will be lost.

If an APRO penetration occurs, the functions of the Positronic brain will be affected in one of the following ways. Roll 1d6: Non-combat Robots simply shut down when hit by an APRO bolt (Result 1 automatically applies).

1d6 Result	Disruption Effect of APROBDIF on Positronic 'Brain'
, 2, 3	obot will stand in place and do nothing. irect personal command is required to ake the unit function at all (50% chance hat personal command will succeed on he first attempt; failure means the unit is knocked out' and requires extensive epair.)
4	Robot ceases to fire weapons and moves about in a random direction until personal command is assumed or the unit is turned of t. Personal command succeeds 80% of the time on the first attempt.
	obot ceases movement but continues to re weapons in random directions at any arget in sight until it runs out of mmunition, or until it is turned off or ersonal command is assumed. Personal ommand succeeds at 50% on the first ttempt.
6	Robot moves and fires at random at any target in sight until it runs out of ammunition or is turned off, etc. Personal command succeeds at 40% on the first attempt.

The MekPurrs have developed special anti-APRO screens or Positronic 'Brain Screens' to protect their cybernetic equipment. Before a normal penetration of armour can occur, this anti-APRO screen must first be penetrated. This entails rolling 2d6. At point-blank and short ranges APRO penetrates on 7+. At medium range, 6+ penetrates. At long and extreme ranges, 9+ penetrates. Some 'Brain Screens' will have +1, +2, or +3 protection, which raises the score required to penetrate by the same value. MekPurr spacecraft and major installations will have powerful anti-APRO field generators which produce a +4 protection throughout the volume, making APRO projectors all but useless.

Disabled Positronic equipment requires significant repair and reprogramming by a skilled Computer Tech; at least a class 4 Breakdown has occurred (roll on Single-System Breakdown Table, 4.22, with a class 4 malfunction as the minimum.)

APRO Projector	ROF	Ammo	Length	Mass	Tech Level	Cost (CR)
APRO Pistol	1	10c	150mm	500gm	7	500
APRO Rifle	1	20c	600mm	2000gm	7	900
APRO MG@	10	50c	900mm	6000gm	7	1500
Hv. APRO@@	1	100c	l200mm	l8kg	7	2500
APRO Field Gen.	auto	l00hr.	2x2x2m	1500 kg	7	17500

@Tripod mounted.
@@Vehicle mounted only.

Cost of powercells = CR 0.50 per charge. APRO Field Generator has a 100-hour continuous use powercell which can be recharged in 15 minutes at a cost of CR 250. Anything entering its field which has a Positronic 'brain' must check for APRO penetration at each range level, and every minute when at point-blank range.

APRO Screen	Protection	Tech Level	Cost (CR)
+0 Standard	standard	7	7500
+1 MekPurr	+1	7	10000
+2 MekPurr	+2	7	22 500
-+3MekPurr	+3	8	30000
+4 MekPurr@	+4	8	50 000
+4 MekPurr@@	+4	7	10000Per 1000m^3 protected

@Vehicle APRO screen only.
@@Area anti-APRO field generator for spacecraft/major installations.

All portable units mass 5 kg and have a duration equal to the power levels of the unit using it. Vehicle generators mass 25 kg and Operate on vehicle power. Area generators mass 200 kg per l000m^3 protected. They operate from power mains but also have 100 hr. emergency powercells.

6.26 DALLY GUN

The Tech/8 Dally Gun or 'Dial-a-Gun' (the initial reaction of the Terran troops to which it was issued) is a LMG massing 9 kg and costing CR 15 000. It has the capacity to fire as a 10mm fully automatic Cone Rifle with 10mm InfR ranges when steadied on its bipod, as a 7mm Blast Rifle with Blast LMG ranges when steadied on its bipod, and as a Mdm. ('Thimble') grenade launcher, The weapon holds 30c 10mm Cone rounds, 50c 7mm Blaster charges, and 20c Thimble 'H' grenades.

The Dally Gun is rather heavy for a man to carry easily, but it is suitable for Power Armour personnel, the strong Balrads and Hisssss'ist, etc.

7.0 HEAVY WEAPONS

It is expected that many Space Opera role-play scenarios will not involve weaponry heavier than side arms and light support weapons.

8.0 GROUND COMBAT

The term 'ground combat' is used in Space Opera to refer to a range of combat situations which occur on the surface of a planet or asteroid, or inside a spaceship. The systems closely parallel and are designed to be fully compatible with those in Space Marines. In effect, they are an extended version of the Space Marines skirmish rules, with greater emphasis on personal characteristics.

8.1 SCALE

Normal Space Opera ground combat scale is 1mm = 1m. This corresponds exactly to Space Marines scale of 1 inch = 25m.

Extended ground combat scale is 10mm = 1m. This is the Space Opera close combat scale and is recommended for combat simulations in enclosed spaces, such as spaceships and buildings, or when a small group of characters will be operating in a relatively limited area.

8.2 TURN DURATION

While provision is made in Space Opera for turns of 6 seconds, 1 minute, 6 minutes, and 1 hour, ground combat tends to be most effective in 6-second segments. The action tends to be at close quarters, so the reduced time period permits the situation to develop stage by stage. Since all movement is based upon a true scale representation of actual speed, 6-seconds turns will not bring characters and NPCs some hundreds of meters away into the action within a space of one or two turns. For instance, a running man covers about 30m in 6 seconds. Using the Space Marines turns of 20 seconds, he would cover 100m.

8.3 TURN SEQUENCE

The turn sequence is the sequence of events in which various operations will be performed during a Space Opera combat turn. The sequence of events corresponds to that in Space Marines.

1. Roll for move or countermove.
2. Indirect fire (grenades, artillery, etc.) is plotted and individuals/units performing cover fire are designated in secret.
3. Side 'A' moves ('mover' in the turn).
4. Side 'B' ('counter-mover' in the turn).
5. Both sides perform covering fire, and individuals/units that did nothing else previously in the turn may 'observe' if they are not currently cover firing.
6. Both sides perform simultaneous regular fire and observation.
7. Indirect fire effects occur.
8. Hand-to-hand close combat (melee) occurs.
9. Return to Phase 1 for start of next combat turn.

In rolling for the move or countermove, 2d6 are rolled by each side. The side with the highest dice roll decides whether to move first (mover) or second (counter-mover) in the turn. Optionally, players may wish to use simultaneous movement. This may involve writing down individual orders for each individual/unit, setting out where they will move, how quickly, and what actions they will perform in general when they arrive at the designated position. Such actions are then made simultaneously in Phases 3 and 4, which effectively become one phase.

Morale checks are taken whenever they are needed, within whichever phase they apply. (See Morale rules.) If desired, player-characters may be exempted from morale checks, their players taking full personal responsibility for the courage of their characters. However. NPCs are always subject to morale considerations, as they are effectively 'alive' and 'aware' of their situation. The Non-Player Character 'decides' his own fate through a randomised Bravery CR; he values his life, even if the 'living' players and StarMaster don't. Only the ferocious 'Bug' Warrior caste never checks morale, are literally mind. less 'units' genetically programmed to DEFEND THE HIVE at any cost.

8.4 COMBAT TURN MOVEMENT

A vehicle character, or NPC is not obligated to move unless desired by the controlling player and may remain stationary or performing other functions. However, it sometimes happens that a 'forced' move will result from a failed Bravery CR, or because a vehicle has malfunctioned or the driver is incapacitated and control has been lost. Generally, players are perfectly free to decide whether a character or NPC moves at all, where he moves, the speed at which movement occurs, etc.

Terrain, mass of equipment carried, and the nature of the character/ NPC moving will determine the rate of movement. A person or vehicle may move up to the maximum amount listed in section 2.14 as is appropriate to the terrain traversed. The option is always open to move at a slower rate, but it should be remembered that movement is completed in each turn. Movement rates for all characters is discussed in Volume 1.

8.5 PAPA POWERED ARMOUR MOVEMENT

Travel Mode	Turn	Road	Clear	Downslope	Upslope	Rough	Woods	Swamp	Ford	Water
Scout	6s	55m	45m	45m	30m	22m	15m	7m	7m	7m
	km/h	33	27	27	18	13	9	4.2	4.2	4.2
Marauder/Assault	6s	45m	37m	22m	22m	15m	7m	7m	7m	7m
	km/h	27	22	22	13	13	8.4	4.2	4.2	4.2
Overboost Power	6s	+17m	+17m	+17m	+8m	+8m	+8m	-	-	-
(all PAPA)	km/h	+10	+10	+10	+5	+5	+5	-	-	-

PAPA 'Overboost' is battle speed. Engagement exhausts 15 minutes of power, and power expenditure is at I hour per 15 minutes Over-boost is used after the initial 15 minutes.

8.6 CONTRA-GRAV HARNESS MOVEMENT

Travel Mode	Max. Speed		
	6 Sec.	Km/h	Cruise
CG 'AAA' Harness	36Cm	216	0.33
CG 'AA' Harness	315m	189	0.32
CG 'A' Harness	27Cm	162	0.33
CG 'B' Harness	225m	135	0.36
CG 'C' Harness	18Cm	108	0.42

Rough Terrain reduces JB (Jump Belt) movement by -25% to 75% of normal speed. Light Woods, Swamps, Steep Slopes, and Mountainsides cut JB movement by -25% to -50%, depending on the nature of the terrain, leaving movement at 75% to 50% of normal. Thick forests, thickets, outright jungle, and very boggy swamps will cut speeds by -75% to -100%, so even the best conditions will result in only 25% of normal speed (and such conditions are generally unlikely). No jump can be made over water in safety unless it can be cleared entirely. Obstacles can be jumped over so long as the distance is not over 1/2 .JB movement in clear terrain or more than 1/4 JB movement in height. Contra-gravity Harness is under the same restrictions when used on JB function. If fully powered flight is used, the Flying rules apply.

One can make no more than 2 jumps in 6 seconds when using a JB unit. (Veteran troops can make 3 jumps in 6 seconds). A 'long jump is defined as more than 25m. Thus speed will require making longer jumps, which will expose personnel to enemy fire. For instance, a Terran JB 'A' can make 15Cm in 6 seconds, but even in the hands of a veteran, only 75m (3 x 25m) can be jumped in short bounds.

8.7 MOVEMENT FUNCTIONS

Certain PC actions or 'functions' can affect movement rates. Changing posture, for example, will subtract from a character's or NPC's movement. With movement in 6-second combat turns, the following 'functions' will require a portion of the time that might otherwise be spent in movement:

Function	Movement Time Reduction
1. Drop to knees	1 second lost
2. Turn 90O~I8Co	1 second lost
3. Fall prone	1 second lost
4. fall prone, ready for action	2 seconds lost
5. Assume kneeling position from prone position	2 seconds lost
6. Assume erect position from kneeling position	1 second lost
7. Assume erect position from prone position	3 seconds lost
8. Leave/enter most vehicles (per man)	3 seconds lost per man
9. Leave/enter narrow opening (window, etc.)	3 seconds lost per man
10. Leave/enter normal single door (per man)	2 seconds lost per man
11. Draw/sheath weapon/equipment	1-3 seconds lost, depending on situation
12. Activate Communicator (hand-held)	1 second lost
13. Reload clip-fed small arm	2 seconds lost
14. Reload loose ammunition weapon	4 seconds lost
15. Reload musket, crossbow, etc.	all movement lost
16. Reload heavy support weapon (MMG, HMG, etc.)	all movement lost
17. Observing closely for hidden enemies	2 seconds lost
18. Acting as Forward Observer for artillery	all movement lost
19. Firing/throwing weapon in same turn as moving	2 seconds lost
20. Setting up bipod weapon for autofire	2 seconds lost
21. Setting up heavy support weapon (MMG, HMG, etc.)	all movement lost

Other situations may be added to the function list as players and StarMasters think of them. Note that the time lost applies to the portion of a 6-second turn used for the actual movement.

Actual combat (firing, etc.) does not depend upon having time to perform the function. Rather, movement depends upon one's having the time left to do so. for instance, if a PC intends to fire his weapon in the turn coming up, he must allow -2 seconds from his movement time if he also plans to move. Suppose he intends to leap up from a prone position and charge the enemy, firing from the hip as he comes. That will take -5 seconds from his movement time.

If close combat (melee) is joined at the end of a turn in Phase 8, no movement penalty time will be assessed. But if melee continues into the next combat turn, 2 seconds of time will be lost due to 'firing' (in this instance, 'striking') at the enemy before any other functions can be considered.

8.8 MORALE

See Section 2.17, PC Morale to determine effects of combat situations on player characters and NPC.

8.9 DIRECT FIRE WEAPON

As noted previously in the description of the various weapons, direct fire weapons must be aimed straight at the target one intends to hit, with line-of-sight being the path the energy bolt or projectile will follow.

To determine whether a direct fire weapon hits a target, 1d100 dice are rolled, and the result is compared to the adjusted hit probability obtained from the Direct Fire Hit Table. If the 1d100 result is less than or equal to the probability indicated, the fire-hits. Otherwise, a clear miss has occurred.

01 Direct Fire Results: A 1d100 result of 01 always hits, unless it is specifically stated that such a hit is not possible. All 1d100 results of 96-00 always miss. Note that these numbers refer to un-modified 1d100 rolls, not to results modified by DMs.

Penetration of Screens & Armour: When a hit is scored, that is not the end of matters. If the target is protected by forcefield battlescreens and/or by armour, the screens and armour must first be penetrated before any injury or damage will result. Penetration will be discussed later in the ground combat rules.

Automatic Weapons: Any weapon with a '10' in its ROF is rated as an automatic weapon. An automatic weapon is capable of firing a burst of projectiles or energy bolts in pulses every time the trigger is pulled on autofire. For normal fire purposes, these weapons will be allowed to roll 1d100 hit determination dice 3 times per 10-round autofire burst to simulate the much increased hit probability of a burst of fire, and also the chance of more than one shot hitting a target.

Bonuses will be assigned to hit probabilities for firing more than once at the same target, but these do not apply to autofire bursts. Each of the '3' shots fired is at the same hit probability as the first.

Simultaneous with the 1d100 rolled to determine whether a hit is scored, roll 1d6. A result of I, 2, or 3 indicates one hit per 3 rounds fired if the 1d100 result also indicates a hit. A 4 or 5 indicates that 2 of the 3 rounds hit. A 6 indicates all 3 rounds hit.

Area AutoFire: An automatic weapon can also be autofired into an area. For hand-held small arms, this area is 25m x 50m, and for bipod, tripod, and vehicle-mounted heavy automatic weapons (MMG and up), the autofire area is 50m x 150m. The long axis of the rectangle defining the autofire area is directed away from the muzzle of the weapon. More than one target can be hit with area autofire:

Small arms (man-carried) can hit up to 5 targets. Roll I1d100 along with 1d6. If a hit result occurs on the 1d100, 1-5 = 1 round hits and 6 = 2 rounds hit, using the 1d6 result.

Support Weapons (MGs and up) can also hit up to 5 targets. Roll 1d100 along with 1d6. If a hit result occurs on the 1d100 1-4 = 1 round hits and 5-6 = 2 rounds hit, using the 1d6 result. Area fire is directed against personnel, for the most part. If less than 5 targets are in the autofire area, each target can be subjected to area autofire only once (1d100 rolled once per target). Targets are chosen on the basis of which ones are closest and most exposed to the automatic fire if there are more than 5 targets in the area. For instance, 8 troopers come under autofire, but 4 are prone and 4 are erect. The 4 erect troopers would be vulnerable, as would the closest prone trooper. If a vehicle or building is in the autofire area, it is fired upon first, with the 1d6 roll indicating the number of rounds that strike it if a 1d100 hit is scored. That means that the number of other targets in the autofire area vulnerable to attack will be reduced in some instances. For example, suppose that a light AFV was in the same autofire zone as the 8 troopers mentioned previously. It would be first to receive autofire. If the 1d6 result was 5,5 rounds of the 10 in the automatic burst have already been expended. Two of the closest erect troopers would each receive a burst with the possibility of 1 or 2 rounds hitting them, while the third closest erect trooper would receive only the 1 remaining round if he is hit. At that point, all 10 rounds have been accounted for.

Autofire is typically used when multiple targets are available, or when smoke or other cover has partially obscured the targets. The aim is significantly lower than for the 3-target aimed burst, but it has the good result of bringing more than 3 targets under fire at one time.

Some heavy automatic weapons like HMGs, 20mm autocannon, and Heavy 20mm Laser or Blaster autocannon can be given the opportunity to hit 10 targets, provided the ammunition lasts. That is, so long as a round remains unexpended by the 1d6 rolls, another target can be ranged. If only 1 hit is scored on each target, 10 can be hit. This reflects the actually much higher ROF or rate of fire of such weapons over the usual infantry weapon without complicating book-keeping by assigning variable rates of fire *(RQFII5, ROFI2O,* etc.) to different weapons.

8.10 DIRECT FIRE HIT TABLE

Roll 1d100. A result equal to or less than the required percentage is a hit. A 01-05 result always hits. A 96-00 result always misses.

	Range to Target				
Firer Status	**Point Blank**	**Sho**	**Mediur**	**Long**	**Extrem**
Erect	95	80	50(60)	15(30)	0(15)
Kneeling/Sitting	95	85	55(65)	20(3	5(20)
Prone/in Foxhole	95	85	60(75)	30(50)	10(35)
Using Bipod, Pedestal or Tripod Mount w/o T/ Mech.,	90	85	65(75)	35(5	15(40)
Using Tripod with T/E Mech. or Mechanical Mount	50*	90	75(80)	50(65)	25(50)

*For second shot at stationary target from stationary weapon, hit percentage = 95%.

Numbers in brackets ( ) are percentages to hit for scopesights or equivalent.

Modifiers to the basic percentage to hit are added to or subtracted from the hit probability, not the 1d100 roll. The base percentage to hit will thus be adjusted upward or downward:

Firer Status Modifiers: Subtract the worst modifier applicable	Hit % Modifier
Moving at walk	-10
Moving at trot (double)	-35
Moving at run, using jump belt, etc	-70
Firing from slow moving vehicle	-15
Firing from fast moving vehicle (over 40 km/h)	-50
Using integral weapon of stabilized vehicle moving slowly	-05
Using integral weapon of stabilized vehicle moving fast	-20
Using 'wrong' hand of firing 'off sided'	-25
Using one hand with pistol at short range or less	-05
Using one hand with pistol at medium range or more	-10
Using one hand to fire shoulder weapon	-35
Under fire	-10
Suppressed	-40
Dazed	-50
Tired (less than 1/2 SF remaining)	-05
Exhausted (no SF remaining)	-25
In melee but not grappled and using pistol or SMG	-10
In melee but not grappled and using short shoulder arm	-25
In melee but not grappled and using long shoulder arm	-45
In melee but not grappled and using heavy weapon (LMG, HMG, etc.)	-70
Has sustained light wound in firing arm or shoulder	-10
Has sustained light wound in head	-10
Has sustained serious wound in head/firing arm	-25
Has sustained more than 50% loss of DF	-20

AutoFire Area Modifiers: Subtract the applicable modifier	
AutoFire at Point Blank Range (multiple target)	-35 on each target
AutoFire at Short Range (multiple Target)	-25 on each target
AutoFire at Medium Range (multiple target)	-20 on each target
AutoFire at Long Range (multiple target)	-10 on each target
AutoFire at Extreme Range (multiple target)	-05 on each target

Firer's Skill Modifiers: Add/Subtract the applicable modifier	Hit % Modifier
Firer's skill (above basic familiarisation with weapon)	+02 per skill level
Firer not familiarised with weapon and range is Point Blank	-15
Firer not familiarised with weapon and range is Short	-20
Firer not familiarised with weapon and range is Medium or more	-25

Consecutive Shots/Bursts at Same Target: Add applicable modifier	
Firing at same Short range target in consecutive turns:	+05
Firing at same Medium range target in consecutive turns	+10
Firing at same long range target in consecutive turns:	+15
Firing at same Extreme range target in consecutive turns:	+20

Projectile weapons receive the bonus twice at Medium range or greater; beam weapons receive it only once. Firing semiauto, the second shot at the same target counts as a subsequent shot though fired in the same turn. The firer must be stationary or the weapon must be of a stabilised, slow-moving vehicle.

Projectile Weapon in Unfamiliar G: Subtract applicable modifier	
Unfamiliar gravity field and range is Short	-0
Unfamiliar gravity field and range is Medium	-10 (Gf-Gp)
Unfamiliar gravity field and range is Long	-50 (Gf-Gp)
Unfamiliar gravity field and range is Extreme	-90 (Gf-Gp)

Gf = familiar (home planet/ship) gravity; Gp = planetary gravity. Example: If Gf - Gp = 0.13 G difference, penalty at Long range is -50 x 0.13 = 6.5 = -7 (always round fractions up).

Target Status Modifiers: Add/Subtract applicable modifiers*	
Target moving slowly (man on foot trotting)	-10
Target moving fast (Jump Belt, fast ground vehicle)	-25
Target moving very fast (aircraft, etc.)	-40
Target kneeling or in equivalent cover	-15
Target prone or in equivalent cover	-30
Target in foxhole or equivalent cover	-40
Target half man-sized	-15
Target quarter man-sized	-30
Target large animal size (horse, etc.)	+10
Target small vehicle size (car, jeep, etc.)	+15
Target large vehicle size (truck, APC, AFV)	+30
Target is single body part: head	-35
Target is single body part: neck	-60
Target is single body part: arm or shoulder	-35
Target is single body part: leg	-25
Target is single body part: chest	.25
Target is single body part: abdomen	-25
Target is stationary and in the open	+10
Target is partially concealed (in bush, etc.)	-10**
Target is lightly obscured by smoke, etc., but still visible	-25**
Target is completely obscured	-25***

*All applicable modifiers may be applied.
**Adjustment not applied to area fire by automatic weapons.
***Adjustment applied only to area fire by automatic weapons.

8.11 HIT LOCATION

The location of a hit is important. Body armour and the armour of many vehicles will vary from point to point, and the penetration effect is of shot will therefore be of greater or lesser degree depending upon the point actually struck.

Human/Humanoid Target Hit Location@	
1d100 Result	Body Area Affected
01-06	Left Lower Leg
07-12	Right Lower Leg
13-19	Left Upper Leg
20-26	Right Upper Leg
27.40	Lower Abdomen/Groin
41-54	Abdomen/Belly
55-68	Chest
69-71	Left Hand/Lower Arm
7 2-74	Right Hand/Lower Arm
75-77	Left Upper Arm
78-80	Right Upper Arm
81-83	Left Shoulder
84.86	Right Shoulder
87-89	Neck
90-00	Head

@Used for Terrans, Azuriach, GPR, IRSOL, Mercantile Leaguers, Balrads, MekPurrs, Rauwoofs, Hissss'ist, and Pithecines. Related Humanoid, Ursoid, Feline, Canine, Saurian, and other such races are also considered 'human' in form, as are all Avians like the Whistlers. Terran-type four-footed animals are also included, with 'arms' and 'shoulders' signifying the front legs. Only exposed parts of the body can be hit. If not exposed = miss.

Non-Human Target Hit Location@	
1d10 Result	Body Area Affected
01-02	Head
03	Right Limb
04	Left Limb
05	Right Pincer
06	Left Pincer
07-10	Abdomen/Thorax

@Applied to Bugs, Klackons, Mertuns, and Arachnids, Insectoids, Scorpionids, in general, while Icythoids can be of this or 'humanoid' type. Animals may also be non-humanoid in shape.

Silicates & Cold Planeters Hit Location:	
1d10 Result	Body Area Affected
01-10	Hit! There aren't any vital spots, so it will not matter.

8.12 PENETRATION

Once a hit has been scored on a figure, vehicle, or other target, the round or energy pulse must still penetrate the protection of the unit to injure/damage the target. To determine whether a hit penetrates the protection of the target, consult the penetration table and roll 1d10 (decimal die) for each hit scored.

If the target is protected by forcefield battlescreens, the screens must be penetrated first before the armour itself is threatened. Penetration of the screen but not the armour means that the round/energy pulse has had no effect.

As noted earlier in the description of personal armour, vehicle armour, and aircraft armour, several classifications are to be distinguished.

Body Armour: Three armour class ratings are given in the form -/./-. The first class is used only for melee weapons. The second is defence against all projectiles (whether arrows, bullets, or rocket-propelled missiles) and chemical explosives. The third is defence against energy weapons. For instance C/A/B gives armour protection 'C' against melee weapons, protection 'A' against projectiles and explosions, and 'B' against all energy beam weapons.

TECH/1-4: DIRECT FIRE SMALL ARMS

Weapon Category	ROF	Ammo	Target Range (Meters)					Armour Protection Class/1d10 N+ Required to Penetrate												Wound Factor	Vehicle Damage
			PI	SR	MR	LR	ER	K	J	I	H	G	F	E	D	C	B	A	AF\	Screer		
Blowgun(1)	1:2	1	5	10	15	25	35	4	9	10	10	—	—	—	—	—	—	—	—	—	Poison	—
Sling (1,2)	1:2	1	—	25	50	10(	15(	5	7	8	10	–	–	–	–	–	–	–	–	–	-2	—
Sling staff(1,2)	1:2	1	—	25	50	100	200	5	7	8	10.	—	—	—	—	—	—	—	—	—	-1	—
Short Bow (1,2)	1	20	—	25	50	10(	15(	4	6	8	10	–	–	–	–	–	–	–	–	–	-1	—
Compound Bow(1,2)	1	20	—	25	50	125	200	2	4	6	9	—	—	—	—	—	—	—	—	—	-1	—
Longbow(1,2)	1	20	—	25	50	12!	27!	2	3	5	7	9	1(	—	—	—	—	—	—	—	-1	—
Lt. Crossbow (1)	1:4	20	10	25	50	125	250	2	3	5	7	9	10	—	—	—	—	—	—	—	+0	—
Hv. Crossbow (1)	1:6	20	1(	25	50	12!	30(	2	2	2	5	7	9	1(	—	—	—	—	—	—	+1	—
Thrown javelin(1,2)	1	1	5	10	25	40	50	3	6	8	10	—	—	—	—	—	—	—	—	—	+1	—
Thrown Axe(1,2)	1	1	5	10	15	20	25	4	6	8	10	–	–	–	–	–	–	–	–	–	+0	—
Thrown Dagger(1,2)	1	1	5	10	15	20	25	5	7	8	10	—	—	—	—	—	—	—	—	—	-2	—
Thrown Club(1,2)	1	1	5	10	15	20	25	7	1(	—	—	–	–	–	–	–	–	–	–	–	-3	—
Thrown Rock(1,2)	1	1	5	10	25	50	75	8	10	—	—	—	—	—	—	—	—	—	—	—	-4	—
.85Matchlock(1)	1:8	1	1(	50	75	10(	15(	C	2	3	3	4	6	8	9	1(	—	—	—	—	+2	1
.75Matchlock(1)	1:8	1	10	50	75	100	150	0	2	3	4	5	7	9	10	—	—	—	—	—	+1	1
.75Musket(1)	1:4	1	1(	50	75	10(	15(	C	2	3	3	4	6	8	9	1(	—	—	—	—	+1	1
.6lSRifleMusket(1)	1:5	1	10	100	175	250	325	0	2	3	3	4	6	8	9	10	—	—	—	—	+1	1
.40Longrifle(1)	1:5	1	1(	10(	20(	27!	35(	1	3	4	4	5	7	9	—	—	—	—	—	—	+0	—
.40MuzzlePistol(1)	1:4	1	5	15	25	—	50	2	3	5	6	7	—	—	—	—	—	—	—	—	-2	—
.40DuelPistol(1)	1:5	1	5	25	35	50	75	2	3	4	5	6	—	—	—	—	—	—	—	—	-2	—
.32Derringer(1,3)	1/2	2	5	10	15	20	25	2	3	5	6	7	—	—	—	—	—	—	—	—	-3	—
.38Revolver(1)	11/2	6m	5	25	35	50	75	2	3	4	5	5	—	—	—	—	—	—	—	—	-2	—
.44/.45Revolver(1)	11/2	6m	5	25	35	50	75	2	2	2	3	4	—	—	—	—	—	—	—	—	-1	—
.22Rifle (1)	1	1	1(	10(	20(	30(	50(	2	3	4	5	5	—	—	—	—	—	—	—	—	-3	—
.30Rifle(1,4)	1/11/2	1/10m	10	100	200	300	500	0	0	0	1	2	5	7	8	9	10	—	—	—	+0	—
.30Carbine(1,4)	1/11/:	1/lOin	1(	10(	20(	27!	35(	C	0	1	2	3	6	8	9	1(		—	—	—	+0	—
.30+BuffaloGun(1)	1	1	10	100	200	350	600	0	0	0	0	1	4	6	7	8	9	10	—	—	+1	1
.500Express(l,5)	1/2	2	1(	10(	15(	20(	25(	A	A	A	A	A	2	4	5	6	7	8	9	10	+3	1
.600Express(1,5)	1/2	2	10	100	150	200	250	A	A	A	A	A	1	3	4	5	6	7	9	10	+3	1
.12Shotshell(1,6)	1/2	1/2/6	1(	25	50	75	10(	2	4	5	6	8	10	—	—	—	—	—	—	—	-2	—
.12Flechette(1,7)	2	6m	10	25	50	75	100	0	2	3	4	6	9	—	—	—	—	—	—	—	+0	1
.12Slug(1,6)	1/2	1/2/6	1(	50	75	10(	15(	C	2	3	4	5	7	9	1(	—	—	—	—	—	+1	1
.10Shotshell(1,8)	1/2	1/2/6	10	25	50	75	100	2	3	4	6	8	10	—	—	—	—	—	—	—	-1	—
.10Flechette(1,7)	2	6m	1(	25	50	75	10(	C	1	2	3	5	9	—	—	—	—	—	—	—	+0	1
.10Slug(1,8)	1/2	1/2/6	10	50	75	100	150	0	2	3	4	5	7	9	10	—	—	—	—	—	+2	1

(1) All weapons increase penetration N+ by +1 at LR and +2 at ER.
(2) Weapon has variable range at ER.
(3) Hold-out weapon.
(4) Single-shot and repeating versions represented.
(5) 'express' Elephant Guns are double-barrelled.
46) Single and double barrel breechloaders and Tech/S 'automatic' shotguns represented.
(7) Tech/6 shell.
(8) Single and double barrel breechloaders and Tech/S shotguns represented. Shot load fired by .85 matchlock.

TECH/5-6: DIRECT FIRE SMALL ARMS

Weapon Category	ROF	Ammo	Target Range (Meters)					Armour Protection Class/1d10 N+ Required to Penetrate													Wnd Fctr	Vhcl Dmg
			PI	SR	MR	LR	ER	K	J	I	H	G	F	E	D	C	B	A	AFV	Scr		
.22Revolver(1,2)	2	6m	5	15	25	40	60	2	3	4	5	6	—	—	—	—	—	—	—	—	-3	—
.22largetPistol(1)	2	10c	1(	25	75	100	150	2	3	4	5	6	–	–	–	–	–	–	—	—	-3	—
.32AutoPistol(1,2)	2	6c	5	15	25	50	75	2	3	4	5	6	—	—	—	—	—	—	—	—	-3	—
.32AutoPistol(1)	2	10c	5	25	50	75	100	2	3	4	5	6	–	–	–	–	–	–	—	—	-3	—
9mmAutoPistol(1,2)	2	6c	5	15	25	50	75	1	2	2	3	4	9	—	—	—	—	—	—	—	-1	—
9mmAutoPistol(1)	2	10c	5	25	50	75	100	C	1	1	2	3	8	–	–	–	–	–	—	—	-1	—
.38'Special'(1,2)	2	6m	5	15	25	50	75	2	3	3	4	5	—	—	—	—	—	—	—	—	-2	—
.38Revolver(1)	2	6m	5	25	50	75	100	2	3	3	4	5	–	–	–	–	–	–	—	—	-2	—
.45Revolver(1)	2	6m	5	25	50	75	100	2	2	3	3	4	—	—	—	—	—	—	—	—	-1	—
.45AutoPistol(1)	2	8c	5	15	35	60	75	2	2	3	3	4	–	–	–	–	–	–	—	—	-1	—
.22Rifle(1)	11/2	10m	10	100	200	400	600	2	3	4	5	5	—	—	—	—	—	—	—	—	-3	—
.22Carbine(1)	2	20c	1(	10(	20(	300	400	2	3	4	5	5	–	–	–	–	–	–	—	—	-3	—
.30Rifle(1)	11/2/2	10c	10	100	200	400	600	0	0	1	2	3	4	6	8	9	10	—	—	—	+0	—
.30Carbine(1)	11/2	10c	1(	10(	20(	300	400	C	C	1	2	3	4	7	9	1(	—	—	—	—	+0	—
.30+H.P.Rifle(1)	11/2	10c	10	100	300	500	800	A	A	0	0	1	2	4	6	7	8	9	10	10	+1	1
.30+H.P.Carbine(1)	11/2	10c	1(	10(	20(	350	500	A	A	C	C	1	2	5	7	8	9	1(	—	10	+1	1
.40+H.P.Rifle(1)	11/2	10c	10	100	300	500	900	A	A	A	A	A	0	2	4	5	6	8	10	9	+2	1
.40+H.P.Carbine(1)	134	10c	1(	10(	20(	350	500	A	A	A	A	A	0	3	5	6	7	9	10	9	+2	1
.50+H.P.Rifle(1)	11/2	10c	10	100	300	500	1000	A	A	A	A	A	A	1	3	4	5	7	9	8	+3	1
.30AutoCarbine(1)	2/1C	20c	1(	75	15(	225	300	C	C	1	2	3	5	7	9	–	–	–	—	—	+0	1
9mmMach.Pistol(i,3)	2/10	30c	10	25	50	75	100	1	2	2	3	4	9	—	—	—	—	—	—	—	-1	1-2
9mmSMG(1,4)	2/10	30c	1(	50	75	100	150	1	2	2	3	3	8	–	–	–	–	–	—	—	-1	1-2
.45SMG(1)	2/10	30c	10	50	100	125	150	1	2	2	3	4	8	—	—	—	—	—	—	—	-1	1-2
3CLMG(1,5)	2/10	30c	2!	12!	30(	500	800	C	C	1	2	3	4	6	8	9	1(	—	—	—	+0	1-2
.30MMG(1,6)	10	100b	25	150	400	600	1000	0	0	1	2	3	4	6	8	9	10	—	—	—	+0	1-3
.50HMG(1,7)	10	100b	2!	15(	50(	750	150(	A	A	A	A	A	A	1	3	4	5	7	9	8	+3	1-6
.357Mag.Rev.(1)	2	6m	5	25	50	75	125	A	0	0	1	2	7	10	—	—	—	—	—	—	-1	1
.357AutoMag(1)	2	10c	5	25	50	75	125	A	A	C	C	1	6	9	–	–	–	–	—	—	+0	1
.44Mag.Rev.(1)	2	6m	5	25	50	75	125	A	A	A	0	0	5	8	10	—	—	—	—	—	+0	1
.44AutoMag(1)	2	10c	5	25	50	75	125	A	A	A	C	0	4	7	9	1(	—	—	—	—	+0	1
7.62mrnSAR(1)	2	30c	10	100	200	400	700	A	A	0	1	2	3	5	7	8	9	10	—	10	+1	1
7.62AutoRifle(1)	2/10	30c	1(	10(	20(	400	600	A	A	C	1	2	3	5	7	8	9	1(	—	10	+1	1-3
7.62mmCarbine(1)	2/10	30c	10	100	200	300	400	A	A	0	1	2	3	5	8	9	10	—	—	10	+1	1-3
5.56mmCarbine(1)	2/10	30c	1(	10(	20(	300	500	A	A	C	1	2	3	5	8	9	1(	–	—	—	+1	1-3
9mmSMG(1,8)	2/10	30c	10	50	100	150	200	A	0	1	2	3	7	9	—	—	—	—	—	—	+1	1-3
7.62mmLMG(1,5)	2/10	100b	2!	15(	40(	600	100(	A	A	C	1	2	3	5	7	8	9	1(	—	10	+1	1-4
7.62mrnMMG(1,6)	10	100b	25	150	500	750	1250	A	A	0	1	2	3	5	6	7	8	9	10	10	+1	1-4
.50HMG(1,9)	10	100b	5(	30(	60(	120(	200(	A	A	A	A	A	A	1	3	4	5	7	9	8	+3	1-6

(1) All weapons increase penetration N+ by +1 at LR and +2 at ER.
(2) Hold-out Weapon.
(3) M.P. has 9mm SMG ranges if fitted with stock.
(4) Tech/5 SMG.
(5) Bipod.
(6) Tripod.
(7) Tripod TE/Mech.
(8) Tech/6 8MG.
(9) Tech/6 ranging HMG.

TECH/7+: DIRECT FIRE SMALL ARMS

Weapon Category	ROF	Ammo	Target Range (Meters)					Armour Protection Class/1d10 N+ Required to Penetrate													Wnd Ftr	Vcle Dmg
			PB	SR	MR	LR	ER	K	J	I	H	G	F	E	D	C	B	A	AFV	Scr		
5mm Sportsman (1)	2	10c	10	25	75	100	150	A	A	A	0	0	3	6	8	9	10	—	—	10	+0	—
5mmBody Pistol (1,2)	2	10c	5	15	25	50	75	A	A	A	0	0	4	7	9	10	—	—	—	10	+0	—
7mm Enforcer (1)	2/10	10c	10	25	75	100	150	A	A	A	A	0	2	5	7	8	9	—	—	10	+1	1-2
7mmBody Pistol (1,2)	2	10c	5	15	25	50	75	A	A	A	0	0	3	6	8	10	—	—	—	10	+1	—
10mmAuto Mag (1)	2	10c	10	25	75	100	150	A	A	A	A	A	1	4	6	7	8	9	10	10	+2	1
10mmAuto Fire (1)	2/1(	10c	1(	25	75	125	200	A	A	A	A	A	1	4	6	7	8	9	10	10	+2	1-3
5mmLt. Rifle (1)	2	30c	10	100	300	500	800	A	A	A	0	0	3	6	8	9	10	—	—	10	+0	—
5mmLt. Carbine (1)	2/1(	30c	1(	10(	200	300	500	A	A	A	0	0	3	6	8	9	10	—	—	10	+0	1-2
7mrnMdm. Rifle (1)	2	30c	10	100	300	500	800	A	A	A	A	0	2	5	7	8	9	10	10	10	+1	1
7mmAR7Auto Rifle (1)	2/1(	30c	1(	10(	300	500	900	A	A	A	A	0	2	4	6	7	8	9	10	10	+1	1-3
10mrnHv. Rifle (1)	2/10	30c	10	125	400	600	1000	A	A	A	A	A	1	3	5	6	7	8	9	9	+2	1-3
10mmHv. Carbine (1)	2/1(	30c	1(	10(	200	300	500	A	A	A	A	A	1	3	5	6	7	8	9	9	+2	1-3
12mmH.P.Rifle (1)	2	10c	25	150	300	600	1200	A	A	A	A	A	0	2	3	4	5	7	8	8	+3	1-2
AMG10 LMG (1,7)	2/1(	100	2[	25(	600	100(	150(	A	A	A	A	A	1	2	4	5	6	7	8	9	+2	1-4
5mmGyro Pistol (3)	2/10	10c	10	50	100	150	300	A	A	A	0	1	3	5	6	7	9	10	—	—	+0	1-2
5mmGyro Rifle (3)	2/1(	3Cc	1(	10(	300	500	800	A	A	A	A	1	3	5	6	7	9	10	—	—	+0	1-2
5mmGyro Carbine (3)	2/10	30c	10	100	200	300	500	A	A	A	A	1	3	5	6	7	9	10	—	—	+0	1.2
7mmCone Rifle (3)	2/1(	30c	1(	10(	250	500	100(	A	A	A	A	0	2	4	5	6	8	9	10	10	+1	1-3
10mmCone Rifle (3)	2/10	20c	10	100	300	600	1200	A	A	A	A	A	0	1	2	4	5	7	8	9	+2	1-3
10mmLt.Inf.Re. (3,7)	10	200c	2[	20(	400	750	150(	A	A	A	A	A	2	3	4	5	7	9	9	9	+4	1-5
StatRifle (4)	2/10	30c	10	100	300	600	1200	A	A	A	A	A	A	A	2	3	4	5	7	8	+4	1-3
20mmGaussPisto (1)	2	8c	1(	10(	200	300	600	A	A	A	A	A	0	1	2	3	5	7	8	8	+~	1-2
20mmGaussRifle (1)	2	20c	25	200	500	1000	1800	A	A	A	A	A	0	1	2	3	4	5	6	7	+5	1-2
3mmMiniNeedler (1,2)	2/1(	10c	5	25	50	75	100	A	0	1	2	3	4	5	6	8	10	—	—	—	+1	—
3mmNeedlePistol (1)	2/10	20c	10	50	75	100	150	A	0	1	2	3	4	5	6	8	10	—	—	—	+1	—
3mmRazor Gun SMG	2/1(	50c	2[	10(	200	300	500	A	A	0	1	2	3	4	5	7	9	—	—	—	+1	—
3mmNeedle Rifle (1)	2/10	50c	25	400	800	1200	—	A	A	0	1	2	3	4	5	7	9	—	—	—	+1	—
10mmDart Rifle(1,5)	1	10m	1(	10(	200	300	600	2	3	4	5	6	7	8	9	10	—	—	—	—	Drug	—
5rnmShock Dart (4,2)	1	1	1	2	3	4	5	A	A	A	A	2	3	4	5	7	9	—	—	—	+5	—
2mmTangle Pisto (4)	1	10c	5	25	50	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	—	NA	NA	
2mmTangle Rifle (4)	1	20c	10	25	50	75	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1mmCX2Slug Gun (2)	1	10c	1	2	3	4	5	A	A	A	A	6	6	7	10	—	—	—	—	5	+4	—
3mmLaser Pistol (6)	2/10	20c	10	50	125	200	400	2	2	2	3	4	5	6	7	8	9	10	10	10	+0	1-2
5mmLaser Carbine (6)	2/1(	30c	2[	10(	250	500	100(	0	0	0	1	2	3	4	5	6	7	8	9	10	+1	1-3
5mmLaser Rifle (6)	2/10	30c	25	100	500	1000	2000	A	A	A	0	0	2	3	4	6	7	8	9	10	+1	1-3
5mmL. Laser (6,7)	2/1(	50c	2[	15(	500	150(	300(	A	A	A	0	0	2	3	4	5	6	7	8	9	+2	1-4
7mmM.Laser (6,8)	10	100	25	200	600	2000	4000	A	A	A	A	A	0	2	3	4	5	6	7	8	+2	1-5
10mmH.Laser (6,8)	10	100	2[	30(	100(	250(	600(	A	A	A	A	A	A	0	2	3	4	5	6	7	+3	2-7

(1) All weapons increase penetration N+ by +1 at LR and +2 at ER.
(2) Hold-out weapon.
(3) Recoilless weapons raise penetration N+ by +1 at PB and SR.
(4) Penetration unaffected by range.
(5) See Drugs & Poisons section.
(6) Lasers reduce penetration N+ by -1 in 25Cmin atmosphere to vacuum, and ER range is also used. ER not used in +250 mm atmosphere.
(7) May be bipod or tripod mounted.
(8) TE/Mech or Vehicle mounted only.

TECH/7+: DIRECT FIRE ENERGY SMALL ARMS

Weapon Category	ROF	Am	Target Range (Meters)					Armour Protection Class/1d10 N+ Required to Penetrate												Wnd Ftr	Vcl Dmg
			PB	SR	MR	LR	ER	K	J	I	H	G	F	E	D	C	B	A	AFV	Scn		
5mm Blast Pistol(1)	2/10	20c	25	50	150	300	600	A	A	A	2	2	3	5	6	7	9	10	10	10	+1	1-3
5mm Blast Carbine(1)	2/10	30c	25	100	250	500	1000	A	A	A	A	2	2	4	5	6	8	9	9	9	+1	1-3
7mm Blast Rifle(1)	2/10	30c	25	100	500	1000	2000	A	A	A	A	A	2	2	4	5	7	8	9	9	+2	1-3
7mm Blast LMG(1,5)	2/10	50c	25	150	600	1500	3000	A	A	A	A	A	2	2	3	4	5	7	8	9	+2	1-5
10mm Blast MMG(1,6)	10	100c	25	200	1000	2500	5000	A	A	A	A	A	A	2	2	3	4	6	7	7	+3	1-6
15mm Blast HMG(1,6)	10	100c	25	500	1500	3000	7500	A	A	A	A	A	A	A	A	A	2	4	5	6	+4	2-7
SPD Pistol(2)	1	10c	10	50	75	100	—	1	1	1	2	4	6	8	10	—	—	—	—	—	+1	—
SPD Carbine(2)	1	20c	25	100	200	300	—	1	1	1	2	3	5	7	9	10	—	—	—	—	+2	—
SPD rifle(2)	1	20c	25	100	250	500	—	1	1	1	2	3	5	7	9	10	—	—	—	—	+2	—
SPD MG(2,6)	10	50c	25	150	500	1000	—	1	1	1	2	2	4	6	8	9	—	—	—	—	+3	—
Hv. SPD(2,7)	10	50c	50	300	750	1500	—	1	1	1	1	2	3	5	7	8	10	—	—	—	+5	—
SMD PistolC2)	1	10c	25	50	75	100	—	2	2	2	2	2	2	2	2	3	5	7	8	—	—	1-3
SMD rifle(2)	1	20c	25	100	250	500	—	0	0	0	0	0	1	2	2	2	3	6	7	—	—	1-5
SMD MG(2,6)	10	50c	25	150	500	1000	—	0	0	0	0	0	0	0	0	1	2	5	6	—	—	2-7
Hv. SMD(2,7)	10	50c	50	300	750	1500	—	0	0	0	0	0	0	0	0	1	2	3	4	—	—	3-8
ED Pistol	2/10	10c	10	50	75	150	—	0	0	0	0	2	2	4	6	8	9	10	10	10	+2	1-3
ED Carbine	2/10	20c	25	100	200	400	—	1	1	1	1	2	2	3	5	7	8	9	9	9	+3	1-5
ED rifle	2/10	20c	25	100	400	600	—	0	0	0	0	0	1	2	4	6	7	8	9	9	+3	1-5
ED MG(6)	10	50c	25	150	500	1000	—	A	A	A	A	0	0	1	2	3	5	7	8	8	+4	1-6
Hv. ED(7)	10	50c	50	300	750	1500	—	A	A	A	A	A	0	0	1	2	3	5	6	7	+6	3-8
Flame Pistol NB(3)	2	20c	10	50	125	200	—	0	0	0	1	2	3	4	6	8	9	10	10	—	+4	1-3
Flame Pistol WB	10	20c	10	—	50	100	—	0	1	2	3	4	5	7	9	—	—	—	—	—	+2	1-3
Flame Rifle NB(3)	2	30c	10	100	200	400	—	0	0	0	0	1	2	3	5	7	8	9	9		+4	1-5
Flame Rifle WB	10	30c	10	—	50	100	200	0	1	2	3	4	5	7	9	—	—	—	—	—	+2	1-3
Hv. Flamer(7)NB(3)	1	100c	25	150	300	750	—	A	A	A	0	0	0	1	2	4	5	6	7	7	+6	3.8
Hv. Flamer(7)WB	10	100c	25	—	75	150	300	1	1	1	1	2	3	5	7	9	—	—	—	—	+2	1-3
Fusion Pistol(1)	2/10	20c	10	50	150	250	500	A	A	A	A	0	1	2	3	4	5	7	10	—	+2	1-3
Fusion Rifle(1)	2/10	30c	25	100	300	800	1500	A	A	A	A	A	A	0	1	2	3	4	6	9	+3	1-3
Fusion MG(1)	10	100c	25	100	500	1500	3000	A	A	A	A	A	A	A	A	0	1	2	4	6	+5	1-6
Stun Pistol(4)	2/10	10c	10	50	150	300	—	0	0	0	1	2	3	5	6	8	9	10	—	—	Stun	—
Stun Carbine(4)	2/10	30c	10	100	250	500	—	0	0	0	1	2	3	5	6	8	9	10	—	—	Stun	—
Stun Rifle(4)	2/10	30c	10	100	500	1000	—	A	A	A	0	1	2	4	5	7	8	9	—	—	Stun	—
Hv. Stunner(4,7)	2/10	100c	25	150	600	1500	—	A	A	A	A	A	A	0	1	3	4	5	~10	—	Stun	—
APRO Pistol	1	10c	10	50	75	100	—	A	A	A	A	1	2	2	3	3	4	4	4	5	APROB DIF	
APRO Rifle	1	20c	10	100	150	250	—	A	A	A	A	1	2	2	3	3	4	4	4	5	APROB DIF	
APRO MG(5)	1	50c	25	100	250	500	—	A	A	A	A	A	A	A	A	A	2	2	2	4	APROB DIF	
Hv. APRO(7)	1	100c	—	200	500	1000	—	A	A	A	A	A	A	A	A	A	A	A	2	4	APROB DIF	
APRO Field(7)	Autc	100hr	200	400	600	800	1000	A	A	A	A	A	A	A	A	A	A	A	0	2	APROB DIF+1	

(1) ER used in atmosphere under 250mm or in vacuum, with penetration N+ reduced by -1.
(2) Sonic weapon increases penetration N+ by +1 at MR, +2 at LR, +3 at ER, and cannot be used in atmospheres under 250mm or over 3000 mm.
(3) NB (narrow beam) flame reduces penetration N+ by -1 at MR, -2 at LR, and -3 at ER.
(4) Sonic stunners are limited as are sonic disrupters (Note (2) above.)
(5) Bipod mounted.
(6) Tripod or TE/Mech.
(7) Vehicle or installation mounted only.

The Penetration Tables: Contained in the weapon penetration tables is a summary of some of the basic characteristics of the weapons, as well as armour penetration numbers which must be equalled or rolled higher on 1d10. Data included are the 'ROF' or rate of fire of the weapon, with '10' indicating automatic weapon capability. 'Ammo' entry gives the number of rounds contained in the typical weapon. The 'Target Range' entries give the upper end of 5 range categories, 'PB' or point-blank, 'SR' or short range, 'MR' or medium range, 'LR' or long range, and 'ER' or extreme range. The armour protection classes range from K to AFV, representing various levels of natural and body armour types as well as standard armoured fighting vehicle armour ('AFV'). Below each armour class is the 'N+' number of the 1d10 result or higher which is required to penetrate the armour. After the 'AFV' entry is the 'Screen' N+ number required to penetrate a basic strength battlescreen. Small arms also have a 'Wound Factor' entry, which is a DM applied to the wounds table to determine injury to a living target, while the 'Vehicle Damage factor indicates the amount of damage that will be inflicted if the round penetrates a vehicle and that result is rolled on 1d6. Where the range is greater than 1.6, as in 2-7, a 1 result delivers 1 + 1 damage. a 3 delivers 1 + 3, etc.

8.13 WOUNDS

When a living target is penetrated by a projectile, energy bolt, or melee weapon, wounds result. The damage inflicted varies according to where the person was hit. Roll 1d20 and consult the line corresponding to the location of the hit in the victim's body:

Wound Category Determined by 1d20					
'Humanoid' Area of Body Hit	**Very Light**	**Light**	**Moderate**	**Serious**	**Critical/ KIA Chance**
Left Lower Leg	01-06	07-14	15-17	18-19	20/nil
Right Lower Leg	01-06	07-14	15-17	18-19	20/nil
Left Upper Leg	01.04	05-10	11-14	15-17	18-20/nil
Right Upper Leg	01-04	05-10	11.14	15-17	18-20/nil
Lower Abdomen/Groin	01-02	03.06	07-10	11-14	15.20/10% + wound factor
Abdomen/Belly	01-02	03-06	07-II	12-IS	16-20/10% + wound
Chest	01-02	03-05	06.09	10-12	13-20/15% + wound
Left Hand/Lower Arm	01-04	05-07	08-II	12-14	15-20/nil
Right Hand/Lower Arm	01-04	05-07	08-II	12-14	15-20/nil
Left Upper Arm	01-07	08-12	13-16	17-18	19-20/nil
Right Upper Arm	01-07	08-12	13-16	17-18	19.20/nil
Left Shoulder	01-05	06-10	11-14	15-17	18-20/2%
Right Shoulder	01-06	06-10	11-14	15-17	18-20/2%
Neck	01-02	03-05	06-08	09-10	11-20/25% +wound factor
Head	01-03	04-05	06-08	09-10	11-20/25% + wound factor

Non-Humanoid				
Area of Body Hit	**Light**	**Serious**	**Critical/KIA Chance**	**Comment**
Head	01-05	06-10	11-20/30% + wound factor	full damage
Right Limb	01-03	04-09	10-20/nil	no damage points lost -
Left Limb	01-03	04-09	10-20/nil	no damage points lost -
Right 'Pincer'	01-09	10-16	17-20/nil	1/2 damage points lost
Left 'pincer'	01-09	10-16	17-20/nil	1/2damage points lost
Abdomen/Thorax	01-07	08-12	13-20/20% + wound factor	full damage

The 1d20 roll is modified upward or downward by the wound factor of the weapon scoring the hit.

Very Light Wound: 1/2d6 (1-3) points of damage. A very superficial flesh wound has been sustained.

Light Wound: 1 + 1d6 (2-7) points of damage. The wound is nothing to ignore, but does not seriously impair the victim.

Moderate Wound: 2 + 1d6 (3-8) points of damage. The wound is still not serious, but a Shock CR is required of all victims with Constitution under 11. (Animal Constitution = Shock CR rating).

Serious Wound: 7 + 1d6 (9-13) points of damage. A Shock CR is required.

Critical Wound: 13 + 2d6 (15—25) points of damage. A Shock CR minus the wound factor of the weapon is required.

KIA: NPCs run the risk of being killed outright by a critical wound. Roll 1d100 for all NPCs and creatures suffering the effects from a critical hit before determining damage Or rolling a Shock CR.

Effects of wounds will vary somewhat according to their location, and according to the general characteristics of the race sustaining them:

Humans & Humanoids: All bipedal creatures (including Ursoids, Canines, Felines, Pithecines, Saurians, and Humanoids) will have movement cut by -20% for each serious wound sustained to the legs, torso, and head (but not the arms). If 3 such wounds are sustained anywhere, the victim is deemed to be suffering from a critical wound, and a Shock CR (unmodified) is rolled. A critical wound reduces movement to 25% if sustained anywhere except in the legs. A critical wound in the legs is deemed to have shattered the bone or ripped up muscles so badly that it is incapacitated, reducing the Victim to a crawl speed (either a hobble if one leg is functional or an actual crawl if both legs are critically hit). Three light wounds are translated as producing the same effects as one serious wound. A light wound in the weapon arm or shoulder will impair ones aim, as will a serious wound (see Direct Fire Hit Table modifiers). A critical hit in the weapon arm incapacitates it completely, necessitating shifting to the other hand. Melee capability is also affected by wounds.. Each serious wound reduces the H/H melee combat factor by .25%, and three such wounds reduce the H/H factor to 26%, as does one critical hit. Note: 3 light hits anywhere on the body are equal in effect to a serious hit.

Non-Humanoids: The Mertuns, Klackons, Bugs, Arachnids, and Scorpionids have multiple limbs. Bugs and Insectoids have 6 limbs. When a limb is hit, there is a 25% chance for light, 50% for serious, and 100% for critical that it has been shot/chopped off. The creature feels no other effects. Movement can be maintained so long as the creature has 4 limbs, 2 on either side. When 3 limbs (2 and 1) remain, movement is at 50%. When 2 limbs remain, movement can be only at a crawl. If a Bug/Insectoid needs to fire a weapon (2 limbs required), and only 4 remain, movement will be at a crawl. Movement is not possible with one limb. Hits to the body or head will have no effect on movement; 'Bugs' have to be shot to pieces to stop them.

Klackons have 6 'legs' and 2 heavy, claw-like pincers used for manipulations and combat. Klackon movement is not affected until 3 limbs/claws remain. Essentially, the same comments as made for Bugs will apply, and Klackon claws can double for legs. Arachnids and Scorpionids are essentially the same. Hits to the body have no effect on movement. Shock CRs are never rolled.

Mertuns are 8-legged octopus-like creatures and movement is affected as outlined for Klackons.

Each serious wound reduces the H/H melee factor of all Non-humanoids by -25%, and three such wounds reduce the H/H factor to 25%, as does one critical hit. Such wounds have to be sustained in the head or body to be effected. Three light wounds to the head or body are the equal of I serious wound. Also, when movement is restricted due to loss of limbs, the H/H is reduced to half the existing level. Klackons losing the use of both claws (treat as the same as arms for human/humanoid types) have no H/H capacity or ability to use weapons.

Silicates: Silicate creatures are solid rock, or rather, its plastic or crystalline equivalent. Damage sustained from all weapons is halved, and location of hits is irrelevant because the being is fully operational in all respects until its damage levels are reduced to zero.

Animals: All animals will be on the 'humanoid' model, even if four-footed, or else on the non-humanoid model. All effects apply as outlined above.

8.14 CLOSE COMBAT

Despite the firepower of advanced weapons, a character is going to find himself locked in hand-to-hand combat with an enemy sooner or later.

PC Player Character Hand-to-Hand Capability: The basic H/H capability of a PC is computed by adding up the appropriate pre-requires with a given weapon:

Dagger, Throwing Knife Stabbing Sword	Expertise + Dexterity + Agility +2
Foil	Expertise + Dexterity + Agility +2
Katana	Expertise + Dexterity + Agility +2
Spear, Javelin, Pike Halberd, Bayonet	Expertise + Dexterity + Agility +2
Sword, Broadsword, Great-sword	Expertise + 2/3 (Dex. + Agil. + Str)+2
Battle Axe, Mace, Morning star, Flail	Expertise + 2/3 (Dex. + Agil. + Str)+2
Sabre	Expertise + Dexterity + Agility +2
Unarmed Combat, Quarter-staff, Clubs, etc	Expertise + 2/5 (Dex. + Agil. + Str. +Con + IQ) +2
VibroBlade, ForceBlade MonoFilament Blade	Expertise + 2/3 (Dex. + Agil. + Str)+2
Coagulator, Neuronic Whip	Expertise + 2/3 (Dex. + Agil. + Str)+2
LightSword, LaserSword	Expertise + 2/3 (Dex. + Agil + Str)+2

In addition, make the following adjustments to the H/H for race and character type:

Race	Armsman	Others
Human	110% H/H	80% H/H
Transhuman	175% H/H	150% H/H
Humanoid	100% H/H	80% H/H
IRSOL (no powered exoskeleton)	20% H/H	10% H/H@
IRSOL (in powered exoskeleton)	100% H/H	80% H/H@
Canine/Rauwoof	90% H/H	80% H/H
Feline/MeKPurr	150% H/H	125% H/H
Feline/Avatar	175% H/H	150% H/H
Ursoid/Blarad	200% H/H	150% H/H
Pithecine	150% H/H	100% H/H
Avian/Whistler	80% H/H	70% H/H
Saurian/Hissss'ist	150% H/H	100% H/H

@IRSOL are physically very weak; most typically wear powered exoskeletons to augment strength, and carrying capacities, etc., assume such equipment. If not in powered mode, all physical capabilities (carrying, moving, etc.) are reduced by the 'no powered exoskeleton' percentage. Note: The powered exoskeleton is not PAPA Powered Armour as such, but it may be light armour. Players should note that NPCs and creatures have hand-to-hand combat factors provided in the NPC and creature description.

Hand-to-Hand Initiative: At the start of each melee phase, each combatant rolls 1d20 (random factor), to which various modifiers will be added. The highest score has the initiative in that melee phase. The character/NPC with the initiative gets the chance to strike the first blow with a melee weapon or, if he is attempting to fire a weapon at point-blank range in melee, to loose 1 round. Normally, firing is not allowed in the melee phase, but combatants can try to fire at their melee assailant. Automatic weapons can be autofired at an assailant/ assailants only. All disengaged personnel cannot fire into the melee. (It is assumed that they have been occupied with other matters when the melee occurs and/or the combatants are too close to permit outside fire to be safely directed at the right target.) Exception: Creatures of over 600 kg mass will provide large enough targets to be fired upon. When engaged in hand-to-hand melee with man-size opponents. After the combatant having the advantage has struck his blow or fired his weapon, the other may attempt to strike or fire back.

When faced with multiple attack (a maximum of 4 opponents is possible, with 2 to the front and another 2 to the sides and back), the appropriate initiative modifiers will be provided for in the following table.

Hand-to-Hand Combat Factor	full H/H
Per point Effective Length of weapon is superior (1st round)	+3
Per point Weapon Speed is superior (subsequent rounds)	+3
In Spacecraft, with Spacecraft Orientation training	+5
In null grav without Space Combat training	-20
In house-to-house action, with Street Combat	+5
With Combat Training and opponent has no CT	+5
Charging/rushing the enemy	+3
Per enemy engaged	-10
Character is surprised/dazed/demoralised	-20
Character is prone/in foxhole/crawling/below level of adversary	-15
Character is fatigued/winded	-15
Character is carrying regular load	-1
Character is carrying heavy load	-2
Character is carrying full load	-25% H/H
Character is partially encumbered	-50% H/H
Character is fully encumbered	-75% H/H
Character is holding heavy weapon (except Transhumans/Blarads/PAPA)	-10
Character is attempting to draw pistol from 'quick draw' holster	-10@
Character is attempting to draw pistol from flap holster	-20@
Character is attempting to draw melee weapon from sheath	-10@
Per expertise level in Unarmed Combat	+3@@
Character is attempting to fire pistol in hand	+9@@@
Character is attempting to fire SMG held at ready	+5@@@
Character is attempting to fire shoulder/heavy weapon	-5@@@
Character is wielding MonoFilament sword weapor	+3
Character is wielding VibroBlade sword weapon	+5
Character is wielding ForceBlade	+7
Character is wielding LaserSword	+10
Character is wielding LightSword	+15
Character is attempting to enter through window	-10
Character is attempting to enter through door	-2
Character's vision limited by gas mask/filter mask	-3
Character is lightly wounded in weapon arm	-3
Character is seriously wounded in weapon arm	-10
Character lacks expertise with the weapon he is using	-10

@Penalty may be countered by +1 per expertise point with the given weapon.
@@Bonus added even if engaged in unarmed combat mode of attack/defence (no standard weapons), as character has special skills in close combat.
@@@Replaces 'weapon length' and 'weapon Speed' factors. However, if grappled by the enemy or grappling the enemy, only a pistol can be fired (-7); SMGs and longer weapons are useless as firearms in such situations.

Wounds also affect the combat capabilities of a character. Apart from wounds in a weapon arm, the following general effects Occur:

Under 25% DF lost through wounds	Increase load by 1 level
From 25% to 75% DF lost through wounds	Increase load by 3 levels
Over 75% DF lost through wounds	Increase load by 5 levels

Load levels' are
(1) optimum, 1/12 CC;
(2) light, 1/7 CC;
(3) regular,1/4 CC;
(4) heavy, 1/3 CC;
(5) full, 1/2 CC;
(6) partially encumbered,2/3 CC;
(7) fully encumbered, 4/5+ CC.

Combatants in PAPA add the PAPA H/H factor + personal weapon expertise for the weapon being used instead of using their own H/H ratings. The Power Armour effectively increases their overall strength and reaction times to maximum levels. Also, light wounds have no effect, while wounds from 25% to 75% DF cause -10% loss of H/H, and wounds over 75% DF cause -25% loss of H/H.

Melee Weapon Hit Probability: Once the initiative is decided, blows are struck. All melee weapons have a basic 35% hit probability. This percentage is modified by:

Attacker	
Expertise with weapon	+2% x level
Unarmed combat expertise	+1% x level
Combat Training expertise	+1% x level
Space Combat training	+5%@

Defender	
Expertise with same weapon	-2% x level
Or expertise with own weapon	-1% x level
Unarmed combat expertise	-1% x level
Combat training expertise	-1% x level
Space Combat training	-5%@

@Applicable Only in spacecraft, null Grav, etc.
If fighting in an Alien Environment without appropriate training, all combat bonuses are halved, whether attacking or defending.

Melee Firearm Hit Probability: If the combatant is attempting to fire a weapon at his enemy, he uses the hit probabilities given in the Direct Fire Hit Probabilities section, presented previously. If the defender is using a LightSword or LaserSword, he may attempt to deflect the shot with his beam weapon, the chance being equal to 10% + (2% x expertise).

Grappling: If the combatant with the initiative wishes, he may grapple with his opponent. This permits him to restrain his enemy so that weapons with length greater than effective length 3 cannot be used in close combat (LightSwords and LaserSwords can be shortened to that effective length), and all hit probabilities are halved. One may strike with hands and feet, daggers, knives, pistol butts, bottles, and short clubs. A shot has a flat 5% chance of hitting anything, if fired by a pistol, but a round can be loosed without affecting the ROF or melee 'rate of fire' with any other weapon, as the shot is fired more by reflex than by careful deliberation. A grapple is treated as an 'unarmed attack' and must 'hit' to be successful.

Once grappled, a combatant cannot escape unless he gains the initiative. This is automatic.

Close Combat ROF: the number of times that a given weapon can be used in a close combat attack during the melee phase is given as its 'ROF' or 'rate of fire' in the Melee Weapon Table. While ROF may not seem to be an appropriate term, it is used merely to keep a consistency with weapons capable of firing at a distance. The number of defences that a character can make against the attacks of adversaries depends upon his weapon skill, with a minimum of 2 active defences plus 1 per two expertise levels over expertise/2. A PC with expertise/7, for instance; would have 2 + 5/2 = 4 active defences in which he could apply his skill bonuses against the enemy's hit probabilities. The number of attacks can be increased by +1 when PC reaches expertise/7+, and by +2 at expertise/10, giving a total possible number of attacks at 4 with the 'fast' weapons and '3' with slow weapons. Exceptions are the pike and the lance, which are too long for such use.

Receiving Melee Charge with the Lance/Pike: Characters armed with these archaic melee weapons get an automatic first strike at an opponent if the effective length of the lance/pike is longer. After that, they can be in serious trouble, as neither weapon provides any defensive advantages unless used in a massed infantry formation (hedgehog) because of the unwieldy nature of the initiative determination is applied.

8.15 MELEE PENETRATIONS

Melee penetrations are a function of the weapon being used (or natural weapon by the race or species employing it) in comparison to the armour or hide to be penetrated. The table below gives the basic penetration capacity for each race and animal type with natural weapons (claws, teeth, fists, etc.). The N+ number must be equalled or exceeded to penetrate the protection listed. A bonus number is given for effective length, weapon speed, and wounds inflicted, as well as a bonus penetration DM which is added to the 1d10 penetration die roll.

Natural Weapons	Natural	Effective	Speed/	Wound	Armour Protection/N+ on 1d10 to Penetrate													
Race/Animal	Armou	Length	ROF	Effects	Skir	K	J	I	H	G	F	E	D	C	B	A	AFV	Screer
Terran Armsman	S	0	6/2	-5	3	4	5	6	7	8	9	10	11	12	13	14	17	A
Human	S	0	5/2	-6	4	5	6	7	8	9	10	11	12	13	14	15	17	A
Humanoid	S	0	5/2	-5	4	5	6	7	8	9	10	11	12	13	14	15	17	A
IRSOL	S	0	4/2	-5	5	6	7	8	9	10	11	12	13	14	15	16	8	A
Ursoid/Blarad	K	2	5/2	+1	2	2	2	2	3	4	4	5	6	7	8	9	13	A
Feline/MekPurr	K	0	6/2	.2	2	2	3	4	6	7	8	8	9	10	11	12	15	A
Feline/Avatar	K	1	7/2	+0	2	2	2	2	3	4	5	6	7	8	9	10	14	A
Canine/Rauwoo	S	0	6/2	-5	3	4	5	6	7	8	9	10	11	12	13	14	17	A
Pithecine	K	1	5/2	-2	2	3	4	5	6	7	8	9	10	11	12	13	16	A
Avian/Whistler	5	0	5/2	-6	4	5	6	7	8	9	10	11	12	13	14	15	17	A
Insectoid/Bug	Varies	2	4/2	+1	2	2	3	4	5	6	6	7	8	9	10	10	15	A
Icythoid/Klackor	Varies	3	4/2	+1	2	2	3	4	5	6	6	7	8	9	9	9	15	A
Saurian/Hiss	J	1	5/2	-2	2	2	3	4	6	7	8	8	9	10	11	12	15	A
Icythoid/Mertun	S	4	4/2	-4	3	4	5	6	7	8	9	10	11	12	13	14	17	A
Scorpionojd	Varies	3	4/2	-1	2	3	4	5	6	7	7	8	8	9	10	10	15	A
Arachnid	S	1	5/2	-3	3	4	5	6	7	7	8	8	9	9	10	10	15	A
ColdPlanet	Varies	1	3/2	-3	A	A	A	2	4	5	6	7	8	8	9	9	15	A
Silicate	Varies	2	2/2	+2	A	A	A	A	A	2	3	4	5	5	6	6	10	A
Animal/A	Varies	3	6/2	+4	A	2	2	3	3	4	4	4	5	6	7	8	10	A
Animal/B	Varies	3	6/2	+3	2	2	3	3	4	4	5	5	6	7	8	9	10	A
Animal/C	Varies	3	6/2	+2	2	3	4	4	5	5	6	6	7	8	9	10	10	A
Animal/D	Varies	2	6/2	+1	2	3	4	5	6	6	7	7	8	9	10	10	10	A
Animal/E	Varies	2	6/2	+0	2	3	4	5	6	7	7	8	8	9	10	10	11	A
Animal/F	Varies	2	6/2	.1	2	3	4	5	6	7	8	9	9	10	10	11	12	A
Animal/G	Varies	2	6/2	-2'	2	3	4	6	7	8	9	10	10	10	11	12	14	A
Animal/H	Varies	1	6/2	-3	2	3	5	6	7	8	9	10	11	12	13	14	—	A
Animal/I	Varies	1	6/2	-4	3	4	5	6	7	9	10	11	12	13	14	15	—	A
Animal/J	Varies	1	6/2	-5	4	5	6	7	8	10	11	12	13	14	15	—	—	A

Natural weapons include fists, feet, fangs, claws, etc. — 'weapons' associated with 'unarmed' combat. It should be noted that it makes little difference in game terms as to whether a beast attacks with claws or hooves, what really matters is the size of the 'weapon' and the force with which it hits. Thus, each creature has been rated for the power of its attack, while StarMasters are free to fill in the details of how the attack is made.

Melee	Effective	Speed			Wound	Armour Protection/1d10 N+ Required to Penetrate												
Weapon Category	Length	Initiative DM		ROF	Effect	S	K	J	I	H	G	F	E	D	C	B	A	Screen
Dagger	+3	+3		2	-3	A	3.	4	6	8	9	9	9	9	10	11	12	A
Knife	+1	+2		2	-3	A	3	4	6	8	9	9	9	9	10	11	12	A
Stabbing Sword	+4	+5		2	-2	A	2	3	4	6	8	9	9	10	10	11	12	A
Sword	+5	+5		2	-1	A	2	2	3	5	8	8	9	9	10	11	12	A
Broadsword	+6	+4		2	+0	A	A	A	2	4	7	8	9	9	9	10	10	A
Greatsword	+7	+3		1	+1	A	A	A	2	4	5	6	7	8	9	8	8	A
Foil	+8	+8		2	-1	A	A	2	3	6	7	7	8	10	10	11	12	A
Sabre	+5	+5		2	-1	A	2	3	3	4	6	8	9	9	10	10	11	A
Katana	+7	+7		2	+0	A	2	3	3	4	6	8	9	9	10	10	11	A
Nordic/Norman Axe	+5	+4		2	-1	A	A	2	3	4	7	8	9	10	10	10	10	A
WarAxe	+7	+3		1	+0	A	A	A	2	3	5	7	7	8	8	9	10	A
Mace	+5	+4		2	+0	A	2	2	3	4	5	7	8	9	10	10	11	A
Morning Star	+7	+3		1	+0	A	A	2	2	3	5	7	8	8	9	9	10	A
Flail	+8	+2		1	+0	A	A	A	2	3	5	6	7	8	9	9	10	A
Spear/Bayonet	+7	+4		1	-1	A	2	3	4	6	7	7	8	19	11	12	12	A
Lance(charge)	+11	NA		1	+0	A	A	A	A	A	4	4	5	6	6	7	8	A
Pike	+12	+0		1	-1	2	3	4	5	6	7	7	8	9	10	11	12	A
Lance	+11	+0		1	-1	2	3	4	5	7.	8	8	9	9	10	11	12	A
Halberd	+8	+3		1	+0	A	A	A	A	2	3	4	6	7	8	9	10	A
Quarterstaff	+6	+6		2	-4	2	5	8	8	9	10	—	—	—	—	—	—	A
Club	+3	+4		2	-4	3	6	9	9	10	10	—	—	—	—	—	—	A
Cudgel	+4	+5		2	-4	3	6	9	9	10	10	—	—	—	—	—	—	A
Bottle(club)	+1	+2		1*	.4	3	—	—	—	—	—	—	—	—	—	—	—	A
Chair(club)	+2	+2		1	-4	3	6	9	9	10	10	—	—	—	—	—	—	A
LongGun(club)	+5	+5		2	-3	3	6	8	9	10	10	—	—	—	—	—	—	A
Carbine(club)	+4	+4		2	-4	3	6	8	9	10	10	—	—	—	—	—	—	A
SMG(club)	+3	+3		2	-4	3	6	8	9	10	10	—	—	—	—	—	—	A
Pistol(club)	+1	+2		2	-4	3	6	9	9	10	10	—	—	—	—	—	—	A
BrassKnuckles	+1	+2		2	-3	3	6	7	8	9	10	10	10	11	11	11	11	A
MonoFilament	**	**		**	(+2)	A	A	A	A	A	2	2	3	4	5	6	7	A
Vibroblade	**	**		**	(+2)	A	A	A	A	A	A	A	2	3	4	5,	6	10
Forceblade	**	**		**	(+3)	A	A	A	A	A	A	A	A	2	3	4	5	10
Coagulator	+7	+8		2	+4	3	4	4	4	5	5	5	6	7	8	9	10	A
NeuronicWhip	+7	+8		2	Pain	2	3	3	3	3	3	3	5	7	8	9	10	A
ParalysisRod	+5	+5		2	Par.	3	7	7	7	7	7	7	8	9	10	—	—	A
LaserSword	+9	+10		3	+3	A	A	A	A	2	2	2	3	3	4	4	5	6
LightSword	+9	+11		3	+3	A	A	A	A	A	A	A	2	2	2	3	4	4

*50% chance of breaking on impact; if not, ROF/2.

**Wound effect is added to that of weapon to which the blade effect is added. Effective length, speed, and ROF are determined by the characteristics of the weapon so fitted.

Note: Weapons rated over N+ = 10 are incapable of effecting penetration unless fitted with a MonoFilament, Vibroblade, Forceblade unit.

Racial 'unarmed' combat modes add +1 to the 1d10 roll for every 3 unarmed combat expertise levels attained, and an additional +1 for expertise/10 (maximum +4). The same penetration bonuses are applied for expertise with an appropriate weapon.

MonoFilament blades are at AFV/10, VibroBlades are at AFV/9, and ForceBlades, LaserSwords, and LightSwords are at AFV/7, meaning that they can cut through vehicle armour (it takes time, but is possible.)

Add any racial unarmed combat natural weapon lengths and speeds to the effective length and speed of any melee weapon wielded.

For any armour over 'A' rating, increase the number required to penetrate by +1 per class the armour exceeds 'A' ratings. Thus Powered Armour with AFV armour ratings would be +1 over 'A' and vehicles with AFV armour would be +2 over 'A'. etc.

9.0 STARSHIPS

The Starship is perhaps the most expensive equipment a PC will ever meet up with in his career. Values are typically stated in scores of MegaCredits (MCR = 1 000 000), vastly beyond the means of most characters. Yet a PC will have many opportunities for employment and adventure aboard naval or civilian Starships, whether or not he has the chance to purchase his own ship.

Commercial Starships: A commercial vessel is designed for transportation of passengers and cargo, It will possess defensive armaments, but NovaGun calibre's will not exceed N175, StarTorpedoes will be ST*1 57s only, and heavy MegaBolt energy torpedo turrets will never be installed. Armour will not exceed +12/+10, while forcefield BattleScreens will not exceed +12. The stresses which the firing of heavy weapons produce are beyond the ability of a commercial hull to withstand. The defences and armaments mentioned are sufficient to hold off a pirate or privateer; if the vessel is a naval cruiser, to seriously meet its challenge would require a warship, not a merchantman designed for profit instead of destructive capability.

Naval Starships: A naval vessel is designed for war and reflects the thinking of naval planners as to what the best "marriage" of speed, guns, and armour should be. While it has cargo stowage, its holds will be relatively small. The Starship Design statistics reflect civilian Starship speeds at the 10 000t displacement level and higher; all naval craft are capable of +10 LS speed and +5 acceleration above those standards. For instance, a commercial vessel is capable of 150 LS speed and +15 LS acceleration if it is of 75 000t displacement; a naval vessel of the same size will be able to attain 160 LS and +20 LS acceleration. That bonus is built into naval Starship engines and is obtained "free," in addition to whatever levels actually purchased. Naval hulls are designed to accept ordinance given in the Starship Design statistics.

Q-Ships: The Navy and the IPA (Interstellar Police) use Q-Ships or heavily armed and armoured merchantmen of cruiser capability to lure pirates to their doom. Outwardly, these vessels resemble lightly armed and armoured merchantmen, but they contain concealed gun turrets, torpedo launchers, and armour of vastly higher quality. They also carry a complement of StarFighters for high-speed pursuit.

Naval Architecture: Should a person desire a Starship, he can engage a naval architect. At least one such firm will be located near the commercial shipyards found in all class A and B StarPorts. For a fee of about CR 25000 plus CR 2500 per 100t of displacement, the. architect custom designs the Starship required in 4 weeks. Roll 1d6, with a 5 or 6 indicating additional time required, for an additional charge of +25% on "5, " and +50% on "6." In gaming terms, this procedure represents determining just how much a specially designed vessel will cost to build, with the player going through the design section and working out the specifications desired. Half the fee must be paid in advance, with the balance due upon delivery of the plans.

Shipyards: Any class A or B StarPort wilt have 1d6 shipyards capable of constructing the Starship a PC desires. A PC can go to each and obtain an "estimate" of the costs. Roll 1d6and 1d20. The 1d6 die is the "hi-lo" determination, with evens adding a percentage and odds subtracting a percentage, which is obtained from the 1-20 result on the 1d20 die. This increase or decrease is then applied to the basic price of the spacecraft. If the PC is a Merchant character with Astronaut and Merchandising skills, he can apply a 1 DM to the 1d20 result for each level of Merchant expertise he possesses. This represents his practical knowledge of Starships and also his ability to "dicker" the price down. (A PC with Starship Engineering skill and Merchandising can also obtain the discount.)

Construction Times: Upon payment of 10% down on the project, the shipyard will commence work on the Starship ordered. Class A shipyards require 10 days plus 1 day per 1000t of hull displacement to complete the project. Class B shipyards require an additional 10% + 1d10% to do the same work. The PC ordering the ship has that time period to arrange bank financing or a government subsidy to pay the balance on delivery. Most shipyards will insist upon the financing being arranged within the first 10 days of construction. Details on how to obtain financing are given in the Trade & Commerce section later in these rules.

Standard Design Starships: A number of standard commercial Starships and private yachts and prospecting vessels are provided in these rules, representing commonly purchased vessels. These ships can be purchased quite readily at -10% reduction (plus up to an additional -10% for one's "dickering" ability). Construction time is 90% of that required for custom vessels because of the familiarity of the shipyards with the design.

9.1 SUB-LIGHT MANOEUVRE DRIVE

With the development of TISA or Trans-Gravitic Interphased Sub-Light Anomaly manoeuvre drive, space travel entered a new phase. Released from the constraints of inefficient, fuel-gobbling reaction motors, Newtonian laws of motion, and the physical limitations of personnel to withstand high acceleration for sustained periods, TISA powered spacecraft are capable of attaining speeds approaching that of light. "Phased out" of the normal universe by the TISA anomaly field, ships become almost "mini-universes" in their own right.

To the outside observer, a TISA powered ship appears to be an elongated teardrop of brilliant blue-white incandescence.

The event horizon of the anomaly marks a "connecting surface" which maintains a tenuous link between the ship and the external universe. A drag effect is exerted by the very fabric of normal space as it seeks to return the anomaly to the continuum. While it is theoretically possible for a ship to attain the speed of light under TISA, in practice the Torch drive encounters such tremendous resistance that velocities above 280 LS (light-seconds) have rarely been attained. Field strengths are so delicately balanced at high speeds that FTL hyperwarps are created when ships attempt to exceed design limits.

TISA (Torch) Drive Speed Rating: Manoeuvre drives are rated according to their maximum economical or "cruising" velocities, maximum velocity before FTL hyper-acceleration and insertion occurs, and acceleration/deceleration rates. These limits are all stated in LS or light-seconds of distance covered in a 5-minute period. For example, a ship rated at Cruise: 75 LS, Maximum: 150 LS, and Acceleration: 10 LS, can cruise at speeds up to 75 LS without using an appreciable amount of anti-matter

fuel. If velocities exceed 75 LS, #1 or one unit of fuel will be expended each hour (or fraction thereof) per 1000 tonnes of ship's mass, and a maximum 150 LS can be attained. The acceleration rating of the engines allows the vessel to increase or decrease its speed up to 10 LS in a 5-minute period.

Deceleration can be rapid if one is prepared to place the drive units at risk. Velocity at sub-light speeds is maintained by the intensity of the anomaly field. The drag of normal space upon the field interface can be used to brake the ship. If deceleration is made at a rate faster than the acceleration rating, a 1% chance exists per 5 LS of deceleration that the drive units will shut down entirely. Warp stresses may cause a "Sub-Light Manoeuvre Drive Circuitry Overload" breakdown, as outlined previously in 4.33 Engineering Malfunctions, so roll a Breakdown of a multi-system, as described in 4.23. If the shutdown is a class 1 malfunction, a restart time of 5 minutes x 5d6 is required. This time period is reduced 8% per expertise level of the Chief Drive Engineer.

If deceleration occurs, a ship must "work up" to desired velocities at the rated level of acceleration. Using the previous example, if a drive shutdown occurred, the ship could work up to the maximum speed of 150 LS for which it was rated at 10 LS increments per 5 minutes, attaining 150 LS velocity in 75 minutes or a little over an hour.

Naval vessels are designed for speed, not economy, and their engines will typically be capable of higher accelerations than those of civilian commercial and private craft. Some naval vessels are also capable of "emergency overboost" accelerations. Vessels with "overboost" expend the equivalent of 1 LY worth of fuel per 1 000t displacement for each 5 minutes that the acceleration is applied. Overboost permits triple the rated acceleration.
It should be noted that the acceleration formula (D = '1/2 at ^{2}) is ignored in these rules. When a ship accelerates/decelerates, the velocity change is considered to be "instantaneous" to simplify game mechanics. This means that a ship rated at Acceleration: 10 LS will immediately increase/decrease its velocity by up to 10 LS/5 minutes at the beginning of the movement phase of the turn in which the acceleration/deceleration is ordered. If the ship were moving at 90 LS in the previous turn, and 8 LS deceleration is ordered for the current turn, the ship moves 90 - 8 = 82 LS in the current turn.

9.2 SUB-LIGHT MANOEUVRE PROCEDURE

A TISA drive unit can propel a spacecraft in any direction quite independent of Newtonian laws of motion. Anomalies are separate from the normal universe and are not bound by the laws governing the motion of objects in standard space. Thus players do not have to plot vectors when making course changes. The ships merely move along their courses and, when required, turn on the proverbial "dime."

A course change may be executed at any time during a 5-minute turn, in the movement phase. The players should pre-record course changes in combat situations to avoid disputes. A turn is made in a series of "legs." Each turn of up to 45° requires that the ship proceed a rated percentage of its current speed before a course change is made. Several legs can be executed in the same turn.

Ships of 1000t displacement can execute a turn after covering 5% of their current speed. Ships of 2500t to 25 000t can execute a turn after covering 10% of current speed. Larger vessels can turn after covering 20% of current speed.

For example, a ship is rated at a manoeuvre turn of 10%, for it is a 5000t corvette. This means that it covers a distance equal to 10% of its speed in the current turn before a leg of up to 45° can be executed. Suppose the ship is making a torpedo run at 200 LS. The Commander (the player in charge of the vessel) writes orders: "200 LS/run 20 LS/Fire StarTorps x4/executing 180° turn." The ship thus proceeds 20 LS (which is 10% of its present speed), fires 4 torpedoes, and turns 45° at that point. The ship proceeds 20 LS, executes another 45° turn, moves again for 20 LS, and executes another 45° turn. Two more such legs are covered, which has the ship turned completely around and running back in the direction from which it came. It has used up a total of 20 + 20 + 20 + 20 + 20 = 100 LS of its 200 LS speed, so it uses the remaining 100 LS to move away at high speed. The diagram below illustrates the manoeuvre:

The battle and manoeuvre rules envision play on a flat, two-dimensional surface. The use of a third dimension (altitude above or below the plane of the playing surface) is not necessary. Most combats will likely involve only two or three ships. Since three points define a plane, the action on a flat surface actually would depict a three-dimensional action.

Even if many ships are involved in a battle, they would usually be manoeuvring in squadrons, so the use of three dimensions is still an unnecessary complication. However, if players desire a three-dimensional manoeuvre situation, the altitude of each ship above or below the playing surface must be noted in light-seconds. Calculation of positions will be assisted by the use of calculators and trigonometry.

Manoeuvres may also be plotted on graph paper. Several sheets of graph paper may be taped together or else a large sheet of draftsman's graph paper may be used. If a plastic overlay is available, it can be used to good effect. Ship's positions, courses, speeds, etc., can all be recorded on the plastic with grease pencils or overhead pens. The plastic can be cleaned after each voyage or battle for reuse later, or even during a battle if there are too many lines and jottings cluttering the surface.

In large battles with numerous ships, plotting on paper may become hopelessly confused after a few turns. Miniatures are strongly recommended in such cases.

9.3 MANOEUVRE DRIVE VOYAGE TIMES

To compute sub-light voyage times, simply divide the distance in light-seconds by the average speed of the ship, and multiply the result by 5 minutes to find the time. Finally, add the time required for the ship to accelerate and decelerate to voyage speed and back down to 0.

For example, a ship is rated at 75 LS cruising speed and 15 LS acceleration. It is shaping a course for Pluto from Terran orbit. The distance is approximately 6 800 000 000 km. Dividing by 300000 km, the distance is found to be 22 667 LS. At an average speed of 75 LS, the ship will reach Pluto in 5 x (22 667/75) 1511 minutes plus 5 x (75/1 5) x 2 = 50 minutes for the ship to accelerate and decelerate, a total of 1561 minutes or 26 hours! Incidentally, 75 LS is 25 PSOL (25% speed of light).

Long distance voyages under TISA drive will likely be plotted on paper. In battle, it is often necessary to determine when relieving vessels will arrive in the battle zone, and a paper plot proves the easiest way to handle the situation. Once the ships arrive at the edge of the battle zone, appropriate miniatures can be placed on the edge of the playing surface.

9.4 MANOEUVRE NAVIGATION

Sub-light navigation is regarded as "child's play" with the sophisticated computers available to starfarers. Setting a course requires mere seconds or split-seconds as a result, if the player-character is a qualified Astrogator or Pilot. See 4.7 for the procedure used.

9.5 FTL WARP DRIVE

The FTL Warp Drive is a faster-than-light propulsion system which uses anomaly drive to send a Starship past the speed of light (a shade over 300 LS), "translating" it into Tachyon hyperspaçe. Under Warp Drive, a Starship becomes totally isolated. There is no longer an interface (anomaly "event horizon") linking the ship with the normal universe. To all intents and purposes, it ceases to exist. From the point of view of its crew, the entire universe ceases to exist as well. Thus Starships are undetectable under Warp Drive, but FTL combat is impossible. Each ship, unless physically linked to another, is in its own separate universe.

In FTL mode, a Starship "moves" faster than light because it is not "in" the normal universe at all. However, the crew cannot "look out" of the FTL Warp; until the Starship drops back below light speed, the universe is simply not there to see!

Warp Factor: All FTL drive Units are rated according to a warp factor or the number of light years that the Starship can alter position in a 24-hour period.

Fuel Consumption: Starships consume an appreciable amount of fuel (nuclear or anti-matter) in FTL travel. All drive Units are rated for a Cruising Speed, and fuel consumption is based on the amount of fuel expended to cover 100 LY at cruising velocities or lower. If the Warp factor is increased over the rated Cruise levels, au additional 5% of fuel is expended per LY of increased Warp speed. For instance, a ship is rated at maximum warp factor 20 LY, and a cruise speed of warp factor 60% or 12 LY. It consumes #250 in fuel per 100 LY covered. The Captain has to make a high-speed FTL passage of 74 LY, so he orders maximum Warp factor, which is 8 LY over the cruising rate. This results in 140% expenditure of fuel, for a total expenditures of 1.4 x 74/100 x #250 = #259 rather than a cruising fuel expenditure of 74/1 00 x #250 = 185.
Note: The symbol (#) is the universal symbol for 10 kg of nuclear/ anti-matter fuel.

Planetary & Stellar Gravitic Disturbance Zones: Warp Drives will not function within the gravity fields of major planets and stars when the field strengths are too high:

Major Planet:	Zone = 100 planetary diameters from the planet.
Main Sequence Star:	Zone = 10000 LS from the star.
Sub-Giant:	Zone = 20000 LS from the star.
Giant:	Zone = 35000 LS from the star.
SuperGiant:	Zone = 50000 LS from the star.

For example, a Starship is rated at 100 LS maximum TISA velocity and +10 LS acceleration. Leaving the vicinity of Sol, a main-sequence star, it may accelerate to 100 LS, but no faster, until it passes the 10000 LS limit - a bit outside the orbit of Uranus, as it happens. At that point, the FTL Drive can be cut in, accelerating the Starship at +10 LS per 5 minutes until 300 LS manoeuvre speed is attained. At that point, the Starship "translates" into FTL mode. Similarly, if the Starship were returning to the Solar System, the moment it reached the 10000 LS limit, it would drop below light speed, reverting to its maximum sub-light speed—in this case, 100 LS.

It will also happen that battle-damaged ships will accelerate to light-speed for FTL conversion. In such instances, acceleration and sub-light velocity maximums are at current levels imposed by battle damage. Using the previous example, if the maximum speed has been reduced to 50 LS and the acceleration to +5 LS/5 minutes, the Starship would be unable to exceed 50 LS speed unless an FTL run up to light-speed is made. Similarly, when emerging from hyperspace, such a ship will revert to 50 LS speed, not its usual 100 LS.

FTL Translation: Once a ship accelerates past its rated TISA velocity, it is almost irrevocably committed to a high speed run up to 300 LS (light-speed) and FTL translation. Such a run cannot be aborted without grave risks to both the TISA Manoeuvre Drive units and to the FTL Warp Drives. Any attempt to shut down carries a flat 60% chance minus 2% per expertise level of the Chief Drive Engineer that the FTL Warp Drive will malfunction (roll breakdown number on multi-systems). If the FTL Drive does go down, the effect has the same chance of cascading through the TISA unit and causing it to break down as well. However, naval vessels typically have auxiliary TISA and FTL drives capable of delivering about 5% of the main units' performance, so a vessel can still limp home while the crew is attempting to repair the damage (if possible).

9.6 FTL VOYAGE TIMES

FTL jumps are in fractions or multiples of 24 hours. For example, a ship is rated at Warp factor 15. It will travel 15 LY in 24 hours. If making a short jump from Terra to Alpha Centauri, the 4.3 LY will be traversed in 4.3/15 x 24 = 6.88 hours.

There is sometimes (30% chance) a "time compression" phenomena experienced by Starship crews during an FTL hyperjump. In such instances, the apparent elapsed time in Warp is 1/288th of the normal period. For instance, on a 4.3 LY run as outlined above, a "temporal compression" would reduce the time to 1/288 x 6.88 = 0.0239 hours or 1.43 minutes! If it could carry the fuel, such a ship would cross the 100 000 LY of the First Galaxy in 18 years and 96.67 days of real time, but a temporal compression would give the crew an awareness of only 23 days and same 31/2 hours elapsing since the start of the voyage. Temporal compression is optional.

Of course, these are times only for the FTL portion of the journey. Added to it will be the times required to run up to light-speed and the times to move through the stellar zone of gravitic disturbance at both the departure and arrival points.

9.7.FTL ASTROGATION

Success or failure of an FTL translation requires precise calculations, for the Astrogator will not be able to make star sightings to check the ship's position once it enters hyperspace. The procedure and possible consequences are described in 4.7, Astronaut Training.

9.8 LOST IN SPACE

Whenever there is an error in Astrogation, a ship can arrive at a different set of co-ordinates from those anticipated. Similarly, whenever a Starship exceeds its design speed, an automatic FTL run up to light-speed and Hyperspace translation will commence. Unless the Astrogator can complete computations for an FTL jump before the ship attains 300 LS or light-speed, the ship's destination will be totally randomised. In the case of an inadvertent hyperwarp translation out of control, the distance of the jump will be equal to the cruising speed x 10.d20% for a 1d6 day period. It should be noted that such an error can occur only when manoeuvring outside of the gravitic- disturbance zone of a star and/or major planet.

See 4.2, Astrogation Training, for the skills required to deal with "Lost in Space" situations.

9.9.STANDARD STARSHIP DESIGNS

All naval and commercial/private Starships in "Known Space" are constructed upon one or another of 24 basic hull designs. Into these hulls will be fitted all essential and optional equipment, from powerplants, drive Units, and controls to armaments turrets, missile ordinance, and cargo and passenger compartments. The total tonnage of all installations and cargo cannot exceed the rated internal capacity of the hull. All costs are given in MegaCredits (CR x1,000 ,000).

THE HULL: Starship hulls are identified by the prefix "SSC/-," followed by their displacement in tonnes, with one tonne equivalent to 3 cubic meters (100 cubic feet). The following

tables give Statistical data on the various systems available for installation, along with costs (retail):

Volume: The total volume enclosed by the hull, in cubic meters. Multiply by 100 for cubic footage.

Approximate Dimensions: To ease the problem of designing a vessel so that it corresponds in the scale drawing to the actual volume and deck area, standardised dimensions are given for the hull area. Note:
the actual vessel might be wider in the beam, longer, or higher; the basic dimensions refer simply to the area accessible to the crew. Vessels with other dimensions can be designed, so long as they correspond to a given hull size.

Decks: The number of decks is given for each hull class, with 2.5m (8-foot) clearance from deck plates to overhead. The thickness of decks is omitted for ease of handling the figures, but it is generally several centimetres thick. The same is true of major bulkheads.

Control/Computer Systems: All vessels must have a full set of controls, wiring and circuitry, etc. Computers are also essential. The mass/volume of control equipment and command areas like the Bridge are fixed values and must be installed. The Computer Mk. indicated is standard and included in the basic hull cost. If a larger or smaller unit is desired, the basic cost of the hull can be adjusted accordingly. (See 5.2 Computers.) Note: the volume indicated is actual compartment space, so when designing the Bridge, etc., this value can be applied.

Standard Crew: Each hull class has basic crew requirements. The number of Astronauts and Techs normally shipped is therefore given. A vessel can operate on 10% crew, if necessary, standing watch-on-watch (4 hours on, 4 off) in emergencies. However, no vessel will ship without full crew if the men can be had.

Crew Quarters & Basic Life Support Systems: The number of rated crew and the mass and volume of the quarters provided for the crew, as well as life support systems to maintain the rated number, are fixed values and must be installed. Crew space is generally minimal, with several crewmen sharing the same compartment.

Basic Hull Cost: The cost of the hull, controls, standard computer, and crew quarters' and life support is given in MegaCredits. All equipment following is additional.
Available for Installations: The mass and volume remaining in the hull for installation of desired equipment, after the controls/computer and crew quarters/life support have been subtracted from the total hull capacity. Volume of equipment = x3 tonnage.

Main Powerplant: A Starship requires a Powerplant for its drives, life support systems, battlescreens, armaments—in fact, for every powered system aboard. Three choices of Powerplant are available. AMC Anti-Matter Converters are the lightest in mass. They are also essential for FTL warpspeeds over 25 LY. Fusion Reactors are somewhat more massive and are required for FTL warpspeeds over 15 LY. Fission reactors are the most massive of all and cannot power a vessel faster than Warp/14. Note: vessels over 10 000t displacement require fusion or AMC units, while vessels over 125 000t displacement carry AMC units. All powerplants expend fuel at a rate equal to that used to travel 100 LY under FTL Drive for every 20 days they are in space. This fuel expenditure covers all power consumption aboard the vessel, including operation of TISA manoeuvre drives, weapons, communications, sensors, etc.

TISA Manoeuvre Drive: Each hull has a maximum sub-light manoeuvre speed rating, beyond which speed it cannot go. For each 10 LS of power in the propulsion system, the unit is rated for its mass and cost. The acceleration rating for the class of hull is given as well, showing the increase or decrease in acceleration possible in a 5-minute turn. Note that this is not a cumulative value; a TISA unit rated at 220 LS will accelerate/decelerate at 30 LS for a SSC/100 hull, just as a TISA unit rated at only 100 LS will for the same hull.

FTL Warp Drive: Each hull has a maximum FTL warpspeed rating, beyond which speed it cannot go. The mass and cost of a Warp Drive unit is given per 1 LY of speed generated in a 24-hour period. Fuel consumption is based on the hull mass per 100 LY travelled at Cruising Warp or a lesser speed, with fuel stated in universal units denoted by the symbol "#." Cruising warpspseed is given as a percentage of the maximum warpspeed of the FTL drive finally installed.

Damage Capacity: The amount of damage that the hull can sustain, stated on the same spectrum as given earlier for vehicles and aircraft.

BattleScreens: The mass of a forcefield battlescreen generator per +1 increment of protection and the cost of +1 protection is given, along with the maximum screen strength sustainable with a given class of hull. In atmosphere or low orbit, battlescreen strength will not exceed +15, whatever the field strength, rendering even heavy screens vulnerable to heavy calibre BlastCannon fire.

BattleArmour: Every hull class comes equipped with a standard armour rating (projectiles/energy weapons), to which additional armour protection can be added at the mass and MegaCredit costs indicated per +1/+1 increment the basic protection is increased. There is no upper limit to the armour that can be carried except the total hull capacity. Tonnage refers to internal protection in the form of strengthened bulkheads and decks (armour class is not that of the hull, but at 10%) which use up internal space. Belt armour masses about 5 times internal masses but need not be considered for capacity purposes. Part of the mass/volume used up is in the form of TBX hull screen generators which assist in maintaining the physical existence of matter struck by NovaFire.

Main Battery Turrets: Provision is made in each hull design for the installation of heavy Nova gun turrets, with the "No." entry indicating the number of turrets that can be mounted and the guns in each turret (4x2 = 4 turrets, each with 2 Nova guns). The weapons place great stresses on the hull, so the maximum calibre a given hull class can accept is also given.

Hardpoints: Some vessels are also capable of mounting secondary weapons, used chiefly for anti-StarFighter and anti-Torpedo fire. The number and calibre that can be mounted is indicated. In all instances, only 1/2 the hardpoint turrets mounted can fire in any one direction; if a ship mounts 8x2 N25s, only 4x2 or 8 Nova guns can fire to either side of the vessel. Note that the SSC/100 and SSC/250 are StarFighter hulls and carry up to 6 fixed, forward pointing N25s, used in "dogfighting" in space and in the atmosphere.

MegaBolt Torpedo: Ships of 25 000t displacement or greater can mount a MegaBolt energy torpedo projector in a heavily armoured turret with 180° fire to the front and sides of the ship (usually a nose mount), in the calibre indicated (or lower).

NovaGuns: Turret/Hardpoint mass and cost are given. Megaeolt Torpedo: Turret mass and cost are given.

StarTorp Launchers: The number of launch positions and the maximum number of tubes in each launching bay are given in the form 1 x6, 2x4, etc. The first number is the number of launching bays; the second is the maximum number of tubes. After the launcher parameters are given the maximum calibre of StarTorpedo that can be fired (ST*157, ST*257, etc.). The mass and cost per launch tube are also given.

In addition to the components listed above, the following are available:

Staterooms, High Passage: 10t/30 cubic meters displacement at cost MCR 0.25. Occupancy = 1-2 (2 max.). Quarters are very high quality and relatively comfortable, considering the austerity which is the rule aboard most spacecraft.

Staterooms, Middle Passage: 10t/30 cubic meters displacement at cost MCR 0.2. Occupancy = 2. Quarters are of good quality; stateroom can double for High Passage if let to a single occupant requiring privacy. Crew quarters are generally of Middle Passage class.

Berths, Low Passage: 10t/30 cubic meters displacement at cost MCR 0.2. Occupancy = 4. Very cramped quarters, with about 3 square meters (30 square feet) of deck per person, including space allotted to bunks, etc.

ColdSleep: 1t/3 cubic meters displacement at cost MCR 0.025. Occupancy = 1. Cryogenic chambers which can be stored in a relatively small, area may be installed for quick-freezing emergency cases and recently slain personnel, as well as for low cost interstellar travel.

Dispensary: 7.5t/22 cubic meters displacement at cast MCR 0.25 per patient. Requirement: MediTech.

Sick Bay: 10t/30 cubic meters displacement at cost MCR 0.5 per patient. The Sick Bay is comparable to hospital facilities. Requirement: Physician. Note, any medical facilities over 10 patients must be of Sick Bay standard. One Physician and 1 MediTech are required per 20 patient capacity.

Cargo Hold: Any undesignated mass/volume is rated as cargo hold. No additional cost is incurred for cargo capacity.

Recreation Facilities: Commercial vessels carrying over 10 passengers must provide 1t/3 cubic meters of space per passenger (regardless of class of passage) for recreation areas - lounges, mini gymnasiums, etc.). Cost = MCR 0.05 per tonne/3 cubic meters.

Auxiliary Bridge: Starships over 10 000t displacement may mount an Auxiliary Bridge at 150% of cost of Computer installed. Such a computer is typically 1 or 2 Mk. below that of the Main Ship's Computer. The displacement is 50t/150 cubic meters.

Starship		Approximate				Control/Computer Systems	Standard Crew		Crew Quarters & Basic				Basic Available For		Cost of Main Powerplant/		
Hull Type	Volume (in³)	Dimensions	Decks	Mass	Volume	Computer Mk.	Astro.	Tech	Life Support Systems			s	Installation		Mass of Reactor Systems		
									Number	Mass	Volume	Cost	Mass	Volume	AMC	Fusion	Fission
SSC/100	300	30x4x2.5	X1	5t	15	IV	1	1	2	5t	15	3	90t	270	4.0/2t	3.0/4t	2.0/8t
SSC/250	750	40x7.4x2.5	X1	10t	30	IV	2	2	4	15t	45	5	225t	675	6.0/5t	4.5/10t	3.0/20t
SSC/500	1500	40x7.5x5	x2	15t	45	IV	2	3	5	25t	75	8	465t	1395	8.0/10t	6.0/20t	4.0/30t
SSC/1000	3000	50x8x7.5	x3	30t	90	V	3	7	10	50t	150	15	920t	2760	10/20t	7.5/40t	5.0/40t
SSC/2500	7500	75x10x10	x4	75t	225	V	5	15	20	100t	300	25	2325t	~6975	15/50t	11/100t	7.5/200
SSC/5000	15,000	100x15x10	x4	150t	450	V	10	30	40	200t	600	40	4650t	13,950	20/100t	15/200t	10/400t
SSC/10,000	30,000	125x19x12.5	x5	300t	900	VI	20	60	80	400t	1200	55	9300t	27,900	25/200t	19/400t	13/800t
SSC/15,000	45,000	150x20x15	x6	450t	1350	VI	25	75	100	5001	1500	70	14,050t	42,150	30/300t	23/600t	—
SSC/20,000	60,000	175x22x15	x6	600t	1800	VII	30	95	125	600t	1800	85	18,800t	56,400	35/400t	25/800t	—
SSC/25,000	75,000	200x25x15	x6	750t	2250	VII	35	115	150	750t	2250	100	23,500t	70,500	40/500t	30/1200t	—
SSC/50,000	150,000	250x30x20	x8	1500t	4500	VIII	50	150	200	1000t	3000	175	47,500t	142,500	55/1000t	37/2000t	—
SSC/75,000	225,000	275x32x25	X10	2250t	6750	VIII	75	225	300	1200t	3600	235	71,550t	214,650	70/1500t	45/3000t	—
SSC/100,000	300,000	300x40x25	X10	3000t	9000	IX	100	300	400	1600t	4800	300	95,400t	286,200	85/2000t	60/4000t	
SSC/125,000	375,000	325x42x25	X10	3250t	9750	IX	125	375	500	2000t	6000	360	119,750t	359.250	100/2500t	75/8000t	—
SSC/150,000	450,000	350x42x30	x12	4500t	13,500	IX	150	450	600	3000t	9000	420	142,500t	427,500	115/3000t	—	—
SSC/175,000	525,000	375x47x30	x12	5250t	15,750	X	175	525	700	3500t	10,500	480	166,250t	498,750	130/3500t	—	—
SSC/200,000	600,000	400x50x30	x12	6000t	18,000	X	200	600	800	4000t	12,000	550	190,000t	570,000	145/4000t	—	—
SSC/250,000	750,000	450x55x30	x12	7500t	22,500	XI	225	675	900	4500t	13,500	675	238,000t	714,000	175/5000t	—	—
SSC/300,000	900,000	500x60x30	x12	9000t	27,000	XI	250	750	1000	5000t	15,000	800	286,000t	858,000	200/6000t	—	—
SSC/400,000	1,200,000	525x65x35	x14	12,000t	36,000	XI	300	900	1200	6000t	18,000	1000	382,000t	1,146,000	250/8000t	—	—
SSC/500,000	1,500,000	550x75x35	x14	15,000t	45,000	XII	350	1050	1400	7000t	21,000	1200	478,000t	1,434,000	300/10,000t	—	—
SSC/600,000	1,800,000	600x75x40	x16	18,000t	54,000	XII	400	1200	1600	8000t	24,000	1400	574,000t	1,722,000	350/12,000t	—	—
SSC/750,000	2,250,000	650x85x40	x16	22,500t	67,500	XII	500	1500	2000	10,000t	30,000	1750	717,500t	2,152,500	425/15,000t	—	—
SSC/1,000,000	3,000,000	700x95x45	x18	30,000t	90,000	XIII	650	1850	2500	15,000t	45,000	2000	955,000t	2,865,000	500/18,000t	—	—

	TISA MANOEUVRE DRIVE				FTL WARP DRIVE						BATTLESCREENS			BATTLEARMOUR		
Starship	Max.	Mass/	Acc.	Cost/	Max.	Mass/	Fuel Cons./	Cruise	Cost/	Damage						
Hull Type	TISA	10 LS		10 LS	Warp	LY	100 LY	Warp	LY	Capacity	Mass/+1	Max.	Cost/+t	Basic	Mass/+1	Cost/+1
SSC/100	300 LS	1t	+30 LS	0.5	50 LY	0.5t	1.0	75%	1	100	2t	+9	0.2	+3	10t	0.1
SSC/250	270 LS	2.5t	+25 LS	0.75	45 LY	1t	2.5	75%	1	250	2t	+9	0.2	+3	25t	0.25
SSC/500	260 LS	5t	+25 LS	1.0	40 LY	2t	5.0	70%	1	450	2t	+10	0.2	+3	50t	0.5
SSC/1000	250 LS	10t	+20 LS	1.5	40 LY	4t	10	70%	1.5	850	4t	+10	0.4	+3	75t	0.75
SSC/2500	240 LS	25t	+20 LS	2	35 LY	10t	25	65%	2	1500	10t	+10	1.0	+3	150t	1.5
SSC/5000	220 LS	50t	+20 LS	3	35 LY	25t	50	65%	4	2500	20t	+10	2	+3	250t	2.5
SSC/10,000	200 LS	100t	+20 LS	4	35 LY	50t	100	65%	6	4000	40t	+11	4	+4	400t	4.0
SSC/15,000	190LS	150t	+15LS	6	35LY	75t	150	60%	9	6000	60t	+11	6	+4	525t	5.25
SSC/20,000	180 LS	200t	+15 LS	8	35 LY	100t	200	60%	12	8000	80t	+12	8	+4	650t	6.5
SSC/25,000	170 LS	250t	+15 LS	10	35 LY	125t	250	60%	15	10,000	100t	+12	10	+4	800t	8.0
SSC/50,000	160 LS	500t	+15 LS	15	30 LY	250t	500	60%	20	20,000	200t	+13	20	+5	1250t	12.5
SSC/75,000	150 LS	750t	+15 LS	20	30 LY	375t	750	60%	25	30,000	300t	+14	30	+5	1575t	15.75
SSC/100,000	140 LS	1000t	+10 LS	25	30 LY	600t	1000	60%	32	40,000	400t	+15	40	+5	1950t	19.5
SSC/125,000	140LS	1250t	+10LS	30	30LY	750t	1250	60%	40	50,000	500t	+15	50	+5	2175t	21.75
SSC/150,000	140LS	1500t	+10LS	35	30LY	1200t	1500	60%	48	60,000	600t	+15	60	+5	2500t	25.0
SSC/175,000	140LS	1750t	+10LS	40	25LY	1500t	1750	55%	56	70,000	700t	+15	70	+5	2875t	28.75
SSC/200,000	140 LS	2000t	+10 LS	45	25 LY	2000t	2000	55%	65	80,000	800t	+16	80	+6	3200t	32.0
SSC/250,000	140 LS	2500t	+10 LS	55	25 LY	2500t	2500	55%	75	90,000	1000t	+16	100	+6	3825t	38.25
SSC/300,000	130 LS	3000t	+5 LS	65	20 LY	4500t	3000	50%	85	100,000	1200t	+17	120	+6	4500t	45.0
SSC/400,000	120 LS	4000t	+5 LS	80	15 LY	6000t	4000	45%	100	115,000	1600t	+18	160	+6	5250t	52.5
SSC/500,000	110 LS	5000t	+5 LS	100	10 LY	9000t	5000	40%	120	130,000	2000t	+19	200	+6	6050t	60.5
SSC/600.000	100 LS	6000t	+5 LS	125	10 LY	12,000t	6000	40%	150	150,000	2400t	+20	240	+6	6900t	69.0
SSC/750,000	90 LS	7500t	+5 LS	160	10 LY	15,000t	7500	40%	180	175,000	3000t	+20	300	+6	8125t	81.25
SSC/1,000,000	80 LS	10,000t	+5 LS	200	10 LY	25,000t	10,000	40%	225	200,000	4000t	+20	400	+6	9800t	98.0

Starship Hull Type	MAIN BATTERY No.	MAIN BATTERY Maximum Calibre	HARDPOINTS No.	HARDPOINTS Maximum Calibre	MegaBolt Torpedo	StarTorp Launchers
SSC/100	1x2	N*50	x6Fwd.	N*25	—	1x6 ST*157
SSC/250	1x2	N*50	x6Fwd.	N*25	—	1x6 ST*157
SSC/500	2x2	N*50	4x2	N*25	—	1x6 ST*157
SSC/1000	3x2	N*75	4x2	N*25	—	1x6 ST*157
SSC/2500	4x2	N*100	4x2	N*25	—	1x6 ST*257
SSC/5000	4x2	N*125	4x2	N*25	—	2x4 ST*257
SSC/10,000	4x2	N*150	6x2	N*25	—	2x4 ST*257
SSC/15,000	4x2	N*150	6x2	N*25	—	2x4 ST*257
SSC/20,000	4x2	N*200	6x2	N*50	—	2x4 ST*257
SSC/25,000	5x2	N*200	8x2	N*50	MB*500	2x6 ST*257
SSC/50,000	5x2	N*250	10x2	N*50	MB*500	2x6 ST*375
SSC/75,000	5x2	N*250	10x2	N*50	M6*500	2x6 ST*375
SSC/100,000	5x2	N*300	12x2	N*75	MB*500	2x6 ST*375
SSC/125,000	5x2	N*300	12x2	N*75	MB*500	2x6 ST*375
SSC/150,000	6x2	N*300	14x2	N*75	MB*500	2x6 ST*375
SSC/175.000	6x2	N*300	16x2	N*75	MB*500	2x6 ST*375
SSC/200,000	6x2	N*350	18x2	N*75	MB*750	2x6 ST*375
SSC/250,000	6x2	N*350	20x2	N*75	MB*750	3x6 ST*775
SSC/300,000	8x2	N*400	22x2	N*75	MB*1000	3x6 ST*775
SSC/400.000	8x2	N*500	24x2	N*75	MB*1000	3x6 ST*775
SSC/500,000	8x2	N*500'	26x2	N*75	MB*1000	3x6 ST*775
SSC/600,000	8x2	N*750	28x2	N*75	MB*1000	4x6 ST*775
SSC/750.000	8x2	N*750	30x2	N*100	MB*1000	4x6 ST*775
SSC/1,000,000	10x2	N*1000	30x2	N*100	MB*1000	4x6 ST*775

NovaGun Calibre	Turret Mass	Per Gun Cost
N*25	1t	0.2
N*50	2t	0.4
N*75	5t	0.6
N*100	10t	0.9
N*125	25t	1.25
N*150	50t	1.75
N*175	100t	2.5
N*200	200t	3.5
N*225	300t	5
N*250	400t	7.5
N*275	500t	10
N*300	750t	15
N*325	1000t	20
N*350	1600t	25
N*375	2250t	30
N*400	3000t	35
N*450	4000t	50
N*500	5500t	65
N*600	7000t	80
N*750	9000t	100
N*1000	12,500t	125
MegaBolt Turret	**Torpedo Mass**	**Cost/Turret**
MB*500	7500t	90
MB*750	12,500t	175
MB*1000	20,000t	300

MegaBolt turret Contains a triple projector.

StarTorp Calibre	Launchers Mass/Tube	Cost/Tube	Nova Equivalent
ST*157	1t	0.25	N*250
ST*257	5t .	1	N*500
ST*375.	25t	5	N*750
ST*775	100t	10	N*1000

Communications Gear: Interplanetary and Interstellar communicators can be purchased and installed in the models and at the prices indicated in 5.7 Communication Systems (included in Control mass).

EW/ECM Systems: All Starships are capable of mounting comprehensive electronic warfare and countermeasures systems. The cost of such systems is MCR 1.5 for a basic installation, plus MCR 0.25 for each EW/ECM factor per 1000t (or part thereof) of ship's mass. The limit on the EW/ECM rating is Tech Level + 1 for commercial craft and Tech Level + 5 for naval vessels. The mass and volume displaced by the equipment is equal to ~4% of the ship's mass up to 100 000 tonnes displacement. EW/ECM at 10, for instance, would mass 0.005 x 10 x 50000 = 2500t (7500 cubic meters) for a 50 000t spacecraft. All sensor systems, jamming systems, sensor-screens, internal security, etc., are included.

Sensor Range: Basic sensors have a range of 1000 LS. Depending upon the Tech Level of the star-culture producing the equipment, greater ranges are available. Mass/volume of the equipment is included in EW/ECM:

Sensor Range	Tech Level	Cost (MCR)
1000LS	7	0.75*
1500LS	7	1.25
2000 LS	7	1.75
2500 LS	7	3.0
3000 LS	8	5.0
3500LS	8	7.5
4000LS	9	10.0
4500LS	9	12.5
5000LS	10	15.0

* Also the price for a it SensorBuoy.

Astronomical ranges (equivalent to a telescope) are equivalent to a 200" reflector like that at Mount Palomar. Visual mode is typically used for starscans and locating/examining at long range the major planets and planetoids in a star system. It is not capable of effectively detecting small objects at ranges exceeding standard sensor range.

Computer Software: When a ship is purchased, 10% of the computer (not controls) cost is included as software programs of the purchaser's choice. See 5.2 Computers for available programs.

Fuel Capacity & Fuel Consumption: All vessels use a standard Unit of fuel, denoted (#), massing 10 kg (0.01 tonne). Fuel tankage is determined simply by designating the number of units of fuel one wishes to carry aboard. Once designated, that is the capacity of the vessel. Cost of fuel tanks is MCR 0.2 per #1000. The mass of the tanks is "included" in the fuel mass, with #1000 10t/30 cubic meters. The "tanks" are really storage bays for nuclear and antimatter fuel rods and power capsules. Fuel costs = CR 500 per fuel unit (#) for 10 kg.

Atmospheric Streamlining: Starships are not designed for atmospheric entry, but it may be streamlined to permit atmospheric operations. Streamlining costs MCR 0.5 per 100t of displacement and permits light craft (under 1000t) to operate at speeds equal to 175 times TISA LS rating, with speeds measured in km/h. A TISA 40 rating, for instance, yields 9000 km/h at low level. Craft at 1000t displacement or greater can operate at 150 times TISA LS rating, atmospheric speeds being measured in km/h.

Ship's Boats: Starships may be equipped to accept standard short-range auxiliaries for shuttle service. These are detailed later. The Landing bays will be twice the volume of the shuttlecraft.

Life Capsules: All Starships carry Life Capsules, as described below.

Ship's Workshop: Starships may be equipped with workshop facilities to perform major repairs. Mass of workshops is 10t per 1000t of ship displacement, at a cost of MCR 0.1 per 10t of facility.

Mining Unit: A 20t mining system is available for meteor mining and planetary mining, It can process 2d6 tonnes of ore per day to produce 5/100 concentrate (95% reduction of mass of ore to nearly pure form). It also has analysis equipment for use by trained Geologists.

9.10 STARSHIP CREWS

The numbers in the crew of any given class of starship have already been indicated in the basic specifications. The numbers are based upon the duties that must be performed with adequate efficiency and safety. A Starship can function on even a vastly reduced crew status, but as numbers dwindle, problems tend to increase:

Captain: The Captain is a qualified FTL Pilot (Astronaut) and probably a highly qualified Astrogator as well. Captains receive, in addition to standard salaries, special bonuses for the tonnage of commercial ship commanded. Commercial Captain bonuses are +20 CR per month for each 1000 tonnes of the ship's mass displacement.

Pilot: There must be at least one qualified FTL Pilot aboard a Starship. Commercial and naval vessels of 2500t displacement or greater will ship at least 3 Pilots, including the Captain, and the numbers will likely be greater as the mass of the vessel significantly increases. On ships of 10 000t or more, there will be a Chief Pilot, who receives +125 CR per month per 10 000t of mass displacement.

Astrogator: Ships of 2500t displacement and over will require at least one qualified FTL Astrogator in addition to the Captain. Large vessels will have an Astrogation Section with at least one Astrogator per 10 000t of ship's mass. In such an instance, the Chief Astrogator receives a bonus of +100 CR per 10 000t of mass displacement in his monthly paycheque.

Astronaut: The Astronautic Division aboard a Starship includes a fair number of personnel trained in EVA and other uniquely specialised tasks. They also form the gunnery teams to man the armaments turrets and torpedo launchers (or at least to command such positions, which may be manned by Armsmen).

Gunnery Officers: Each main battery turret is commanded by a Gunnery Officer (either an Astronaut or an Armsman trained in Space Armaments). One of these is designated Chief Gunnery Officer and receives +10 CR per month for each 10 000t of mass displacement.

Engineer: There must be one Engineer for every 10 Techs rated in the Starship specifications. One of these will be designated the Chief Engineering Officer and receives a monthly bonus of +10 CR per 10 000t of mass displacement.

Techs: The Technical & Engineering Division is charged with maintaining and repairing all Starship systems. Techs include Com/Techs as well as Power Techs, Drive Techs, Mech Techs, etc. Even if the Technical Division is much reduced in numbers, the Starship can be operated. However, the maintenance time required for routine checking, adjustment, and minor repair of Starship systems (see 4.26 Starship Maintenance and following sections) is based upon crew status at 100%. For each 10% or part thereof the Technical Division is under strength, increase maintenance times by +10%, reflecting the dramatically increasing chance of minor malfunctions and adjustments needed. (Times given in Starship Maintenance are based upon a full complement, with each man performing his share of the duties during his watch.)

Marines: Naval vessels will often ship a complement of Marines. These troops are maintained in second-class quarters and usually do not become involved in routine operation of the ship. They will be active during any space battle, however, standing to in full battle gear to repel boarders or to board enemy vessels grappled with tractor beams. They also will be ready for planetary assault roles. Shipboard duties include security assignments (guard duty, patrol, etc.) throughout the ship.

Medical Section: Whenever a ship has a Dispensary aboard, a MediTech is required. Once the medical facilities are able to handle more than 10 patients, a Physician and a MediTech will be required per 20 patients capacity (minimum; usually, the ratio is 1 Physician and 3 Medi/Techs per 20 beds) in the sickbay. These personnel can be counted in the "Technical" complement. The Chief Surgeon receives +25 CR per 10 beds in the sickbay.

Gunners: Each hardpoint (excepting fixed units, controlled by the Pilot) requires 1 gunner to man the weapon. Turrets have variable crew sizes, depending upon the calibre:

Weapon Turret	Crew	Weapon Turret	Crew
N*50	1	N*450	10
N*75	1	N*500	10
N*100	2	N*600	12
N*125	2	N*750	12
N*150	2	N*1000	15
N*175	3		
N*200	5	MB*500	10
N*225	5	MB*750	15
N*250	5	MB*l000	25
N*275	5		
N*300	7	ST*157	FM@ Pilot
N*325	7	ST*157@@	1
N*350	7	ST*257@@	3
N*375	7	ST*375@@	5
N*400	10	ST*775@@	10

@ Fighter Mount: SSC/100—SSC/500 only.
@@ Per StarTorpedo Tube in the Launch Battery.

Stewards & Pursers: For every 10 passengers aboard a commercial Starship, there will be one steward, with a Purser in charge of each 5 stewards. There will also be one steward in the ship's dining/kitchen facilities for every 20 passengers. These personnel are shipped in addition to the rated crew, and second-class staterooms must be provided for them as well.

Cargo Handlers: About 10%-l 5% of a commercial Starships rated Techs are General Ship's Hands and Cargo Officers, with one Cargo Officer per 10 hands. Ships under 10 000t displacement usually have all crew members doubling up for cargo duty.

Robot Meks: The MekPurr Starships are heavily manned by robotic equipment (see 5.12, Robots). Only about 10% of the personnel aboard are trained, living beings.

Crew Ratings: Starship crews are rated generally when encountered in NPC roles. A 1d10 is rolled 5 times, and the average is taken to find the average skill aboard the craft. If high-level specialists are required, they must be enlisted. Terran and IRSOL warships have skill levels at 6+, others at 4+. Should the die roll fall below these levels, it is read at 6+ or 4+, as appropriate.

9.11 SHIP'S BOATS

Spacecraft are vessel without FTL capacity. These can include large interplanetary liners and cargo transports based upon Starship hulls, but lacking FTL Warp Drives. More commonly, they include the following spacecraft carried aboard Starships as

"boats" or auxiliaries used for ground-to-orbit shuttle service, and for emergency lifeboats.

Specification	Lander	Shuttle	Cutter	Pinnace	Launch
Crew	1—2	1—2	1—2	1—2	1—2
Standard Cargo	250t	100t	60t	15t	5t
Standard Passengers	50	25	20	10	6
Max. Passengers*	550	225	120	40	15
Life Support**	1100 days	550 days	120 days	80 days	45 days
Mass	250t	100t	6Ot	30t	10t
Volume (in³)	1000	500	400	100	30
Powerplant	TISA Fission	TISA Fission	TISA Fission	TISA Fission	TISA Fission
Speed (atmosphere)	5000 km/h	5000 km/h	5000 km/h	6000 km/h	7000 km/h
Speed (space)	10 LS	10 LS	15 LS	20 LS	25 LS
Acceleration	+1 LS	+1 LS	+2 LS	+2 LS	+5 LS
Range	20,000 LS	20,000 LS	20,000 LS	10,000 LS	5000 LS
Landing Mode	VTOL	VTOL	VTOL	VTOL	VTOL
Maintenance	monthly	monthly	monthly	monthly	monthly
Time Maintain	4 hr.	4 hr.	4 hr.	4 hr.	4 hr.
Breakdown No.***	1/4	1/4	1/4	1/4	1/4
Damage Capacity	100	35	20	18	15
Rad. Shield	total	total	total	total	total
Armour	+21+1	+11+1	+11+1	+ 1/+1	+1/+1
Screens	+1	+1	+1	+1	+1
EW Rating	7	7	7	7	7
Sensor Range	1000 LS	1000 LS	1000 LS	1000 LS	1000 LS
Communicator	SSC/4	SSC/4	SSC/4	SSC/4	SSC/4
Air-to-Air	0	0	0	2	8
Weapon Turret	1x4 Blast HMG	1x4 Blast HMG	1x2 Blast HMG	1x2 Blast HMG	1x2 Blast HMG
Cost (in MCR)	12.5	9	6	4	2.5

Each "boat" comes with 10% as spares and parts. It also is equipped with a CR 15 000 Survival Kit, containing medical supplies, rations, a few weapons, tools, etc. One vacuum suit is also included, along with a Jet Pack/CG Harness for EVA work.
*Max. Passenger capacity is at the expense of cargo, with 1/2 tonne of cargo lost per passenger over the standard rating.
**Life Support limit refers to onboard expendables (food, water, oxygen) in man-days of use. A 45 day supply, for instance provides 10 men with 45/10 = 4.5 days of food and water. Air will hold out x1d6 as long, depending upon the efficiency of the air unit, condition of the occupants, and other variable factors. In a shortage condition, the air supply will be known by the crew.

9.12 LIFE CAPSULES

Every ship carries life capsules with an occupancy of 4 persons, with sufficient emergency capacity to take off the entire crew plus passengers. The capsules are mounted in the hull and are included in the basic price + accommodations installed. The capsule is capable of firing retro rockets to inject the capsule into a planetary atmosphere. The rockets will also automatically home the capsule in on any planet within 3 days' range (about 5 LS or 1.5 million kilometres). A CR 1000 Survival Kit is included, and may be stocked as desired. Mass: not relevant; included in hull. Cost: CR 25000; usable once.

10.0 STARSHIP COMBAT

In a universe populated by diverse life forms and cultures, misunderstanding, distrust, and outright hostility toward "aliens" is all too inevitable. Starfarers therefore must be ever vigilant and prepared to do battle in the dark void between the stars. The following rules are presented to cover deep space combat, whether between single ships locked in a running gun and torpedo action, or a mass naval engagement involving the Starship squadrons of rival star systems and Empires.

10.1 BATTLE TIME SCALE

Each starship battle turn represents 300 seconds or 5 minutes of game time, with 20 battle turns in an hour of game time.

10.2 BATTLE VELOCITY & DISTANCE SCALE

In **SPACE OPERA** we envision the velocities and ranges involved in starship combat to be on a vast scale, compared with those in any previous games. In **SPACE OPERA**, all battle distances are measured in light-seconds (LS), a unit of measurement equal to 300 000 kilometres or 186 000 miles, the distance travelled by light in one second.

Starship velocities are stated in terms of the number of light-seconds moved by a starship in a battle turn of 5 .minutes duration. Starship accelerations (the amount by which they can increase or decrease velocity in a battle turn) are also stated in light-seconds.

A recommended standard battle scale is 1 cm = 10 LS or 1/2 inch =10 LS. Metric units are best, because all unit divisions are in tenths
(10mm = 1 cm, etc.)

10.3 SUB-LIGHTSPEED COMBAT

All standard combat will occur below the speed of light (300 LS per 5 minutes). The rules assume that a starship will literally "cease to exist" the moment it begins to touch the speed of light, the vessel being "translated" to FTL hyperspace.

10.4 STARSHIP EW & ECM

SADAR (Sub-Space Anomaly Detection & Ranging) systems sensor-scan from 1000 LS to 5000 LS, the range depending upon the technological level of the producing starculture. Sensors provide functions similar to radar, high powered visual and electromagnetic (radio, X-ray, etc.) telescopy and detection, and science and battle sensorscanners.

Detection: At 100% range, SADAR has a 2-7 chance rolled on 2d6 of detecting a spacecraft. The probability is increased +1 for every 10% closer the ship approaches the "target" or vice versa. If the target is attempting to prevent detection with ECM, the EW factor and the technological level of the detecting ship are added to the 2d6 roll, and the EW (ECM) factor and the

technological level of the "target" are subtracted from the 2d6 roll. If a formation of ships is the "target," +1 DM is gained for each 3 ships (or part thereof) in the formation. If ships are lying "doggo" and are not under anomaly drive, they obtain a -1d6 modifier to the detection chance.

Target Acquisition: Once a "target" has been detected, it appears as a "blip" (or series of "blips") on the sensor's Tri-D screen. Contact, once acquired, will not be lost, and the movements of the "target" will be tracked so long as it remains in the sensor field.

Targets at Minimal Range: Once a SADAR scan is made under 20% range, detection of objects is automatic, including objects in orbit around a star (asteroids, etc.). Any spacecraft under power will be automatically detected as such, but "doggo" craft will not appear to be anything more than a celestial body like an asteroid if forcefield battlescreens, sensordefense screens, and all atomics/antimatter power systems are shut down. If this method of avoiding detection is being used, roll 20d10 to signify the number of "normal" objects detected by the sensorscan. The EW BattleComputer analysis of these objects is at a rate of 1d10 x EW rating every 5 minutes. An EW analysis which equals or exceeds the object count "detects" that the spacecraft is out of the ordinary, and a detailed Sensor Probe may be made. If the analysis fails to scan the spacecraft, the whole procedure is repeated in the next 5-minute turn.

When several spacecraft are making a search, each can roll the EW analysis scan. However, 20d10 will be rolled against each searching spacecraft to simulate the number of objects on its detectors. (It is assumed that the searching vessels will be spread out, and thus each will be scanning at least in part a different volume of space. If desired, the number of objects can be "thinned" out at distances far from a stellar primary to 10d10 at 10000 LS range, and can be increased to 25.d10, 30d10, or even more in asteroid belts. This represents relative densities of objects in various areas of space. Note: "objects" will range from tiny debris to large objects.

SensorProbe: A high-intensity sensorscan can be made of any "blip" to provide a visual image at ranges over 50%, and a full-scale sciences sensorscan under 50% SADAR range. SensorProbes can penetrate the hulls of most vessels, and ships unprotected by Sensor-Defence systems will be "x-rayed" by the TVTK probe so that highly explicit details about the internal layout, number of personnel, power system, and other details will be revealed. If a long time is available, very specific information can be obtained on circuitry and specialised equipment, but this is usually not possible in the period normally covered by a battle scenario. SensorDefense systems will be pre-set to trigger at the first sign of a SensorProbe, usually at 60% on automatic and at 100% if manned by a competent Tech (see ECM/SSDS SensorDefenses in 5.8 Electronic Counter Measures). If the SensorScreen is up, visual details can be obtained, which would include the "target" configuration, number of gun turrets and possible calibre's, number of StarTorp launch tubes, etc. If under TISA manoeuvre drive, the system will give a rating of the engine power, +5% to -5% of the speed and acceleration capability. It also provides the data for Warp Course Prediction & Interception (see 5.2).

Battle Ranging & Gunnery Prediction: The EW capability of a Starship includes the capacity to translate target position into ranging data for the ship's main and secondary armaments, and to pre-set StarTorps for a hyper-speed run toward the target. Hit DMs and defence DMs will be given in the appropriate sections below.

10.5 WARP EMERGENCE DETECTION

It is impossible to emerge from a hyperjump without the event becoming readily detectable by sensors or electromagnetic detectors within range of the point of emergence. The very fabric of Einsteinian space/time is momentarily rent by the translation from FTL to normal space.

A slight "curdling" of space occurs in the region of the emergence point for at least 5 minutes prior to the appearance of a warping vessel. This disturbance in the gravitic/electromagnetic balance of Einsteinian space/time is caused by the linking of the FTL warp of the Starship with its destination point. The time period is increased by 10% of the subjective time experienced by the crew as it travels through hyperspace.

For example, a Starship hyperjumping from Terra to Rigel at warp factor 15 will cover the 900 LY in 1/288 x 900/15 x 24 hours = 5 minutes or 305 minutes. The "curdling" of space at the emergence point will occur 30.5 + 5 = 35.5 minutes before the ship emerges.

The spatial distortion often becomes the initial line of defence in space warfare. Patrol vessels picket the edge of the zone of gravitic disturbance around a star, scanning a large volume of space for any unscheduled warp emergence distortions, and especially for multiple distortions.

Detection is 90% automatic, plus +1% per additional ship emerging, if the detecting ship is in sensor range of the emergence point(s). Depending upon the range of sensors, the number of pickets required to patrol the boundaries of the emergence zones are:

Detector	**Main Sequence**			
Range	**Star**	**Sub-Giant**	**Giant**	**SuperGiant**
1000LS	100	400	1225	2500
1500LS	44	178	545	1110
2000LS	25	100	307	625
2500LS	20	64	196	400
3000LS	12	45	137	278
3500 LS	9	33	100	205
4000LS	7	25	77	157
4500LS	5	20	61	124
5000LS	4	16	49	100

It is unlikely that a number of ships equal to the pickets required will be detailed for patrol duty. However, SADAR "buoys" (similar to 20th century sonar buoys) can be dropped into orbit along the edge of the emergence zone as a DEW (Distant Emergence Warning) system. A single patrol ship can monitor 100 SADAR buoys and maintain them if kept on regular patrol. Commerce is restricted to limited approach lanes, and stiff penalties (fines, etc.) are imposed for triggering a Defence Alert, which brings all Planetary Defence forces and StarForce units to Invasion Immanent status and scrambles the Fleet.

SADAR buoys have a detection range of 1000 LS, so the number required can readily be determined simply by reading along the top line of the table given above. Major planets will have 100% coverage and usually very heavy patrols. Colonial planets will have 40% + 5.d10% coverage. Subtract the coverage from 100%. The result is then subtracted from the 90% automatic detection capability to represent the chance that a ship or formation of ships can slip through. (Smugglers as well as raiders tend to operate in colonial areas; major planets have heavy patrols and a very high risk of detection operating against them.)

There is a chance equal to 7% x expertise of a Science Officer or Com/Tech manning the detectors of determining the emergence point within an error of 10d100 LS. If a failure occurs, the error is increased 1d6 times (added to basic error). The error will not be known to the person or side making the detection. SADAR buoys are monitored by a Watch Officer or Tech, so the percentages apply for them, too. For each additional ship making an emergence at the same point, the error is narrowed by N x 1d10 LS.

Because there is a high chance of detection when invasion fleets are sent in, emergence tends to be outside the defence zone; standard doctrine holds that "surprise" attacks by concentrated forces are almost impossible. If a long hyperjump had been made to the attack point, the warning time might be sufficient for defensive StarForces to mass around the zone of emergence, with weapons and StarTorps registered on the volume in which the invasion force will appear.

Individual spacecraft manned by players can apply the EW rating and the expertise of the Con/Tech in charge of the equipment as a negative DM against detection probabilities. This permits the PCs to operate with some chance of slipping through on a scouting mission or a smuggling run. It is not advised for regular space combat, as it may cause certain undesirable play imbalances.

10.6 WARP COURSE PREDICTION & INTERCEPTION

While it is impossible to detect or to track a ship in hyperspace, Science Officer or Astrogator can analyse the anomaly field frequency used by the target ship as it runs up to light-speed and FTL translation. The Science Officer/Astrogator has a 5% chance x expertise in Astrogation or Hyper- Dimensional Physics of correctly analysing the FTL field frequency. If the data is accurate, the ship's FTL Drive can be engaged to follow the target vessel, with an accuracy such that the ship will emerge within 50.d100 LS of the target's emergence point. If the readings are in error, there is a 9% chance x expertise of the Science Officer/Astrogator that he will detect the error and not initiate FTL pursuit. However, if the warp analysis error is undetected, a random (uncontrolled) hyperjump will occur.

It should be noted that if the pursuing ship is capable of faster FTL travel than the target vessel, it will arrive at the destination first, possibly with enough time to locate the point of emergence and prepare a "warm reception" for the quarry.

10.7 STARSHIP BATTLEARMOUR

No ordinary material can withstand the destructive energies of Starship ordinance, but collapsed matter reinforced by TBX Battle-Screens will. The chief constituent of BattleArmour is an allotropic form of iron known as "collapsium." This silvery, crystalline substance is created under great pressures and temperatures at the core of high density planets and is much sought by asteroid miners in the debris of exploded planets (dating back to the savage Ru'un Wars of ForeRunner Times). It is able to absorb and re-radiate a substantial quantity of energy. It also blocks all radiation and sensor beams.

BattleArmour is rated on the standard armour scale, with +1 being standard light armoured vehicle class. So long as the BattleScreens of the Starship are functioning, the armour rating is added to the protective factor of the BattleScreens. Hits on armour alone score full damage if they penetrate, but only 10% damage if they fail to penetrate.

10.8 STARSHIP BATTLESCREENS

The TBX BattleScreens of a Starship can absorb tremendous amounts of energy. The strength of the BattleScreen is enhanced, first of all, by the armour rating of the hull from which it is propagated. A +8 BattleScreen protecting a +5 hull, for example, has a +13 protection factor.

Each +1 BattleScreen protection factor (not BattleArmour factors) produces a screen protection value equivalent to 10% of the Starships damage capacity, with a minimum of 1000 DC, and a maximum of 75000 DC. Unless penetrated outright, the screens will absorb the full destructive energies of all offensive weapons directed against them. If penetrated, the screens will absorb 10.d10% of the penetrating energy. Once the DC levels of the screens are reduced to zero or below, they will absorb no more energy.

For example, a 500t "Islander" has +3 BattleArmour and +7 Battle-Screens, for a +10 screen protection factor. The DC of the screens is 7 x .1 x 500 = 350, but this is raised to the minimum DC 1000 level. If the energy burst does not penetrate the screen, it will absorb all of the energy up to DC 1000. Each hit will reduce the DC of the screens, however. Suppose the screens took 3 hits causing 300 points of damage. The weapon penetration is only 9, so the screens hold and absorb all 300 damage points, which reduces the screen DC to 700. If, on the other hand, the weapon penetration had been 11, enough to overcome +10 defensive levels, the screens absorb 10d10% of the energy. Suppose the roll was 6, 6x10 = 60% or 180 points of the 300 damage points was prevented from getting through to the hull, leaving 120 to penetrate and be charged against the DC of the Starship.

From time to time a critical hit or an equipment malfunction aboard the target Starship causes a reduction in BattleScreen strength by a given percentage. This strength reduction refers to the DC levels. For instance, a -10% reduction in screens for a 500 DC BattleScreen means that 50 DC are lost (10% of 500). The reduction is charged against the full DC rating of the screens, not current levels.

Once the BattleScreens are down completely and their DC is exhausted, +10% may be restored per hour, plus +1% per expertise level of the Chief Starship Engineer in Force Field Physics or else +1% per expertise level of the Ship's Armourer in Armaments Engineering.

When the BattleScreens fail because of total loss of DC, there is a 20% chance they have broken down (serious single-system malfunction), with +1d6 added to the 1d20 breakdown roll. Until repairs are effected, the screens cannot be brought back up to strength.

10.9 STARSHIP DAMAGE CAPACITY

The DC or damage capacity of the Starship is the number of damage points the hull can absorb before the ship is out of action, power gone, armaments knocked out, and the hull riven through by numerous holes. However, the ship is not as yet destroyed. Once the damage exceeds 100% DC, it is simply immobilised and open to assault by a boarding party.

All damage sustained in excess of 100% MDC (maximum damage capacity; the DC rating), is at double the normal rate. When the damage exceeds 200% of the MDC, the ship's capacity to withstand any further damage is ended, and it explodes as the Powerplant goes critical, etc.

For example, a ship is rated at 10000 DC. When it sustains damage over 10000 points, its MDC has been exceeded and damage is doubled. Suppose it was hit by 600 points in the last turn, and had only 275 DC remaining. The first 275 points of damage reduce the ship's DC to zero, and the MDC is reached. The 325 damage points left are doubled to 650, putting the ship into negative damage levels (-650). When -10000 MDC is reached, the ship is complete junk.

There is also a risk of an explosion each time the ship is struck after the MDC is exceeded. The percentage chance of destructive detonation is equal to the negative MDC as a percentage of the ship's normal DC level. For example, -650 points is 6.5% = 7% of the 10 000 DC, so a detonation which destroys the vessel is possible on a roll of 1-7 on 1d100. The percentage is additive, so if another -1000 points was scored in the next turn, the new percentage would be 1650/10000 x 100 = 16.5% = 17%.

10.10 STARSHIP CREW CAPABILITIES

The various qualities and especially the expertise required of Starship crews for various bonuses in combat are determined as outlined in Crew Ratings (see 9.10). Player characters apply their expertise and qualities as developed at the beginning or during the course of the campaign. Some crews will also be "known," especially those in the Starship of the PCs.

10.11 TURN SEQUENCE

Each 5-minute battle turn is divided into the following segments:

1. Orders: Both sides write movement orders, indicating general course, turns, and speed/acceleration. Fire orders need not be written; fire control is based upon the situation as it develops and is designated after movement.

2. Initiative: Both sides roll 1d6. The highest roll has the initiative conferring +5% on gunfire probabilities due to superior tactics. The die roll is modified on each side by the expertise of the respective Captains in Starship Battle and Leadership.

3. Movement: Both sides move their ships according to orders.

4. Fire Designation: Both sides designate all targets to be fired on with NovaGuns, MegaBolt Torpedoes, and StarTorps.

5. All energy weapons are registered on the targets. fired (simultaneous) and effects are

6. StarTorpedoes are fired. Movement of StarTorps begins in the following turn.

7. Return to #1 for next movement period.

10.12 TARGET SELECTION & RANGE

A starship battle is conducted in 5-minute battle-turn segments. NovaFire between ships is assumed to occur throughout the battle turn. Gunfire is simultaneous, with no side having the advantage of firing first except when the other ship is not closed up for action.

It is permissible to divide the fire of the main and secondary battery NovaGuns amongst several targets. A Gunnery Officer may apply his skill bonuses when engaging a number of targets equal to his skill level divided by 2, the result being rounded down to the nearest whole number (minimum targets = 1). When a ship has an Auxiliary Bridge, which will be the case for any vessel of corvette size or larger, the Assistant Gunnery Officer will train the secondary battery while the Gunnery Officer is engaging the main battery.

If the gun director positions are knocked out or cannot exercise fire control over all of the NovaGuns, Turret Commanders assume local fire control. In most instances, these will be NPCs with a skill level equal to the average skill of the ship's crew. However, if a player-character is a Turret Commander, he will apply his full skill bonus to his turret's fire.

The target is selected at the end of the movement phase of the battle turn, but is assumed to have been under fire throughout the time it was in range during the turn. If the target moved in to launch torpedoes and then withdrew to greater range, fire is directed at the point of nearest approach. Since a torpedo launch is marked by a special counter which is moved after all NovaFire has taken place, the exact position of such a target will be known.
Players are not allowed to measure ranges before designating targets or allocating the number of rounds that will be fired by each gun. Ranges should be judged initially by the Mk. 1 Eyeball. This simulates the effects of enemy ECM (Electronic Counter Measures) to confuse the gunners. Whether it is from an error in the SADAR data, inaccurate computer prediction of the developing battle situation, or plain stupidity on the part of the Gunnery Officer who wasted ammunition, such mistakes add to the general tension of any engagement.

Once the targets have been designated, exact ranges may be measured with tapes or rulers. The range is the distance from the centre of the firing vessel to the centre of the target ship. A dot might be placed on the miniature starship or counter in order to facilitate precise measurement.

If players wish to use the altitude option, the range to the target equals the square root of the sums of the horizontal and vertical distances separating the ships. For example, a ship is firing at a target 400 LS distant (horizontal) and 90 LS "above" the plane of the firing ship. The range for such a three-dimensional situation is the square root of (400 x 400) + (90 x 90) = 410 LS.

10.13 STARTORP FIRE

The StarTorpedo is a hypervelocity missile capable of attaining light-speed. The StarTorp is actually placed and moved on the playing surface for the duration of its run, as if it were a Starship.

StarTorpedoes have a sensor range of only 400 LS. Within that range, they can identify and lock onto a target. At greater ranges, however, they must be guided by the ship's gunnery computer or by a trained Pilot until they reach lock-on ranges and can home in by themselves.

Guided StarTorps can be jammed by the enemy with an ECM/3 Computer programmed communications jamming system on a roll of 13+ on 1d20. The EW of the missile is added as a negative DM to the 1d20 roll, while the ECM of the target is added with a positive DM to the 1d20 roll. Jamming can take place to the limit of sensor range, with one missile target possible per expertise level of the Com/Tech or Communications Officer commanding/controlling the jamming unit. A jamming roll is made each turn the StarTorps are in flight, with the warhead detonating if the missile is jammed (the jamming effect "convinces" the proximity trigger that it has arrived at target).

Self-homing missiles have a 30% chance of hitting the target, subject to the following DMs

StarTorp EW . .	+1% x EW rating
Target has ECM/1 Program	-2% x ECM/EW@
Target has ECM/2 Program (Multiple Image)	-2% x 1d6
Target using AutoNav: Evasive 1	-4%
Target using AutoNav:Evesive 2	-6%
Target using AutoNav:Evasive 3	-8%
Target using AutoNav:Evasive 4	-10%
Target using PilotNav:Evasive 1	-1% x 1/4 Pilot expertise
Target using PilotNav:Evasive 2	-1% x 1/2 Pilot expertise
Target using PilotNav:Evasive 3	-1 x Pilot expertise
Stern Chase Wake Disturbance	-1% x 1d10

StarTorp Calibre	Mass	EW Rating*
ST*157	200 kg	10
ST*257	500 kg	12
ST*375	2000 kg	13
ST*775	5000 kg	15

Piloted and/or Ship Gunnery Computer assisted guided missiles also add the following DMs:

Missile/1 Computer Guidance Program	+1% x Computer Mk.
Missile/2 Pilot Guidance (Naval)	+1% x Pilot Expertise
Missile/3 Pilot/Computer Interact (Naval)	both the above

Note: A Computer can guide missiles equal to 1/2 x its Mk. rating. Pilots can guide only one StarTorp missile at a time.

Counter-missile fire is possible with the secondary guns aboard the ship or any main guns as well, up to N125 calibre. In such instances, the StarTorp will evade fire as if a StarFighter, using the DA dogfighting factor as a -DM. It also counts as a target under 100t (for a total size DM of -25%). Multiple Targeting programs may be engaged to control the guns in the battery and obtain full Target Lock-On and Gunnery Officer bonuses.

Missiles may be launched to attack incoming missiles—StarTorp vs StarTorp. Usually, the ST157 is used in this role because it is much less expensive than heavier calibre's. All DMs apply as given above.

StarFighters may be used to attack StarTorps. In such instances, they add their dogfighting ability to their hit probability.

All StarTorps have a damage capacity of 30. If hit by less, they have a 25% chance of exploding.

Any StarTorp of a lesser calibre may be fired from a launcher of heavier calibre. For instance an ST257 launcher can fire ST257 StarTorps or ST157 StarTorps.

The various statistics for the StarTorp calibre's are as follows:

*Also use as the dogfight factor for Tech/7 equipment. Add +1 for each Tech Level above Tech/7.

Range	Reload	Cost (CR)
x2 300 LS turns	2 turns	25,000
x3 300 LS turns	3 turns	75,000
x5 300 LS turns	4 turns	150.000
x7 300 LS turns	5 turns	250,000

10.14 THE NOVA GUN

The Nova Gun is the ultimate in destructive energy weapons. This series of weapons was first developed from ForeRunner ordinance recovered by archaeologists of the Korelian Empire at the beginning of the present Galactic Era (some 37000 years ago), and the weapons were immediately adopted by the StarFleets of every advanced culture.

Under manoeuvre drive, spacecraft attain such high velocities that ordinary Laser and Blaster fire is simply too slow to be effective. NovaFire is Tachyon-related, "phased" energy which arrives at a target's predicted position within nanoseconds. It derives its energies from KTAM (Klysestron Anti-Matter) charges exploded in the VVR forcefield reinforced ignition chambers of the weapons under stellar core conditions. The resultant bolt of energy passes through hyperspace to emerge at the target position. If the KCX3 energy bolt is correctly "phased" to synchronise with the BattleScreens of the target, a powerful enough bolt will penetrate. Ranges are considerable; the heaviest armaments capable of projecting a pulsed beam to distances of about 1000 LS (some 300 million kilometres) before the sub-space anomaly field of the energy bolt itself dissipates.

The Nova energy bolt produces molecular and atomic disintegration in any matter struck by the charge. A target under NovaFire seems to have multiple nuclear fireballs flaring against its BattleScreens and hull, giving rise to many popular names: NovaGun, Sun Gun, Disintegrator, Needle Beam, and Phaser all being variously applied, depending on the locality.

The heavy naval rifles are mounted in automatic, armoured turrets on the hull of the Starship. Only weapons of Nova calibre's N*150 or less are crew-served. Heavier ordinance requires that the gun crews never enter the turrets when they are engaged and firing. No organism can survive the heat, hard radiation, and matter-distorting forcefields generated in the turret interiors. Heavy-duty servomechanisms perform all manual "crew" functions under the remote control of the turret commander and gun crew. Action stations for the gun crew are located in the turret command room and the magazines beneath the turret inside the armour belt of the hull. It is theoretically possible for the Chief Gunnery Officer to single-handedly fight the ship. In practice, only the MekPurrs have achieved the degree of expertise with robotics to make this a combat efficient procedure. The heavy guns generally require the attention of a living gun crew to obtain maximum performance from the ordinance and the many other systems involved.
The turret "mass" noted in the Starship specifications refers only to the internal control systems and the magazines for the weapons. (External mass is irrelevant for general design purposes.)

The "ammunition" for all NovaGuns is in the form of anti-matter "rounds" which can be readily manufactured by the Chief Power Engineer in the reactors of the Starship. The mass and fuel required to produce a "round" of ammunition for each calibre of NovaGun are given below, along with the cost of purchasing such rounds if there is no one qualified to make them in the ship's reactors (Power Engineer/5+ required). Ship-produced rounds can be made at a rate of 3 per hour x expertise of the Chief Power Engineer. If an Armaments Engineer is aboard, his skill may be added to that of the C.P.E.

NovaGun Calibre	Mass/10 Rounds	Fuel Required	Cost in CR
N*25	250 kg	2	1500
N*50	500 kg	4	3000
N*75	750 kg	6	4500
N*100	1000 kg	8	6000
N*125	1250 kg	10	7500
N*150	1500 kg	12	9000
N*175	1750kg	14	10,500
N*200	2000 kg	16	12,000
N*225	2250 kg	18	13,500
N*250	2500 kg	20	15,000
N*275	2750 kg	22	16,500
N*300	3000 kg	25	18,750
N*325	3250 kg	30	22,500
N *350	3500 kg	35	26,250
N*375	3750 kg	40	30,000
N*400	4000k0	50	37,500
N*450	4500 kg	60	45,000
N*500	5000 kg	75	56000
N*600	6000 kg	100	75,000
N*750	7500kg	150	110,000
N*1000	10,000 kg	200	150,000

Note that the cost in CR refers to the cost of purchasing 10 rounds
of the listed ammo type on the market. This is cheaper to produce
on the ship by a Power Engineer/6.

Some 75% of each weapon position's tonnage rating can be used as a magazine; however, because of the density of the ammunition, only 25% of the volume is occupied by the magazines. If additional ammunition is desired, besides the rounds in the ready magazines, additional stowage is possible in the ship's holds. However, it takes about an hour to replenish the magazine with 5000 kg of ammunition, if manhandling the rounds, and 10 000 kg if using servos. (That rate is per magazine, assuming 5 men working.)

10.15 MEGABOLT TORPEDOES

The Megaeolt Torpedo is nothing mare than a very heavy NovaGun designed deliberately to overload and fire with extra intensity. The result is that each round loses nothing in penetration power over the full range of the weapon. The "Primaries" are mounted in a triple battery in the nose of the warship, covering a 180° arc of fire. Mass and cost of ammunition is triple that of a comparable Nova-Gun calibre because the refractory core of the weapon is consumed with

each shot and has to be replaced with a new one. If the round penetrates the BattleScreens of a target, full damage is inflicted (the screens cannot handle the intensity of a penetrating MegaBolt and do not dissipate any of its power).

10.16 MAIN & SECONDARY NOVAGUN BATTERIES

All Nova ordinance is mounted in batteries of guns of the same calibre.

The main battery consists of armaments of the heaviest calibre in the Starship.

The secondary battery consists of armaments of lighter calibre, used to augment the fire of the main battery but, more important, also to engage small craft attempting to close range to launch StarTorps and to fire upon incoming missiles. There is also a third function:
when the main battery might destroy a vessel outright, the lighter secondaries may be used to cripple the vessel so that it can be captured.

All weapons are turret mounted, with both guns in the turret firing at the same target. The turret itself is used as the unit firing on a target (if hits are scored, both guns register).

StarFighters typically have up to 6 light, fixed NovaGuns in the nose. These fire forward along the StarFighter's current bearing. Special rules govern combat of StarFighters with other StarFighters. When attacking larger ships, the general rules given below will be used.

Main battery turrets have 360° all-around fire. Secondaries can fire only to "port" or "starboard," so only half the turrets can engage any one target. However, all secondaries can fire directly forward or astern.

10.17 NUMBER OF NOVAGUNS FIRING

Determine the number of turrets firing in each battery at a given target. It is standard practice to fire all of the NovaGuns if they can bear, are in effective range, and are of a calibre such that significant damage will be inflicted.

It is not necessary to fire all the guns in the ship at a target.

"Number of guns firing" means guns of the same calibre. When guns of several calibre's are firing, the number of those firing in each battery is totalled separately for purposes of obtaining salvo bonuses. For example, a ship firing 8x N 250s in the main battery and 6x N*25s in the secondary battery is firing 8 guns and then 6 guns in two separate actions, not a total of 14 guns together. Salvo hit probability bonuses are based upon guns of the same calibre, and adding different calibre's together distorts the bonus system.

10.18 RATE OF FIRE

NovaGuns have a rate of fire equal to the full expertise of the gun crews. That is, if the gun crew has expertise/9 in spacecraft Armaments, the turret has a rate of fire of RPG/9. ("RPG" means "rounds fired per gun.") Since we are dealing with two-gun turrets for the most part, that means the expertise/9 gun crew could fire up to 18 rounds in a battle turn. Of course, they could choose to fire fewer rounds to conserve ammunition, but the heavier the rate of fire, the greater the possible damage inflicted upon the target.

Generally, gun crew expertise is an average value for the entire ship. The procedure for determining this will be described later.

10.19 VOLUME OF FIRE

The volume of fire is the amount of damage inflicted upon a target by a gun of a given calibre. NovaGun calibre's also give the damage inflicted; an N*500, for instance, inflicts 500 damage points per round hitting. This volume of fire is multiplied by the RPG of the gun. Thus, returning to the previous example, an expertise/9 gun crew could fire 18 N*500 rounds, for a maximum possible volume of fire of 9000 damage points (18 x 500). In practice, the actual amount of fire striking a target tends to be much less, unless the target is at point-blank range or is moving slowly or not at all.

NOTE: The NovaGun hit and firing tables can be found on card stock in the box containing this game. This is to facilitate photo-copying these much used tables.

STRADDLING THE TARGET

In order for a gun turret to hit a target, the percentage chance of simply getting the rounds into the vicinity of the target must be rolled on 1d100 percentile dice. A 'straddle' means that the shots are more-or-less reaching the target's position; it does not signify actual hits. However, the number of rounds straddling the target will have a very substantial effect on the number of hits scored and the damage thus inflicted.

Consult the NovaGun Action Hit Table to determine the base percentage needed to straddle the target with a turret salvo. Then add or subtract the following modifiers:

Attacker/Defender Tactics Program (Naval)	+1%/-1% x Computer Mk.
Attacker/Defender Battle Display (Naval)	+2%/-2%
Target Lock-On 1 Program, Tech/7	+2%
Target Lock-On 2 Program, Tech/7	+4%
Target Lock-On 3 Program, Tech/8	+5%
Target Lock-On 4 Program, Naval, Tech/8	+6%
Target Lock-On 5 Program, Naval, Tech/9	+8%
Target Lock-On 6 Program, Naval,Tech/10	+10%
AutoNav: Evasive 1, Tech/7	-4%
AutoNav: Evasive 2, Tech/8	-6%
AutoNav: Evasive 3, Tech/9	-8%
AutoNav: Evasive 4, Tech/10	-10%
PilotNav: Evasive 1 (-25% Target Pilot's Expertise)	-1% x 1/4 Pilot Expertise
PilotNav: Evasive 2 (-50% Target Pilot s Expertise)	-1% X 1/2 Pilot Expertise
PilotNav: Evasive 3 (-100% Target Pilot Expertise)	-1% x Pilot Expertise
Initiative	+5%
Gunner Expertise (Chief Gunner or Turret Commander)	+1% x Space Arms Expertise
Per Gun (not turret) salvoing	+1% x (no. of guns + RPG)
Per 10,000t Target is under 200.000t	-1%
Target under 1000t	-5%
Attacker/Defender ECM	+1%/-1% x EW/ECM
Stern Chase Wake Disturbance (30~ to either side)	-1% per 25 LS range

Note that the NovaGun Action Hit Table gives no base percentage to straddle a target for some speeds and ranges. In such instances, the base percentage is zero, and modifiers alone are applied to derive the percentage chance of straddling. Ships moving faster than 220 LS can be hit using this method up to 800 LS range. Ships moving at 300 LS (just below light-speed) cannot be hit beyond a range of 500 LS using this method.

The maximum range for the heaviest NovaGun, the N 9000, is 1300 LS. No target may be hit beyond that range by any energy ordinance. Similarly, no ordinance of lesser calibre may hit a target beyond its effective range.

A roll of 01—05 (unmodified) always straddles the target. A roll of 96—(1)00 (unmodified) always misses the target.

NOVAGUN 8 MEGABOLT RANGES

Th. following weapons have maximum ranges as indicated, beyond which a target cannot be registered for hits:

Weapon	Range	Weapon	Range
N*25	300LS	N*350	700LS
N*50	300LS	N*375	750LS
N*75	350LS	N*400	850LS
N*100	350LS	N*450	950LS
N*125	400LS	N*500	1000LS
N*150	500LS	N*600	1100LS
N*175	550LS	N*750	1200LS
N*200	600LS	N*1000	1300LS
N*225	600LS		
N*250	600LS	MB*500	400LS
N*275	650LS	MB*750	400LS
N*300	650LS	MB*1000	400LS
N*325	700LS		

NOVAGUN ACTION HIT TABLE

Target Speed	Range to Target in Light-Seconds/Percentage Required to Straddle Target																					
in LS	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550
00	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	78	77	76	74	73	72
10	90	89	88	87	86	85	84	83	82	81	80	79	77	76	75	74	72	71	70	68	67	66
20	88	87	86	85	84	83	82	81	79	78	77	76	74	73	72	71	69	68	67	66	64	63
30	86	85	84	83	81	79	78	77	75	74	73	72	70	69	68	67	65	64	63	62	60	59
40	84	83	82	81	79	78	77	76	74	73	72	71	69	68	67	66	64	63	62	61	59	58
50	82	81	80	79	77	76	75	74	72	71	70	69	67	66	65	64	62	61	60	59	57	56
60	80	79	78	77	75	74	73	72	70	69	68	67	65	64	63	62	60	59	58	57	55	54
70	78	77	76	75	73	72	71	70	68	67	66	65	63	62	61	60	58	57	56	55	53	52
80	76	75	74	73	71	70	69	68	66	65	64	63	61	60	59	58	56	55	54	53	51	50
90	74	73	72	71	68	67	66	65	63	62	61	60	58	57	56	55	53	52	51	50	48	47
100	72	71	70	69	66	65	64	63	60	59	58	57	54	53	52	51	49	48	47	46	44	43
110	70	69	68	67	64	63	62	61	58	57	56	55	52	51	50	49	47	46	45	44	42	41
120	68	67	66	65	62	61	60	59	56	55	54	53	50	49	48	47	45	44	43	42	40	39
130	66	65	64	63	60	59	58	57	54	53	52	51	48	47	46	45	43	42	41	40	38	37
140	64	63	62	61	58	57	56	55	52	51	50	49	46	45	44	43	41	40	39	38	36	35
150	62	61	60	59	56	55	54	53	50	49	48	47	44	43	42	41	39	38	37	36	34	33
160	60	59	58	57	54	53	52	51	48	47	46	45	42	41	40	39	37	36	35	34	32	31
170	58	57	56	55	52	51	50	49	48	45	44	43	40	39	38	37	35	34	33	32	30	29
180	56	55	54	53	50	49	48	47	44	43	42	41	38	37	36	35	33	32	31	30	28	27
190	54	53	52	51	48	47	46	45	42	41	40	39	36	35	34	33	31	30	29	28	26	25
200	52	51	50	49	48	45	44	43	40	39	38	37	34	33	32	31	29	28	27	26	24	23
210	50	49	48	47	44	43	42	41	38	37	36	35	32	31	30	29	27	26	25	24	22	21
220	48	47	46	46	42	41	40	39	36	35	34	33	30	29	28	27	25	24	23	22	20	19
230	48	45	44	43	40	39	38	37	34	33	32	31	28	27	26	25	23	22	21	20	18	17
240	44	43	42	41	38	37	36	35	32	31	30	29	26	25	24	23	21	20	19	18	16	15
250	42	41	40	39	36	35	34	33	30	29	28	27	24	23	22	21	19	18	17	16	14	13
260	40	39	38	37	34	33	32	31	28	27	26	25	22	21	20	19	17	16	15	14	12	10
270	38	37	36	35	32	31	30	29	26	25	24	23	20	19	18	17	15	14	13	12	10	9
280	36	35	34	33	30	29	28	27	24	23	22	21	18	17	16	13	12	11	10	9	6	5
290	34	33	32	31	28	27	26	25	22	21	20	19	16	15	14	11	10	9	8	7	4	3
300	30	29	28	27	24	23	22	21	18	17	16	15	12	11	10	7	6	5	4	3	—	—

Target Speed	Range to Target in Light-Seconds/Percentage Required to Straddle Target																				
in LS	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1100	1200	1300
00	71	70	68	67	66	65	63	62	61	60	58	57	56	55	53	52	51	50	48	46	44
10	65	64	62	61	60	59	57	56	55	54	52	51	50	49	47	46	45	44	42	40	38
20	82	61	59	58	57	56	54	53	52	51	49	48	47	46	44	43	42	41	39	37	35
30	58	57	55	54	53	52	50	49	48	47	45	44	43	42	40	39	38	37	35	33	31
40	57	56	54	53	52	51	48	47	46	45	43	42	41	40	38	37	36	35	33	31	29
50	55	54	52	51	50	49	47	48	45	44	41	40	39	38	36	35	34	33	31	29	27
60	53	52	50	48	47	48	44	43	42	41	39	38	37	36	34	33	32	31	29	27	25
70	51	50	48	47	48	45	42	41	40	39	37	36	35	34	32	31	30	29	27	25	23
80	49	48	48	45	44	43	40	39	38	37	35	34	33	32	30	29	28	27	25	23	21
90	46	46	43	42	41	40	38	37	36	35	33	32	31	30	28	27	26	25	23	21	19
100	42	41	39	38	37	36	34	33	32	31	29	28	27	26	24	23	22	21	18	16	14
110	40	39	37	36	35	34	32	31	30	29	27	26	25	24	22	21	20	19	16	14	12
120	38	37	35	34	33	32	30	29	28	27	26	24	23	22	20	19	18	17	14	12	10
130	36	35	33	32	31	30	28	27	26	25	23	22	21	20	18	17	16	15	12	10	8
140	34	33	31	30	29	28	26	25	24	23	21	20	19	18	16	15	14	13	10	8	6
150	32	31	29	28	27	26	24	23	22	21	19	18	17	16	14	13	12	11	8	6	4
160	30	29	27	26	25	24	22	21	20	19	17	16	15	14	12	11	10	9	6	4	2
170	28	27	25	24	23	22	20	19	18	17	15	14	13	12	10	9	8	7	4	2	—
180	26	25	23	22	21	20	18	17	16	15	13	12	11	10	8	7	6	5	2	—	—
190	24	23	21	20	19	18	16	14	13	12	10	9	8	7	5	4	3	2	—	—	—
200	22	20	18	16	14	12	10	8	6	4	2	**Ships travelling in excess of 220 LS Per battle turn have a 00 base percentage to straddle. Apply modifiers only.**									
210	20	18	16	14	12	10	8	6	4	2											
220	18	15	12	9	6	3															

NOVAFIRE SUCCESS FACTOR

The hit determination rolls described previously in fact determine only the number of NovaGun Turrets whose salvoes have arrived in the immediate vicinity of the target. The following table gives the number of rounds that actually hit the target. Multiply the RPG of the NovaGuns times the number of guns hitting the target. Then multiply that result by the NovaFire Success Factor:

Target Speed	TARGET RANGE IN LS																				
in LS	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	1000	1100	1200+
00	.90	.89	.88	.87	.86	.85	.84	.83	.82	.81	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70
10	.88	.87	.86	.85	.84	.83	.82	.81	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68
20	.86	.85	.84	.83	.82	.81	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66
30	.84	.83	.82	.81	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64
40	.82	.81	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62
50	.80	.79	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60
60	.78	.77	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58
70	.76	.75	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56
80	.74	.73	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54
90	.72	.71	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52
100	.70	.69	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52	.51	.50
110	.68	.67	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52	.51	.50	.49	.48
120	.66	.65	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52	.51	.50	.49	.48	.47	.46
130	.64	.63	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44
140	.62	.61	.60	.59	.58	.57	.56	.55	.54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42
150	.60	.59	.58	.57	.56	.55	54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42	.41	.40
160	.58	.57	.56	.55	.54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42	.41	.40	.39	.38
170	.56	.55	.54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42	.41	.40	.39	.38	.37	.36
180	.54	.53	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34
190	.52	.51	.50	.49	.48	.47	.46	.45	.44	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32
200	.50	.49	.48	.47	.46	.45	.44.	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30
210	.48	.47	.46	.45	.44	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28
220	.46	.45	.44	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26
230	.44	.43	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24
240	.42	.41	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23	.22
250	.40	.39	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21	.20
260	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21	.20	.19	.18
270	.36	.35	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21	.20	.19	.18	.17	.16
280	.34	.33	.32	.31	.30	.29	.28	.27	.26	.25	.24	.2i	.22	.21	.20	.19	.18	.17	.16	.15	.14
290	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21	.20	.19	.18	.17	.16	.15	.14	.13	.12
300	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21	.20	.19	.18	.17	.16	.15	.14	.13	.12	.11	.10

NOVAFIRE PENETRATION

Once a target has been hit, it remains to see if the rounds have penetrated the BattleScreens and armour belt. The following table gives the penetration factor of Nova armaments, and also of equivalent torpedoes. The penetration factor is at 25 LS range or less (2.5 cm or 1 inch in scale range.) For each 25 LS increase in range, the penetration drops by —1. Maximum penetration of weapons systems increases by +1 per Tech Level over Tech/7 for NovaGuns up to N*25O, and by +2 for larger calibre's. At 25 LS, NovaGuns and MegaBolt Torpedoes of N600 equivalent or higher will penetrate any armour.

NovaGun Calibre	Penetration at 25 LS	NovaGun Calibre or Other Ordinance	Penetration at 25 LS
N*25	+8	N*375	+28
N*50	+9	N*400	+32
N*75	+10	N*450	+36
N*900	+12	N*500	+40
N*925	+15	N*600	+44
N*950	+18	N*750	+47
N*975	+20	N*9000	+50
N*200	+21	MB*500	+40
N*225	+22	MB*750	+48
N*250	+23	MB*9000	+50
N*275	+24	ST*957	+20
N*300	+25	ST*257	+28
N*325	+26	ST*375	+40
N*350	+27	ST*775	+50

10.20 EFFECTS OF BATTLE DAMAGE

Once a Starship begins to sustain physical damage to the hull (and interior), there is a chance that a penetrating hit will score serious damage to some vital equipment or area in the Starship.

For each penetrating hit, roll 3d6 (one roll per turret or StarTorp hitting the target). If all 3 dice turn up the same number, roll 1d20 and consult the following table:

1d20 Result	Critical Damage	Critical Damage Effect
1	Bridge Hit	Bridge System malfunctions*
2	Drive System Hit	Drive System Malfunctions.**
3	Power Deck Hit	Power System malfunctions**
4	Life Support System Hit	Environmental System malfunctions***
5	Damage Control System Hit	Damage control System malfunctions***
6	Sensor System Hit	Sensor System malfunctions****
7	Computer System Hit	Computer System malfunctions****
8	Main Gun Battery Hit	Main Gun Battery malfunctions*****
9	Secondary Gun Battery Hit	Secondary Battery malfunctions*****
10	MegaBolt Torpedo Hit	MegaBolt Turret malfunctions*****
11	Missile Battery Hit	StarTorp, malfunction*****
12—19	Armour Belt Penetration	+ 1/2d6 x round power in additional damage.
20	Magazine Penetration	Possibility of explosive detonation equal to 1% x calibre of round/40******

*See 4.32.
**See 4.33.
***See 4.34.
****See 4.35.
*****See 4.36.
*****Destructive detonation sets of 10.d10% of the ammunition in the turret magazines. Divide ammo total by No. of turrets, and use this figure as the number of rounds available for the blast.

Player characters acting as individual turret gun commanders, StarTorp Pilots, or StarFighter Pilots who aim for a "specific target" (—10% from hit/straddle probability) have a chance equal to "1 ." rolled on 1d6 of scoring a critical damage hit with a penetrating shot—in addition to the standard 3d6 roll. This special feature is not extended to NPCs run by the StarMaster or under the command of a player.

10.21 CASUALTIES

For each 10% of damage sustained by the Starship, 5% of the crew will become casualties. In the case of small crews, the percentage of casualties must include a "whole" man. For example, a ship with 10 crewmen will not lose casualties until 10% casualty levels are reached, as a "whole" man 10% of the crew, requiring 20% damage to the ship. Casualties are "hors de combat" and cannot join in any boarding action, etc., for the remainder of the battle.

Of the casualties suffered, 60% will be deemed to have "light wounds," 25% have "serious wounds," and 15% are killed outright.

Player characters are never included in the casualty figures from a Starship action. Even if the Starship explodes, if the PC is in space armour or a spacesuit, he finds himself floating in space in the middle of the battle. The nature of Space Warfare is so dangerous that PCs cannot be placed on the same spectrum of risk as NPCs. Too much work goes into developing a PC to make 'lucky shots" a way of ending a promising career. Only direct, personal, face-to. face action should carry a risk of grievous injury or death.

If a destructive detonation occurs, the crew has a chance of reaching the Life Capsules and Ship's Boats. PCs always make it. NPCs have a 50% chance; that is, 50% of the surviving members of the crew, beginning with all the unwounded, will reach the emergency craft and jettison safely. StarFighters have automatic ejection systems which will blast the Pilot (and any other crewmembers) free of the ship if it is mortally stricken. NPCs run as the enemy by the Star. Master have only a 50% chance in such circumstances.

10.22 BOARDING ACTIONS

Boarding will not be considered as part of general battle rules. Ships will simply "finish off" cripples or, when the enemy is reduced to -90% MDC (180% damage taken), the ship can be automatically taken by storm by the boarding party of any Starship or Starships with twice the effective (unwounded) fighting strength.

However, PCs can become involved in boarding actions, either as an offensive or defensive scenario, depending on whether they are the aggressors or the victims of the boarding attack of others. This is a full scenario in itself, requiring that the Starship be mapped out in detail, with a corridor-by-corridor, deck-by-deck, room-by-room close combat and small arms battle raging throughout the ship until all resistance is overcome or else the boarders have been repelled.

In such instances, PCs enjoy a +10% hit probability and a -15% penalty against the hit probability of all enemies in order to give them a ghost of a chance in such savage conflicts. When they are fighting other PCs, the hit bonus is lost. This may seem like a Deus Ex Machine sort of procedure (excessive "interference"), but PCs are not run-of-the-mill people. The combat rules are very savage, and some outside factor has to be introduced to give PCs a better than normal survival factor to live up to the full traditions of Space Opera science fiction, in which the heroes always have the edge over the villains. However, in no instance will the hit probabilities of the enemy be reduced below 5%.

Actual boarding can take place only when a ship is crippled and cannot resist the tractor beams of the vessel attempting to board. This means that the crippled vessel cannot move faster than 20 LS. Also, ships that are more than 3 times the mass of their intended victims may lock on with tractor beams at ranges of 25 LS or less upon a roll of 1 or 2 on 1d6. A vessel caught in this way has a chance equal to 1 rolled on 1d6 of escaping if it has more than 20 LS in speed remaining. If it fails, the Starships are pulled together, hull to hull, and the attackers will blast their way in through the airlocks in 1 turn plus 1 turn per +5 of armour over a base +5 armour rating. Internal bulkheads will take 12 seconds times armour rating of the ship to cut through, or, alternatively, each bulkhead door can be rated at 2 vehicle damage points x armour rating, with access gained once the door is destroyed by small arms fire and explosives. A thermal grenade or thermal charge is typically used to burn through a hole large enough to destroy the locking mechanisms.

The tractor beam is a MMTMX force-field which attracts any object at which it is aimed. Tractor beams are generally ineffective when ships are under anomaly drive above 30 LS. The tractor can be fired' like a gun at ranges under 25 LS and, if a hit is scored, there is a 25% chance of a lock-on. A target vessel proceeding at 30 LS or less will be drawn toward the firing vessel, or, rather, the two vessels will move toward each other. At higher speeds, the lock-on percentage is reduced by 2% per 10 LS of speed above 30 LS.

Ships typically have one or two tractor beam Units aboard, although very large vessels carrying substantial StarFighter complements may have 2-8 tractor projectors to assist in recovery and landing.

Tractor beams are typically used as one would employ magnetic grapples. That is, they catch objects one desires to bring inboard or else act as towing systems. A crippled vessel can thus be towed by another. The speed attained is found by adding the mass of the towing vessel and the ship under tow, then dividing the result into the mass of the towing vessel. For instance, a 5000t Starship rated at LS 90 is towing a 25 000t cripple. The maximum speed under tow Is 90 LS x 5000/30 000 = 15 LS. The same procedure is used for FTL towing, and fuel consumption is increased proportionately. Note that towing at FTL speeds is not possible if the towing vessel is under 5% of the mass of the vessel being towed.

10.23 ORBITAL FORTRESSES

Orbital Fortresses are nothing more, for gaming purposes, than Starship hulls with minimal propulsion used for maintaining Orbit around a planet. They can therefore be constructed by using the Starship design rules, with mass being concentrated in providing armour, BattleScreens, and armaments. Major planets will have a number of these "space stations" in Orbit around them, and they may also be positioned farther out to provide a longer range defence line, using ST775 missiles and StarFighters to harass invading fleets and slow them down so that the local StarForce units may mobilise and position themselves to best meet the strike with a counterattack. Orbital Forts must be neutralised before invasion forces can be landed in strength. Long range defensive Fortress lines may be penetrated.

SpacePort Class	Defensive Installation	Defensive Force.	Repair Expertise	Repair Capacity in Points/Day
AAAAA	x3 1m tonne	x5 Regiments	7—10	50,000
AAAA	x3 750,000 tonne	x4 Regiments	7—10	40,000
AAA	x3 500,000 tonne	x3 Regiments	7—10	30,000
AA	x3 300,000 tonne	x2 Regiments	7—10	20,000
A	x3 200,000 tonne	X1 Regiment	7—10	10,000
B	X1 100,000 tonne	X1 Battalion	6—9	5000
C (outpost)	X1 20,000 tonne	X1 Company	5—8	1000

The defensive Installation is equivalent to a maximum strength hull with maximum amour.

10.24 STARBASES

StarBases are military StarPorts. Depending upon the class of the base, it will be protected by a ground installation equivalent to an Orbital Fortress of a given "displacement." In such cases, Battle-Armour and BattleScreens will correspond to "atmospheric" standards. While such installations are quite secure against attack from space, they will be somewhat vulnerable to ground assault, and therefore a unit of infantry, armour, and aircraft will typically be attached as a defence and security force.

The defensive installation is equivalent to a maximum strength hull with maximum armour.

The defensive forces refer to military organisations as outlined in Space Marines. Players desiring full-scale military campaigns should use that set of rules, available from Fantasy Games Unlimited and its distributors, as a basic handbook on the various military organisations of the races mentioned in these rules. For role-playing purposes, it should be clear that a StarBase will generally have more than enough combat-ready troops to deal with player characters who decide to "shoot up the place."

11.0 STARSHIP ECONOMICS & INTERSTELLAR COMMERCE

A Starship represents a major purchase, and its operation brings considerable expenses as well. With good management and a bit of luck, owning a commercial Starship can be fairly profitable. Exploratory vessels, private yachts, etc., will sometimes require a considerable amount of resources to keep them operating, as revenues will not be so predictable or loans as easy to secure.

11.1 FINANCING STARSHIP PURCHASES

To purchase a Starship, a PC or syndicate of PCs requires a considerable sum of money, usually 10% of the price of the vessel. With that amount of money to put down, loans can be secured from either banks or from the government.

Bank loans are made at 5% interest per year for 40 years on the amount borrowed, up to 90% of the purchase price. This amounts to equal monthly payments of 0.417% of the amount borrowed. The loan is secured with a mortgage title on the vessel. If payments are 6 months in arrears, the bank can repossess it. Terms can be arranged to make payments every 3 months of 1.25% of the amount borrowed. The purchaser can then use the ship in whatever way he wishes to pay off the debt and to make a profit as a free trader, explorer, or miner/prospector.

Governments actively encourage trade in less developed regions they control. This also applies to independent planets. They will frequently grant contracts to small or formative shipping companies, granting them routes between six to ten planets. These contracts will guarantee cargoes and/or passengers so as to assure lesser Star-Ports of necessary traffic. Such contracts can be used to procure bank loans for the purchase of or refitting of Starships by newly formed shipping companies.

Contracted routes will not jump all over a sector, but rather will attempt to link a number of stars in a part of the starsector so that the best possible service is provided. This route will be marked on the sector chart by a series of lines indicating the run, with each leg of the run numbered in the order the starsystems will be visited. (All major Starship Lines use the same system in plotting routes.)

11.2 PURCHASING USED STARSHIPS

It may happen that used spacecraft are available at any SpacePort (the size of the Starship(s) will be appropriate to the SpacePort's traffic.) Such craft will be from 10—60 years old. Roll 1d6 (10s of years) and 1d10 (years) to determine the age. The list price of such vessels will be adjusted by —10% to —60% of the cost of a new vessel. A PC with Merchant expertise can attempt to 'dicker' on the price, with a 7% chance per expertise level of reducing the price of the used vessel by a further —1% x expertise in Merchandising. Used spacecraft will have one malfunction of Starship systems per 5 years of age, which can be repaired by the owner and his friends with technical and engineering training. Unlike new vessels, the used craft will have limited spares and parts, usually about 1% of the list price. Roll for the type(s) of malfunction(s) and their seriousness to determine how much repair work will be needed. Bank loans and/or government contracts can be obtained to assist in the purchase.

Starships over thirty years old will have doubled costs for repairs (due to required updating of systems or to pay for tooling of non-available parts.)

11.3 STARSHIP REVENUES

Starships obtain income from the following sources. The rates given are only general, and they can be subjected to modification (usually upward) by the owners and by special circumstances.

High Passage: A single-occupant stateroom with fairly roomy and sumptuous fittings can be booked for CR 250 plus CR 250 per Light Year travelled. Steward service and cuisine are excellent, and 1000 kg of baggage is allowed.

Middle Passage: A double occupant stateroom can be booked for CR 125 plus CR 125 for each LY travelled. Steward service Is fair to good and cuisine Is good, while 250 kg of baggage is allowed.

Low Passage: A passenger shares a stateroom with three others in this form of 'steerage.' There is very limited or no steward service, ship's rations, and a 100 kg baggage allowance. Booking costs CR 75 plus CR 75 per LY travelled.

Cryogenic Berths (Coldsleep): The passenger is cryogenically frozen and is transported as cargo at a cost of CR 50 per LY. The procedure had been somewhat risky in the past but is now 99% safe and certain of successful revival. Note: Cryogenic Capsules are also used to freeze injured or dangerously ill passengers and personnel until adequate medical facilities are available.

Ship's Recreational Facilities: The bar, gambling, and other conveniences offered to passengers will generate additional revenues. High Passage generates CR 20 + 2d10 per day for each stateroom. Middle Passage generates CR10 + 1d10 per day for each stateroom. Low Passage generates CR 1d10 per day per stateroom. Roll for each leg of the Starships voyage (to the next planet) and multiply the result x days journeyed x occupancy.

Occupancy Rate: A Starship is assured of 40% occupancy. Roll 6.d10% to find out how much the various classes of staterooms and coldsleep are booked over 40%. For instance, a ship has 10 High Passage staterooms. Of those, 4 are booked. If a six turned up on the occupancy roll, 6 x 6% or 36% of the remainder are occupied, or 4 additional staterooms (raise fractions to the nearest whole number.) All revenues from High Passage are thus computed on the basis of 8 staterooms filled. Note: High Passage staterooms will never exceed Middle Passage staterooms in number, and Middle Passage never exceeds Low Passage in number. There are limits to the number of possible passengers in each class of accommodation.

Cargo: All cargo will be carried at the standard rate of CR 40 per tonne for each LY it is transported. A 'tonne' means either 1000 kg or 3 cubic meters of cargo space. The ability to obtain cargo is a direct reflection of the Merchant expertise of the Chief Cargo Officer, who can obtain +5% cargo per expertise level above the basic cargo obtained of 5.d 10% of total space. For example, a ship can carry 145t of cargo. The Cargo Officer has Merchant/8, so he automatically rounds up 40% or 58t of cargo. The 5.d10 roll comes up a 4, so 20% or 29t appears from various sources, leaving the vessel 60% full at a revenue of CR 40 x 87t or CR 3480 per Light Year.

Special Modifiers: The various fares can be modified upward by the following conditions:

1. **War:** Rates can be increased by 25.d10% to represent the higher risks of travel at such times or the additional cost of hiring escort vessels.

2. **Piracy Rampant:** Extensive piracy in the region of a ship's operation will bring War rates for the same reasons as War,

3. **Monopoly:** A subsidised ship may be granted a 'monopoly' on scheduled flights into colony planets, meaning that they will be assured of 75% occupancy and 75% cargo capacity plus modifiers. In short, government agencies assure that the run has a chance of being lucrative by diverting business in the way of the subsidised vessel. A subsidised ship has a flat 35% chance of enjoying such a monopoly into a colony planet, and in carrying cargo/passengers out.

4. **Charter:** If an individual or group is chartering a vessel, the cost of the charter can be just about any figure the owner/captain names, as the run Is not to a scheduled destination and may not bring return passengers or cargo. Generally, the entire Ship's passengers and cargo capacity is purchased at double the usual rate, plus 1d100%. The chance of an NPC charter, of this type is 5% at any planet visited by a free trader (subsidised vessels must complete assigned routes; If their schedule permits a charter diversion it may be accepted so long as it does not take the subsidised vessel outside of Its usual territory.

11.4 STARSHIP OPERATIONAL EXPENSES

There are a number of standard expanses involved in Starship operation:

1. **Fuel:** Starship fuel costs CR 500 per fuel unit. However, it is sometimes possible to obtain fuel at reduced rates. A captain can reduce fuel costs by CR 25 per expertise level in Merchandising, with a 8% chance of doing so per expertise level possessed.

2. **Maintenance & Repair:** There are standard costs for routine maintenance (weekly, monthly and yearly) as outlined in the Starship maintenance and repair section in volume 1.

3. **Crew Salaries:** The ship's crew must be paid on a monthly basis. The type of personnel carried aboard (according to rank, not expertise) can be computed from the standard salaries given for the appropriate career area in volume 1. These rates apply to NPCs. Player characters can work for less (or more) depending upon the Situation. Economies are possible at times, especially aboard small free traders and subsidised vessels if temporary crew are taken aboard to earn working passage.

4. **Landing Fees:** A Starship will incur expenses whenever it touches down at a class A or B StarPort. These landing fees are CR 50 to CR 100 per 1000 tonnes displacement for the first week, and CR 25 per 1000 tonnes per day after that. This rate can be higher or lower in some regions, depending upon the attitude of the local government toward encouraging trade and the coming of 'aliens' into its territory.

5. **Insurance:** Mandatory on any vessel financed by a bank loan, optional on all others. Cost is 1% of the ship's original purchase value (price) per year. Various payment plans are available.

11.5 BANK ACCOUNTS

Interstellar inflation is more or less under control throughout known space as most worlds have learned the hard way about allowing excessive inflation of local currency and its effects on trade. Thus, most currencies are based on the planetary GNP and are tied to the Universal Credit (CR). Bank rates tend to be a conservative 3% on deposits in savings accounts, computed on a monthly basis over the year.

Though some planets might still have inflation in the local planetary currency, all loans and deposits by PCs are made with Interstellar Charter Banks dealing only with stable Credits.

11.6 STARPORTS

In some respects a StarPort is similar to a 20th century international airport or shipping port.

The Field: The landing field is an extensive open area which is fenced for security and for suppression of smuggling (with appropriate patrols around the perimeter). Class 'D' fields are rarely more than a cleared region, but class 'A' to 'C' fields are hard-surfaced with ferroconcrete and advanced 'concrete' materials. All repair facilities (see Starship Maintenance & Repair) and shipyards are located in the field area. One may travel freely anywhere on the field without a visa or landing pass from the local authorities, but protective garments will be required in the landing areas.

The Terminal: The terminal itself contains the usual customs and immigration facilities, booking agencies, restaurants, 'duty-free' shops, and over-night accommodations for passengers awaiting flights. In order to enter or leave (to and from the Field) one must pass through a customs and immigrations check, and weapon sensors will often be used to regulate weapons being carried. Note that all restricted and prohibited weapons will be held at the field gate until personnel return to their ships. Ground transport with Rad shields is provided between ships and the terminal.

The Port Region: Around the field and terminal will be a settlement or perhaps a city which corresponds closely to most ports. In this region crews can arrange for various forms of "recreation" in the 'red light district,' purchase supplies and equipment for the vessel, book cargoes from local shippers, etc. It is also the jumping off point for crewmen and passengers proceeding elsewhere on the planet, and vehicles, airline tickets, etc., can be obtained. On some planets, especially those with Dictatorships or Religious Dictatorships, the port region is regarded as the limit beyond which visitors cannot go without special permission, visas, etc.

Orbiting StarPorts: Ships over 50,000t displacement are typically unable to land on planetary surfaces. Planets with class 'A' or 'B' Star-Ports will maintain orbiting space stations with repair facilities and terminal facilities corresponding to those on the ground to service such vessels. Class 'C' and 'D' StarPorts may have limited orbital facilities, but it is unlikely. Cargoes are off-loaded onto local shuttlecraft for transportation down to the planetary surface, where they are then passed through customs. Class 'D' StarPorts typically have limited shuttle capability, so large vessels may have to employ their own shuttles to transport cargo quickly to the surface and avoid delays.

SpacePort Ratings: StarPorts have already been rated for their repair and building facilities (see Starship Maintenance). SpacePorts with AAAA ratings are as 4 A StarPorts in capacity, etc. It may also help players to view StarPorts as conventional airports of today. Class 'A' StarPorts are similar to major international airports (N.Y., Chicago), with a large number of space lines offering runs within the sector and to other starsectors on a regular basis. Class 'B' StarPorts are equivalent to major city airports with fairly regular service within the starsector but only intermittent service to other starsectors. Class 'C' StarPorts are equivalent to small city airports, with somewhat spotty regional service (often by small, independent carriers) and exceedingly rare service to other starsectors. Class 'D' StarPorts are very small landing fields with limited repair and port facilities, offering local transportation within the starsystem and only occasional service to other star systems in the starsector. Note that planets with AAAA or AAA, etc. may have several ports rather than one huge port.

StarPort Defences: Most StarPorts are located near or adjacent to naval StarPorts (which have been described previously) and will have their defences provided by the naval authorities.

extraterritoriality of Starships: In most regions, a Starship is regarded as a piece of territory of its planet of registry, and local authorities cannot enter it without obtaining diplomatic permission from the foreign service representatives of the Starships home planet. IPA and naval authorities have the right of entry whenever ships of their interstellar grouping are involved, if any suspicion of the commission of an interstellar offence exists. Violation of the Starships 'extraterritoriality' by foreign powers is often regarded as a major breach of interstellar relations and may be viewed as an act of war. Weapon control laws and other restrictions applied aboard ship are those of the planet of registry.

11.7 TRADE & COMMERCE

A free trader or subsidised Starship with free cargo space may attempt to speculate by purchasing goods and then attempting to sell them at a profit on another planet. A week is required to arrange for the purchase and delivery of the goods to the ship.

The price of goods for purchase or resale is determined by rolling 3d6, adding or subtracting the modifiers given for Merchandising skill, and for the type of planet upon which the transactions are made. The resulting percentage indicates the purchase/resale value of the goods at a given location. Note: minimum modified score is always —3, and the maximum is 35.

3d6 Roll Value					
—3	40%	10	105%	23	190%
—2	45%	11	110%	24	200%
—1	50%	12	115%	25	210%
0	55%	13	120%	26	220%
1	60%	14	125%	27	230%
2	65%	15	130%	28	240%
3	70%	16	135%	29	250%
4	75%	17	135%	30	260%
5	80%	18	145%	31	275%
6	85%	19	150%	32	300%
7	90%	20	160%	33	325%
8	95%	21	170%	34	350%
9	100%	22	180%	35	400%

Merchandising modifiers are -1 per expertise level for purchasing and +1 per expertise level for selling goods. The Cargo Officer's Merchant skills are normally applied.

Population modifiers are -3 for worlds under 1 billion, -2 for worlds under 5 billion, and -1 for worlds under 10 billion, applied when attempting to sell goods.

Worlds themselves influence the purchase/selling price. The following table gives the DMs applied to the 3d6 roll for RI (Rich Industrial), P1 (Poor Industrial), AI (Average Industrial), RA (Rich Agricultural), AA (Average Agricultural), and PA (Poor Agricultural) planets.

Trade Goods	Unit Base Price	Unit	RI	AI	PI	RA	AA	PA
Industrial Metals	1500	t	+5	+3	+1	-1	-2	-3
Silver	1000	kg	+3	+2	+1	+0	.1	-3
Gold	25,000	kg	+0	+0	+0	+0	+0	+0
Platinum	40,000	kg	+6	+5	+3	+0	-2	-4
Thorium	250	kg	+3	+2	+1	+0	-1	-3
Uranium	500	kg	+4	+3	+2	+0	-1	.3
Irridium	30,000	kg	+3	+2	+1	+0	-1	-2
Collapsium	50,000	kg	+6	+4	+2	+0	-1	-3
GemStones	100d100	gem	+3	+2	+1	+0	-1	-3
Machine Tools	50,000	t	-4	-2	-1	+0	+2	+4
Factory Equip't.	75,000	t	-4	-2	-1	+1	+3	+5
Mechanical Parts	50,000	t	-3	-1	+0	+1	+2	+4
Electronic Parts	100,000	t	-5	-3	-2	+0	+2	+5
Computer Parts	150,000	t	-6	-4	-2	+0	+2	+5
Cybernetic Parts	175,000	t	-4	-3	-1	+0	+3	+5
Petrochemicals	2500	t	+4	+3	+1	+0	-1	-2
Industrial Chain.	5000	t	+4	+3	+1	+0	-2	-4
Vehicles	variable	item	-4	.3	-1	+1	+2	+3
Aircraft	variable	item	-4	-3	-1	+1	+3	+4
Military Equip't	variable	item	-4	-3	-1	+1	+2	+3
Foodstuffs	1000	t	+9	+7	+4	+0	-3	-6
Textiles	2500	t	+3	+2	+2	+0	-1	-3
Polytextiles	5000	t	-3	-2	-1	+0	+2	+3
Furs	25,000	t	+5	+4	+2	+0	-2	-5
Liquor/Wines	10,000	t	+4	+2	+0	.2	-3	-4
Luxury Goods	50,000	t	+5	+2	+0	+3	-2	-4
General Tools*	variable	tool	-3	-2	+0	+2	+2	+2
Misc. Equip't.	variable	item	-3	-2	+0	+2	+2	+2

See equipment lists for basic prices. Use 'discount' purchases to compute the wholesale value of an item and the full retail value to compute any resale values.

The amount of goods that can be sold at any port of call is 10% + (1d6 x Merchant expertise of the Cargo Officer/Trading Officer handling the merchandising. Roll 1d6 for the number of days required to sell off that amount of goods. Note: see Trade Acceptance Index in the section on Culture.

12.0 WORLD CREATION PROCEDURE

Before the StarMaster begins to design a Universe for his campaign, he should study the basic guidelines set out in section 13 and especially section 14 of these rules. Those sections contain a capsulated explanation of relevant conditions for rational design of worlds on a realistic basis.

12.1 MAPPING THE STAR SECTOR

The StarMaster should not attempt to create the "entire" Universe of his campaign all at once. Rather, he should start with a "sector" of space perhaps 100 or 200 light years on a side (in cubic form). Do not use hex sheets. These are admirably suited to mapping out regions of ground, but they have no valuable function in designing a region of space. In fact, they are almost impossible to use
efficiently in three dimensions. Since space is very definitely three dimensional, a large sheet of blank paper is most useful.

Using a cube 200 LY on a side, the vertical ("V") dimension should be divided in two, with the "0" (zero) line acting as a plane passing across the entire middle of the cube. All vertical measurements should be counted upward as (+) LY of distance, and all vertical measurements downward should be counted as (-) LY of distance. The central point should be the "marker star" or the brightest or most important star/star system in the cluster. All other stars in the sector cube will be positioned relative to this star.

Each star can then be placed as desired anywhere on the map. Beside each star two notations should be made initially: the Type/ Subtype of the star and its distance in (+) LY above the "0" plane or in (-) LY below the "0" plane, up to +100 LY or -100 LY.

At this point, every single star/star system has been located relative to all the others, and measurement of the distance between any two stars is a simple matter of using a ruler to find the scale difference, and then using simple geometry of right-angled triangles to find the exact distance between them. The following simple star chart is offered as an example of how easy the mapping procedure is, and how easy it is to plot distances between stars/star systems.

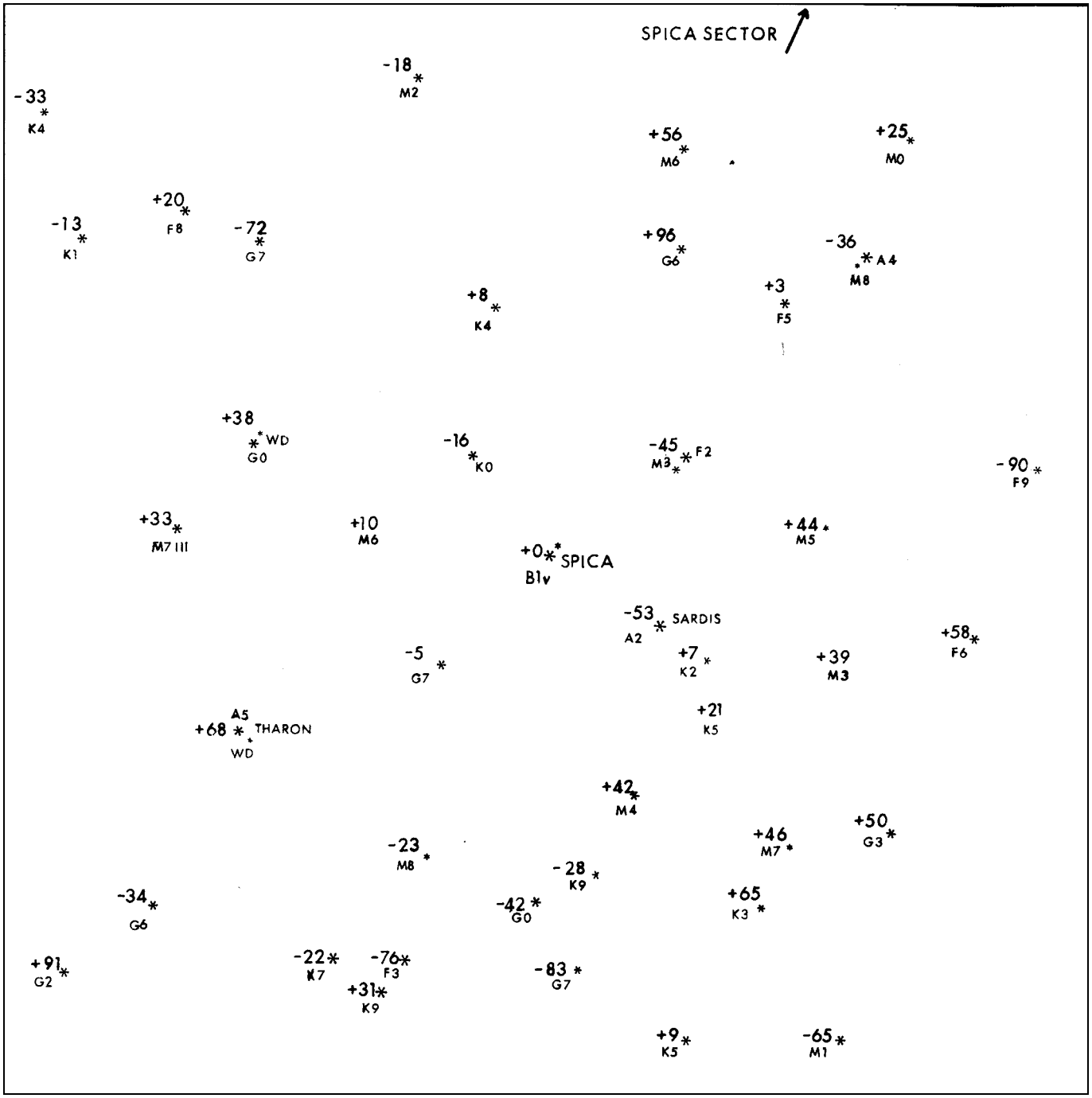
The region mapped is the Spica Sector, a volume 200 LY x 200 LY x 200 LY. The scale is 1 mm = 1 LY, but the map has been reduced slightly, so player measurements will be slightly in error. A Starship is shaping course from the Tharon system to Sardis III, a distance of 72 LY, measuring on the map with a ruler. However, the two Star systems are at different "altitudes." Tharon is at +68 LY, while Sardis is at -53 LY, a difference of 68 + 53 = 121 LY. Using the geometric rule that the hypotenuse of a right-angled triangle is equal to the square root of the sum of the other two sides, squared, we obtained the formula:

$$\begin{aligned} \text{DISTANCE} &= \sqrt{((72 \times 72) + (121 \times 121))} \\ &= \sqrt{(5184+14{,}641)} \\ &= \sqrt{19{,}825} \\ &= 140.8 \text{ LY} \end{aligned}$$

Anyone with a pocket calculator can perform this computation in seconds. Using trigonometric functions will be even faster.

Spica itself can be used as a general "marker" star, and it can be placed on a large volume map to signify the general location of a particular star cluster, however distant it is from Terra. (Spice is 220 LY from Terra, which lies in the general direction indicated by the arrow at the edge of the map.)

Note that only a relatively few star systems have been plotted. In a volume of space encompassing some 8 000 000 cubic light years, one would find an average galactic density of some 32 000 stars, while an open cluster would have around 60 000 stars. One can imagine the headaches to be encountered in mapping that lot! Furthermore, most of these stars will be small, dim, cool "M" Type stars with very low probabilities of having any planets at all, at least inhabitable by the races contemplated for role play and military campaigns. It is enough to plot 40-100 stars for a starter (the Spica Sector marks 41 out of some 43 000 stars in the region). More can always be plotted later. Names can be assigned the major star systems, and some form of number/ letter designation can be used for the others. The sample map contains only Spica, Tharon, and Sardis as designated Star systems to avoid cluttering such a small diagram. In actual practice, all stars shown should be designated by some form of identifying notation so that players and the StarMaster can make ready reference to them.



If one wants to randomise the types of stars, simply mark a star or rather a bunch of stars, on the map. Then roll 1d100 and refer to the following probabilities:

Most star systems will have Type "F". "G", "K", or "M" primaries.

1d100 Result	Stellar Type	Star Size
01—03	'F' Type	99% main sequence dwarf; 1% sub-giant, giant, etc.
04—12	'G' Type	99% main sequence dwarf; 1% sub-giant, giant, etc.
13—26	'K' Type	99% main sequence dwarf; 1% sub-giant, giant, etc.
27—99	'M' Type	99% main sequence or dwarfed star; 1% sub-giant, giant, etc.
00	Special: Star can be a Type 'A' (01-90), Type 'B' (91-99), or a special star, Such as a Wolf Rayet, '0' Type or a variable star, etc.	

12.2 PLANET OCCURRENCE

The chance of a designated star having planets and, if it does, the chance that there might be inhabitable planets, can be determined from the following tables:

Stellar Type	% Chance of Planets	Comments
WR	5%	No planets inhabitable
O	10%	5% that planet will fall in 01.34 range
B	15%	8% that planet will fall in 01-34 range
A	25%	10% that planet will fall in 01-34 range
F	50%	20% that planet will fall in 01-34 range
G	75%	25% that planet will fall in 01-34 range
K	50%	20% that planet will fall in 01-34 range
M	50%	No planets of types 1-9, 13, 15; Only Types 10-12, 14,16-19

If the star has planets, roll 2d6 for the number. Then roll 1d100 to find whether or not planets of the type indicated in the Comment section exists. If so, there is a 10% chance of two such planets and a 1% chance of three such planets.

The chance of sentient life on a planet is 5%. If so, refer to the Cultural Contact Tables for details. (See Section 13.)

1d100 Result	Type of Planet	Class	Indigenous Pop. DM	Colony Pop. DM	Agricultural DM	Industrial DM
01	Type 1 Standard Terran Planet	A	+5	+5	+5	+5
02	Type 1 Terran Steppe Planet	A	-1	+3	+7	+0
03—04	Type 1 Terran Arid Planet	B	-4	+1	-5	+0
05—06	Type 1 Terran Desert Planet	C	-6	-1	-7	-2
07	Type 1 Terran Jungle Planet	B	-5	+1	+4	-4
08—09	Type 1 Terran Tundra Planet	C	-6	-1	-5	+0
10	Type 1 Terran Ocean Planet	B	-6	+0	7	-4
11	Type 2 Terran, No Seasons	B	-5	+0	+0	+0
12—13	Type 3Terran, Extreme Seasons	D	-7	-2	-7	+0
14	Type 4 Terran, at Outer Ecosphere	C	-6	+1	-4	+0
15	Type 5 Terran, No Season, Outer Eco.	B	-5	+2	-2	+0
16	Type 6Terran, Extreme, Outer Eco.	C	-7	-6	-7	+0
17	Type 7 Terran Desert, Inner Eco.	C	-7	-6	-8	+0
18	Type 7 Terran Jungle, Inner Eco.	B	-6	+0	+5	-4
19	Type 8 Terran, No Season, Inner Eco.	B	-7	+0	+5	+0
20—23	Type 9 Terran, Extreme, Inner Eco.	D	-8	-5	-8	+0
24—25	Type 10 Terran, Eccentric Orbit	D	-8	-5	-9	+0
26—27	Type 11 Terran, Eccentric Orbit	D	-8	-5	-9	+0
28—29	Type 12 Terran, Eccentric Orbit	D	-9	-5	-9	+0
30—31	Type 13/7 Desert Planet	D	-7	-1	-9	+0
32	Type 13/7 Jungle Planet	C	-7	-2	+2	+0
33	Type 13/8 No Seasons	C	-7	-2	+0	+0
34	Type 13/9 Extreme Seasons	D	-8	-5	-9	+0
35—40	Type 14Terran, Beyond Ecosphere	D	-8	-3	-7	+0
41—42	Type 13 Airless/Low Pressure	DL/DA	-8	-2	-9	+2
43—44	Type 14 Airless/Low Pressure	DDD	-8	-3	-9	+2
45—47	Type 15 Airless/Low Pressure	EL/EA	-8	-4	-9	+2
48—55	Type 15 High Pressure	EE	-9	-5	-9	+2
56+	Types 16—19	F	nil	-5	-9	+2

12.3 POPULATION

The population levels on inhabited planets will be affected by general planetary conditions, as will the agricultural or industrial activities conducted on the planet. Take note of the agricultural and industrial DMs. The population levels can be noted on the Contacts Service Report form. Roll 1d10, with minimum -4 modified results.

Pop. Level	Native Population	Colony Planet Population	Colony Status	Colony StarPort
-4	100,000	10.	Outpost	E
-3	250,000	100	Outpost	E
-2	500,000	1000	Outpost	E
-1	750,000	5000	Outpost	E
0	1,000,000	10,000	Outpost	E
1	5,000,000	25,000	Outpost	E
2	10,000,000	50,000	Colony	D
3	25,000,000	100,000	Colony	D
4	50,000,000	250,000	Colony	D
5	100,000,000	500,000	Colony	C
6	250,000,000	750,000	Colony	C
7	500,000,000	1,000,000	Colony	B
8	1,000,000,000	2,500,000	Colony	B
9	5,000,000,000	5,000,000	Colony	B
10	7,500,000,000	7,500,000	Colony	A*
11	10,000,000,00C	10,000,000	Associate	AA*
12	12.500,000,000	15,000,000	Associate	AAA*
13	15,000,000,00C	25,000,000	Associate	AAAA*
14	20,000,000,000	50,000,000	Associate	AAAAA
15	25,000,000,00C	100,000,000	Associate	AAAAA

* Naval StarPort of equivalent status is also present (also in AAAAA)

Players should note that planets which base their economies to any great degree on tourism will tend to have Class A SpacePorts, regardless of population figures.

12.4 GENERAL PLANETARY DESIGN

At this point, StarMaster discretion should come into play. The following factors are open for his discretion:

1. Designation of planetary diameter and density, which yields the gravity experienced on the surface. See 15.4 Planetary Size.

2. General planetary conditions are described in 15.5 General Planetary Conditions. The descriptions correspond to the planetary types noted above. It might be noted that the stellar determination tables made no provision for binary or triple star systems, but these can be expected to occur anywhere from 10% to 25% of the time. If the Starmaster desires, he can introduce multiple "suns" when desirable. These can have an effect on surface conditions.

3. The StarMaster can decide on the Hydrographic Conditions (see 15.7) where the situation is not clearly indicated in the planetary determination table, as in the case of a Type 8, for instance. A "Standard" Terran "A" class planet, however, will closely resemble Terra. In the final analysis, the StarMaster's decision is final.

4. Atmospheric conditions can be developed according to the guidelines presented in 15.8, Breathable Atmospheres. Pressures are more or less in the standard Terran range (500mm to 1500mm for planets 01-40 on the planetary determination table. The others are subject to the conditions indicated or else are open for complete discretionary determination by the StarMaster. Type "A" planets will generally have very breathable atmospheres suitable to supporting Terran life without any serious contaminants or dust concentrations. Type "B" planets may have a few "surprises" in store, as may types "C" and "D".

5. Special conditions, such as meteor infall, vulcanism, unusually high background radiation, might exist. These can be assigned as desired.

StarMasters should use the population figures as a general guide to the severity of the surface conditions, particularly in the case of planets diverging significantly from a standard Terran planet. Low population figures, whether native or colonial, indicate that the planet has drawbacks. Class A and B planets are generally favourable to life, class C planets less so, while class D, DD, etc., are definitely lacking in environmental advantages to life.

Basic planetary data can be entered on the Interstellar Survey Report form.

13.0 CULTURAL CONTACTS

The following section presents data concerning the nature of a particular culture that has been contacted by explorers, the Contact Service, traders, etc. Information about a planet and its sentient inhabitants can be quite exhaustive. However, if players are patient, they will find that the results are well worth the effort, for planets will make sense demographically, politically, and economically.

The Contacts Service Sentient Race Report is used to record the data obtained. Note that some of the data is based upon the information contained in the Survey Service Report of the planet. Only planets designated as major Home Planets or colony planets of existing stargroupings, or new planets with native sentient populations, are reported on this form. An uninhabited planet is Simply there for the developing.

Newly discovered, uninhabited planets can be developed at a cost equal to 5 years' revenues from a minimum population rating of "1" on the colonies per capita potential (the planet is worked out as if it had a population of 25 000, and the total income (not taxes) that 25 000 people could generate there is computed for a 5-year period. This represents the initial investment to establish a colony of 25000 in 5 years. Each 5-year period after that sees a flat 10% chance that the colony moves to the next category if it is a "poor" planet, 20% if it is an "average" planet, and 30% if it is a "rich" planet.

13.1 SENTIENT RACE TYPE

Usually, a human or humanoid race will be encountered, but the others should not be ruled out. The StarMaster is encouraged to either decide the type of race on his own, or to make up several sets of probabilities tables for the races included in his campaign, so that he can have a different chance of a given race appearing in different sectors of his universe.

13.2 POPULATION LEVEL

Enter the population as determined in section 12.3. StarMasters are free to designate any suitable planet as being inhabited any time they wish. The 5% chance of sentient life rule is a general guide to unexplored, "new" planets, not to every planet ever encountered. One must assume that others had done some exploring, too, and got there first. In other words, the StarMaster will have to decide which planets have "native" populations, and which are colonies. It is also possible to have "Lost Colonies" which had contact broken with the Home Worlds and may have sunk to lower technological levels than the founding planets. They may have been lost for a time sufficient for them to develop "native" population levels instead of the much more limited colonial levels.

13.3 MAJOR CITIES/POPULATIONS/STARPORTS/ DOCKING CHARGES

All such matters are purely for the StarMaster's discretion as a function in creative world design. Several major cities and their populations should be described for "local colour," as spacefarers will likely touch down there. The class of StarPort will generally be a class A to AAAAA for a planet with a strong economy and Tech/7+. Colonial planets are rated in section 12.3, and the same ratings can be used for non-subject or non-member worlds which have had trading facilities put in by spacefaring starcultures. For instance, Terra would have a class B StarPort constructed somewhere on its surface if a spacefaring race had established contact and had opened up regular trade with that world of somewhere between 4 and 5 billion souls. Docking charges are merely the per day charge per 1000t of hull for landing privileges. These rates can vary, depending on the StarPort and the culture, but fees generally run a minimum of CR 100 per day for l000t (or less). Many vessels will therefore orbit the planet until cargo is to be embarked or offloaded.

13.4 SOCIAL ORGANISATION

The manner in which a society is organised will have a significant effect on local customs and what can or cannot be done by members of society, or by strangers visiting the area:

"Open" Structured Societies: The position one holds in society is the result of "merit"—pure ability to rise to the position desired. No serious barriers are placed in the way of those born into "lower class" positions, and no exceptional privileges are granted to those born into the "upper classes" (although advantages may accrue because of better access to material resources which can provide improved education, business contacts, etc.). Before the law, all are "equal" and have the same basic "rights." Example: United Federation of Planets.

"Corporate" Societies: Government and the Company are one and the same thing. A planet will be governed by the most powerful corporate entity or else a coalition of powerful companies, with the Board of Directors having ultimate control over the society. Advancement is determined by such factors as loyalty to the Company, personal "favour" by superiors in the Company management hierarchy, and sometimes by merit, as one's value to the Company is rewarded by promotion and material profit. The "citizen" is typically born into the Company, is educated by the Company, is employed by the Company, and is cared for in sickness and old age by the Company. Individual rights are overridden by contracts of employment and Company options to "trade" the contracts of employees amongst each other. Small business concerns must obtain the favour and support of large corporations to do business. Example: Mercantile League.

"Socialist/Communist" Societies: In "Socialist" forms, some types of "free" enterprise are allowed under massive government regulation and almost prohibitive levels of taxation. "Communist" forms deny individuals even a minimal amount of free trade, although "farmers' markets" and the like may be allowed if produce is sold at government-set rates. Generally, the aim is to produce the "classless" society, with everyone "equal" in every way. Underlying this myth is a powerful, entrenched ruling class, The Party, which represses all political alternatives, muzzles and/or shoots dissidents, and gives "rewards" (read "outrageous privileges") to loyal Party Workers. Such societies are prepared to share all—all that YOU have, that is! Example: The Galactic Peoples Republic of GPR, and the Invincible Realm of Hissss'Tah (the Hissss'ist).

"Aristocratic" Societies: Including all forms of social organisation which accord hereditary "nobility" to a privileged, ruling class, Aristocratic Societies range from primitive feudal societies to highly advanced Imperial societies. Lower ranking members of the society usually depend upon the favour and influence of the privileged classes to attain high military or political rank. Nobility is a reward for notable service. In strongly governed aristocracies it is usually the King or Emperor who bestows noble rank upon a commoner. Examples: The Kingdom of the Balrad, the Lords of the MekPurr, and the Oligarchs of the Whistlers. The Khanate of the Ranan Horde might also be included here,

although it evidences both communistic and tribal/feudal elements of social organisation.

"Caste" Societies: Societies using hereditary castes to maintain a rigid and unchanging status quo are "caste" societies. They may start off as any of the social types described above, but once "tradition" and "custom" attain dominance of the social order, virtually all capacity of individuals to exercise any upward mobility ceases. Things are done a certain way because—well, that's the way they are done, that's all. There is a high level of resistance in all castes to any attempt to alter existing patterns of behaviour, production, government, law, etc. No matter how downtrodden one of the low castes may be, there is an ingrained fear of "making things worse." Through generations of social conditioning, everyone would rather live with what is known or predictable, rather than to take a chance on the new and the unknown.

"Primitive" Societies: All low technology cultures, usually on the clan or tribal/feudal level, are classed as "primitive" societies. The precise nature of a given culture can vary widely, but it is a seminal or early form of social organisation—essentially "simple" and suited to small numbers of people who live face-to-face and base most relationships on personal levels or upon custom and tradition. Often, these are "Warrior" cultures, like those of the Amerinds or the Zulu of Terra, or even more primitive aboriginal cultures like those of the Bushmen or the Australian aboriginals. Cultures of this type will not withstand the cultural shock which comes with contact with advanced societies. Thus agencies like the Contacts Service act to protect "primitive" peoples until they can evolve in their own way to join interstellar society. Such cultures are mercilessly exploited and enslaved by unscrupulous starcultures and mercantile adventurists, if not exterminated outright.

13.5 SOCIETAL STRENGTH

A scale of 1 to 10 is used to rate the nature of a given society. A "1" signifies a collapsing society, either anarchic because the social institutions cannot cope with needs of the citizenry; government, law enforcement, and the courts are incapable of maintaining order or protecting property and persons. Some are "caste-oriented" and rigid in their thinking and will not survive significant changes in conditions, collapsing into disorder when the status quo is disturbed. A "10" signifies a very strong society, highly resilient to sudden changes because of the sheer determination of the people and the social institutions to survive and adapt. Roll 1d10 for all social organisations. The following limits apply:

"Open Society":	1-10 range; Terran Union planets will not score below 5.
"Corporate Society":	1-10 range.
"Socialist Society":	1-8 range; 9or 10 rolls again,-1.
"Communist Society":	1-7 range; 8, 9. or 10 rolls again, -1.
"Aristocratic Society":	1-10 range.
"Caste Society":	2-5 range; roll is 1/2d10, with minimum 2 signifying that a serious threat to the culture will precipitate a major crisis 75% of the time, with the percentage decreasing by -10% per point above 2.
"Primitive Societies":	1-3 range (divide 1d10 result by 3, rounding down to nearest whole number.)

13.6 XENO-ACCEPTANCE FACTOR

Roll 1d100 and subtract -10 for each Societal Strength point of the culture. The result is the percentage chance that a member of the culture will be prejudiced in his dealings with an "alien" not demonstrably of his race and general cultural background and beliefs. Note: Personnel of the Terran United Federation of Planets have a 5% chance of evidencing racial prejudices; they are painstakingly conditioned to "accept" the non-humanity of aliens. Even when prejudiced, they try hard to disguise the feeling, although not always successfully (10% chance of open prejudice, if prejudiced at all). Azuriach citizenry as a whole are 90% prejudiced against all non-humans; the Azuriach Imperium is a fascist state devoted to the belief that Mankind is the superior race in the Universe, destined to rule aver the "slave races" as undisputed Masters. Finally, Bugs are 100% prejudiced against all non-Bugs. They have no concept of "individuality" and abhor any beings who are not "One-with-All" as units in the Hive Awareness.

13.7 GOVERNMENT

The system of government is distinct from the social organisation in that government refers to the system of making and carrying out major decisions affecting society, while social organisation refers to the general way people live in the society. The term "citizen" means those persons in the society with a political "identity," and who can influence the government. Those who are disenfranchised (do not have the vote, etc.) are second-class citizens who cannot affect the government directly. Even a "democracy" may have limited citizenship. In Heinlein's Starship Troopers, for example, only those who serve a tour of government service are allowed to vote; all members of Terran society are eligible for service, whatever their abilities or handicaps, but they must commit their time, talents, and very lives to the society to earn the privilege of full citizenship. So it is also in the Ten-an United Federation of Planets. Even in a Dictatorship, there may be a very restricted number of "citizens," but those few will have power to choose the Dictator, etc.

The following governmental systems have strong and weak aspects which will influence the degree of success or failure encountered when trying to establish and maintain an interstellar empire or its equivalent.

Roll 1d20 for random government for a planet, or it can be assigned by the StarMaster. The latter method is advisable where planets belong to a known stargrouping in order to maintain the consistency of the StarMaster's concept of the area:

1d20 Roll	Type of Government	Tech Level Range
1	Anarchy	1—4
2—3	Feudal	1—10
4—5	Multi-Government	1—6
6—7	Subjugated	1—8
8	Oligarchy	1—9
9	Religious Dictatorship	1—8
11	Corporate State	5—10
12	Athenian Democracy	3—10
13—14	Representative Democracy	4—10
15—16	Confederacy	5—10
17—18	Personal Dictatorship	5—10
19—20	Empire	7—10

ANARCHY: A "primitive" governmental condition marked more by its absence than by its presence. "Government" is-essentially on the family/clan level. No substantial technological level can be maintained for any significant period of time. No loyalty or support exists outside the family/clan group. The term can also be used to describe tribal forms of government, which do not include the concept of "nationhood," only a crude "Us" and "Them" approach. Government is a matter of custom, tradition, and taboo, with leaders holding their positions out of persona! power, charisma, or fear/respect of others. Most citizens are free to do pretty much as they like, so long as they do not harm others in the family/clan/ tribe.

FEUDAL: An aristocratic form of government based upon the personal loyalty of vassal to lord, and vice versa, feudalism is potentially capable of attaining high levels of technology, as

evidenced by the MekPurrs, who combine a strange mixture of Feudal and Anarchic government. The Royalist Balrads have a strong feudal system on the classic model: King, Lords, Knights, and Commons. Such systems of government do not tend to break down easily, but rebellion is a possibility if a Lord and/or his people are repressed or the King is weak.

MULTI-GOVERNMENT: The planet is dominated by no one power. Rather, a large number of nations of different political persuasions and perhaps racial sub-types attempt to co-exist and/or gain dominance of one another. Terra before the 21st century fell into this category.

SUBJUGATED: The planet is a conquered world dominated by rulers with another governmental system. Subjugated peoples are unable to express their will in any way, for rule is imposed from without by officials and occupation forces of the conqueror.

OLIGARCHY: An Oligarchy will be either a form of "aristocracy" or else a "dictatorship." The aristocratic form is governed by a charismatic, select group of members of a class which enjoys the overwhelming confidence of the citizenry or, at least, their tolerance and general approval. A dictatorial oligarchy is a small group of rulers who perpetuate their domination of all political affairs, accepting little or no real input from the "citizenry."

RELIGIOUS DICTATORSHIP: All ruling functions are performed by a religious organisation, or rather by a ruling priesthood. The specific needs of the general population will be interpreted in terms of their "spiritual" requirements before any purely "material" and "worldly" problems are dealt with. In fact, such governments are amongst the most repressive of dictatorial oligarchies conceivable, ruling by superstition and fear rather than by appealing to reason and enlightened loyalty from its subjects.

CORPORATE STATE: As noted earlier for corporate social organisation, the Corporate State is governed by a small group of company managers, with government affairs closely tied in with business and profits for the shareholders. Such governments can be repressive with respect to competing business interests, but can also be very liberal with rewards for loyal service. Depending upon the particular Corporation and its management policies, freedoms can be very extensive or very limited.

ATHENIAN-TYPE DEMOCRACY: Every citizen has a direct say in all government decisions. There are no intermediaries to represent him; there is only an elected executive to manage the government bureaucracy. Every citizen is a member of the legislative assembly. Every citizen may vote on all issues and may also speak to any issue although, in practice, recognised leaders of the various political factions tend to represent the views of their followers, with instant feed-back available to them). Such a system is made workable through advanced communication/computer networks—a terminal in every home—and even planets with a billion population or more can easily maintain this system of government. However, a single world or solar system is the largest political unit that can be effectively governed through Athenian Democracy. No sub-space communications system can carry the volume of information, let alone at a reasonable cost, which an Athenian Democracy would require to operate on an interstellar scale.

REPUBLICAN DEMOCRACY: All citizens vote in regularly conducted elections to choose a small number of representatives who meet at the capital to decide all governmental matters without further reference to the citizenry—although "opinion polls" often influence governmental attitudes. Republican Democracy is likely to encounter problems in governing beyond a distance of 1500-3000 LY (30 to 60 days' high-speed voyage time by fast couriers). Note that a 1500 LY distance requires at least 60 days' reaction time to a problem on an outlying world of the star grouping. A further limiting factor on the size of an Interstellar Republic is the size of government itself. Even at the rate of 1 elected member per world, disregarding the representation by population, a moderate-sized star grouping would have more than 1000 elected representatives. Such an Interstellar Congress is going to have trouble governing anything, let alone a far-flung interstellar political unit. Such groupings therefore experience an increased control of the daily operations of government by bureaucratic officials. Players are referred to Keith Laumer's Reteif series for a sample of the kind of situations that will actually occur as the "professional" bureaucrats assume the task of running the whole "show."

CONFEDERACY: The Confederate system of government is typified by the Terran United Federation of Planets. A Confederacy is a grouping of semi-independent planets or multi-planet political units joined in a loose political union for defence, foreign affairs, suppression of interstellar crime, and regulation of interstellar trade. Constituent political units retain their own governmental institutions and even local military forces, as well as subscribing to the central Confederate government and military forces. Thus, a Confederacy can extend over thousands of light years in every direction. The only major limitation is based on the response time of the Federation StarForces to mass invasions by external enemies. Even this factor is significantly reduced because the member states maintain fairly strong PDF (Planetary Defence Forces). In the final analysis, an Interstellar Confederacy is the most efficient government discovered to date. In the very diversity which marks its member states, there is strength. For none will trust solely to a distant central government to manage its defence or other internal affairs. The Confederacy exists and prospers because it serves only those needs its members desire to be served. All things best performed by those close to "home" are left to local authority.

PERSONAL DICTATORSHIP: A personal dictatorship requires that one "man" must ultimately make all of the important decisions. This means that the size of the political unit is severely limited. A good rule of thumb is that a personal Dictator will have difficulties governing beyond 500 LY (10 days' voyage time by courier). A single ruler would also have physical problems in dealing with more than about 100 planets; after all, a Dictator cannot really entrust any subordinate with too much power, unless he can be absolutely assured of the loyalty of that subordinate. And men who are personally loyal to him, stupid enough not to be capable of overthrowing him, and yet intelligent enough to be able to control a planet in the manner he would desire, are rare commodities indeed. For if there is one fact that is clear, it is that a Personal Dictatorship has institutionalised the art of succession to the Ultimate Power by assassination and internal rebellion in high government and military circles.

EMPIRE: An Empire under the direct, personal rule of the reigning Emperor would be little different in practice from a Personal Dictatorship. However, if the Emperor and his closest "advisors" (read "most influential nobles and friends") accept a position as overlord, and authority is delegated to Governors of sub-sectors of reasonable size, an effect not too dissimilar to the Confederate system of government will be obtained. Each Star Sector becomes, in effect, an Imperial Province. However, the Governor and the Praetors who administer the sub-sectors or districts which comprise the province, are all Imperial appointees. This means that their term of office, powers, and privileges all derive from the personal Will of the Imperial Presence. If Imperial disfavor is directed their way, they can find that they are quite powerless, unless they have managed to win the allegiance of the troops and StarForces under their command. Each Star Sector or Province is charged with maintaining local defences against external attack, piracy, etc. Imperial Star-Force and Marine assault units are available to bolster Provincial forces in time of need, acting as a "fire brigade" or "mobile reserve" of immense power.

13.8 GOVERNMENT SUPPORT INDEX

The percentage of the population which will support the present governmental system in a "crunch" by actively working, fighting, and even dying to maintain the current system. Roll 2d10. Add 1d6% x Social Organisation Index for all Democracies. Add '1/2d6% for all non-Democracies. Races like the Bugs are 100% in support.

13.9 LOYALTY INDEX

The percentage chance that a given individual citizen will be loyal to the present system. This does not mean that the citizen supports the system actively, but merely that he supports the "rule of law" or perhaps is even fearful of punishment for disloyal or treasonable conduct. Roll 1d100. The result will not be less than the Government Support Index, so raise all lower values to that percentage.

13.10 REPRESSION INDEX

The percentage of the population "repressed" by various discriminatory measures under the present social and/or political system. Democracies have 1d10% repressed. Dictatorships, Empires, Corporate Societies, Socialist/Communist Societies, and Caste Societies have 10d10% repressed. Bug societies simply don't count; everyone is loyal and no one feels repressed, so 0% repression.

13.11 CORRUPTION INDEX

The percentage chance that a given government official will accept a "bribe" or "gift" or "token of appreciation"—obviously not for services rendered—is 1d10% in most democracies, which generally frown on the practice and may punish both the briber and the official severely for the offence. In all other societies, the chance is 10% + 1d10%. If a 20% chance arises, bribery is a normal way of doing business with all officials, and graft is institutionalised. Indeed, one even has to pay income tax on it. Bugs cannot be bribed. Nor can members of the Terran United Federation of Planets StarForces, Space Marines, interstellar Police, or Contacts Service, for such personnel are incorruptible, elite volunteers. Bugs, of course, are unbribable, but sometimes a bit of food will "distract" Workers from giving the alarm.

13.12 LAW LEVEL

Every society will have its own notions as to the level of violence it will accept. The degree of restriction on the bearing of personal arms by non-military/non-governmental personnel and civilians will vary from planet to planet. Where restrictions exist, it will be assumed characters have to obtain a license to bear restricted or prohibited weapons. Depending upon the nature of the government, this may be relatively easy or exceedingly difficult. Members of the military, law enforcement agencies, and many civilian government officials will have the right to bear some form of armaments. "Primitive" and "early" cultures have few if any restrictions upon bearing of arms. The following levels of law can be subject to a 1d20 roll, or can be assigned by the StarMaster to suit the situation.

Some planets will have the "usual" restrictions relaxed because of prevailing local conditions. Terran law, for example, discourages the bearing of arms by civilians except for hunting. On Terra, even this is rare because few hunting licenses are issued. Thus most of the population is effectively disarmed (a good idea on a planet of 10 000 000 000), and arms are borne only by members of the military and civilian arms of government, and by all reservists and retired military personnel, with licenses being issued to security personnel guarding private businesses, acting as bodyguards, etc. However, on a colony planet, every citizen has the right to bear arms, as all adult males on Federation colony worlds are inducted into the militia as a matter of course. Besides, local life forms may be especially dangerous and require heavy calibre small arms to deal effectively with them. Even dictatorial societies make some concessions in such conditions. Each level given below includes all comments made previously:

1d20	DM	Restrictions Placed on Weapons & Their Use
1-5	0	Full citizens are not restricted with respect to weapons ownership. Strangers and conquered subjects are subjected to some form of licensing, especially the latter. Possession of military armaments will be scrutinised closely, especially in a repressive society. Duelling is permissible, but must be conducted according to the prevailing code of honour or possible charges of murder or assault with a deadly weapon will be faced.
6-9	-2	Some weapons are restricted. These include any concealable body pistols and similar weapons which will not register on a detector; explosive weapons such as grenades or PMLs; all CBR weapons (gas, etc.), and heavy military weapons. Duelling is frowned upon.
10-13	-3	As above, but all portable energy weapons excep stunners, are restricted to those licensed or authorised to carry them. Conquered subjects are forbidden to bear arms other than 'archaic small arms for hunting, etc., and attack upon any member of occupying forces, official or citizen will be met with swift (and sometimes savage) punishment and/or reprisal,
14-15	-4	As above with all military armaments restricted to authorised or licensed personnel. Duelling a non-citizen is strictly forbidden, while duelling between citizens is a serious matter to be conducted according to a rigid code and under official supervision.
16-17	-5	All fire weapons are restricted except to authorisec personnel and license holders. Possession of an offensive weapon by conquered subject is punishable by death and reprisal against family and neighbours in some repressive societies. Other societies will have lesser punishments. Duelling is strictly forbidden unless done with 'blade' weapons until 'first blood' is drawn. Stunners are not restricted.
18+	-6	All possession of weapons of any sort outside the home is strictly forbidden to all except to license holders and authorised personnel. The wearing of weapons openly by non-military or non-Police individuals (even if licensed) is discouraged. Any slaying not in the line of duty or in self defence is deemed to be murder.

The 1d20 numbers also indicate the chance, rolled on 1d20, of being arrested by a law enforcement officer (occupation military, police, customs officer, etc.) if discovered bearing a restricted weapon without a license. However, the weapon must be noticeable. If it is a concealed weapon, only a search, etc., will raise the question of arrest. Searches will occur only if the law enforcement officer has some valid reason to suspect the player character and/or NPCs with him.

Possession of weapons tends not to apply in a StarPort area, in which both individuals and ships may be armed more or less as they desire.

The DMs refer to an Administration CR to be made whenever attempting to deal with officialdom. See 4.9 General Skills.

13.13 POLITICAL PARTIES & POLICIES

If a political dimension is going to develop in a scenario, there should be some provision made to introduce specific political organisations and some of their more salient policies. The Star-Master can evolve these as he desires. If the government is dictatorial, repressive, etc., a "loyal" (or "disloyal") opposition can prove to be an interesting factor in any gun-running/espionage/subversion scenario.

13.14 CURRENT POLITICAL SITUATION

Following along with the previous section's line of thought, if a political dimension is needed, the current status of the popularity! support enjoyed by the various parties will be important. The "Vote %" refers to what the citizenry would do if they could vote right now, and is rolled only when an "opinion" poll is required. Once established, it can be altered +1d10% or -1d10% depending upon the actions of the government in improving/failing to improve matters. If the ruling party does not have a 60% majority, roll percentage dice for the "stability" of the current government. Each crisis will require another dice roll, and if the result is equal to or less than the stability factor, the government survives; if not, it fails.

13.15 CURRENT ALLIANCES

Any special agreements with foreign powers over military co-operation, trade, etc., can be recorded here.

13.16 PLANETARY TRADE & COMMERCE

The general technological level of the planet is established, with minimum guidelines as given for Government, above. Roll dice, with minimum values equal to those listed below, and with excessive values requiring a second roll. Dice to be rolled are indicated for each governmental type:

Type of Government	Dice	Tech Levels*
Anarchy	1d6	1-4
Feudal	1d10	1-10
Multi-Government	1d6	1-6
Subjugated	1d10	1-8
Oligarchy	1d10	1-9
Religious Dictatorship	1d6-2	1-8
Corporate State	5 +1d6	5-10
Athenian Democracy	1d10	3-10
Representative Democracy	1d10	4-10
Confederacy	4+ 1d6	5-10
Dictatorship	1d6-1	5-10**
Empire	4+1d6	7-10

* The Tech Level Range is also used as the range of die roll results sought to indicate Planetary Trade Index. Results not within the range so indicated are seen as excessive and require another roll.
** Note that the Tech Level of a Dictatorship is not used as other such entries in this table.

Combined with the DMs given earlier for the planetary Type, the Tech level of the planet will determine the industrial strength of the society located there.

13.17 INDUSTRIALISATION INDEX

The industrialisation index reveals the degree of wealth on the planet. First, if a planet is under Tech/5 and a native population is involved, roll 1d20 and add the agricultural DM to the result. If the roll is 17+, the planet is a "rich" agricultural planet; if the roll is 12-16, it is an "average" agricultural planet; and if the roll is under 12, it is a "poor" agricultural planet.

If a planet is over Tech/5 (all colonies are considered to be Tech/7+, as they are reflections of the technological level of the Mother Planet), roll for industrialisation on 1d20. If the roll is 17+, it is a "rich" industrial planet; if the roll is 12-16, it is an "average" industrial planet; and if the roll is under 12, it is a "poor" industrial planet.

However, if a colony or planet is in the "poor" industrial category, it will then roll for agriculture, as indicated for all native population worlds with less than Tech/5 development.

Apply the +DMs and -DMs as given in the determination of the planetary type earlier.

13.18 AVERAGE INCOME

The average per capita income is derived from the Tech level of the society, the basis of that income (agriculture or industry), and the social system:

Rich Agricultural World	CR 750 x Tech Level per year
Average Agricultural World	CR 500 x Tech Level per year
Poor Agricultural World	CR 250 x Tech Level per year
Rich Industrial World	CR 1500 x Tech Level per year
Average Industrial World	CR 1000 x Tech Level per year
Poor Industrial World	CR 500 x Tech Level per year

This per capita income figure is then modified by the social system or, more properly, the governmental system. For it is the government and its policies which will, in the end, be the determining factor in the entire equation.

Government Type	Income Modifier	Tax
Anarchy	x 0.25	30%
Feudal	x 0.5	30%
Multi-Government	x 0.75	30%
Subjugated	x 0.5	40%
Oligarchy	X0.5	40%
Religious Dictatorship	x 0.35	50%
Corporate State	x 1.0	20%
Athenian Democracy	x 0.8	20%
Rep. Democracy	x 1.0	30%
Confederacy	x 1.0	30%
Dictatorship	x 0.75	40%
Empire	x 1.0	30%

13.19 TOTAL TAXES

The total income owing to the government can be computed by multiplying the per capita income divided by 1 000 000 to find the revenues in MegaCredits (MCR) owing to the government. About 10% + 1d10% of this will be expended upon the armed forces, and each MCR or MegaCredit represents 1 strategic forces point, to be used to purchase ground forces (see Space Marines) or as MCR 1 when purchasing SpaceForce ships. The tax rule is used only for strategic campaigns and is outside the purview of these rules. Strategic Campaigns will be covered in later additions to the Space Opera family of gaming aides.

13.20 MAJOR IMPORTS/EXPORTS

The StarMaster can choose appropriate items from the list of trade goods in the Commerce section (see section 11) as items commonly imported or exported to or from a given planet. Some items will definitely be high on the import list. Industrial planets with large populations, for instance, will have to import considerable quantities of food. A population of 10,000,000,000, for example, might be supported on hydroponic farming and modified yeaststeaks, etc., but real meat and real vegetables would bring premium prices. But if the planet exported heavy machinery, it is dubious that a shipment of heavy machinery would be particularly welcome or bring a good price.

13.21 IMPORT/EXPORT RESTRICTIONS & DUTIES

Some planets and planetary groupings have protective trade barriers, represented by an import duty equal to a percentage of the sale value of the goods (usually 10.d10% of the per capita tax rate). Also, some goods might be banned entirely because they compete with local products, or because they are forbidden for sale to the populace. The Azuriach Imperium, for instance, forbids the sale of armaments of any kind on its colony and subjugated planets, and all such trade must be conducted at a major industrial planet—with sales made to the military authorities only.

13.22 TRADE ACCEPTANCE INDEX

Roll 10.d10% to obtain the percentage chance that a trader will find a ready market for his goods on the planet. Add +10% if the goods are on the Major Imports list, and —10% if the goods are on the Major Exports list. The index does not assure a sale, but it makes an attempt possible once per week that an offer has come up.

14.0 DISCRETIONARY DESIGN OF PLANETS

While random dice rolls might seem to offer an 'easy' method of producing ready made planets, they can result in silly combinations of planetary conditions. For example, a planet with less than 0.4 G surface gravity cannot retain a breathable atmosphere. A number o planetary types are offered in section 15 upon which various conditions can be grafted. StarMasters should familiarise themselves with the basic surface conditions described in section 15 so that the can develop coherent planets for role play that have a reasonable scientific basis. The StarMaster is thus free to design planets, within limits, to suit the scenarios he has planned.

Note: Type WR, Wolf-Rayet eruptive stars and type 0 and B star are very hot and rare, with a chance of life on their planets as exceedingly low levels. Similarly, the very common type M stars are often too cool for life as we know it to develop or to survive. Only type A, F, G, and K stars offer a fair to good chance of habitable planets.

15.0 HABITABLE PLANETS

it is chemically possible that life could evolve which is based upon silicon or methane. The fact remains, however, that such life has a very low order of probability in comparison to the probability of hydrocarbon life. Hydrocarbon life is the most probable because hydrocarbons are pre-eminently capable of forming scores of thousands of compounds.

15.1 DEFINITION OF A HABITABLE PLANET

A "habitable" planet would be one possessing an environment and resources capable of encouraging and sustaining the evolution of life forms similar to (but not necessarily the same as) life on Terra. Such life forms would take shapes and exhibit adaptive characteristics appropriate to environmental demands. In order to state gaming conditions and systems in an SF game so that hard scientific data can be brought in the informed gamer to fill out the environment for role-play, the designers have decided not to fly in the face of science by presenting "fantastic" life forms living under conditions which we currently cannot conceive, let alone comprehend. We do make some limited provision for them, but caution is urged with regard to uncontrolled inventiveness on the part of enthusiastic gainers. In a scientifically governed environment, by definition predictable according to scientific laws and theories, creatures must be viable members of functioning ecosystems. We assume that Terra represents the optimum range of conditions under which most viable hydrocarbon life forms will develop.

15.2 STELLAR PRIMARIES

The stars assumed by these rules to have the best chances of Terran habitable planets are of Type G, followed closely by Type K and F stars. Type M stars are somewhat less likely to be able to produce appropriate conditions but cannot be ruled out.

15.3 PLANETARY SIZE & GRAVITY TABLE

The following table can be used to compute the gravity fields of various planets. The StarMaster can exercise his own discretion as to the size and density of the planet involved:

Planetary Diameter (in Km)	Density/Surface Gravity Very Low	Low	Moderate	Dense	Very Dense
1000	0.02	0.03	0.06	0.08	0.1
2000	0.04	0.07	0.12	0.17	0.2
3000	0.06	0.1	0.19	0.25	0.3
4000	0.08	0.14	0.25	0.34	0.4
5000	0.10	0.17	0.31	0.42	0.5
6000	0.12	0.21	0.37	0.50	0.6
7000	0.14	0.24	0.40	0.58	0.7
8000	0.17	0.28	0.51	0.68	0.8
9000	0.19	0.31	0.56	0.72	0.9
10,000	0.21	0.35	0.63	0~76	1.0
11,000	0.23	0.38	0.69	0.84	1.1
12,000	0.25	0.42	0.75	0.92	1.2
13,000	0.27	0.45	0.82	1.0	1.3
15,000	0.31	0.52	0.94	1.15	1.5
20,000	0.4	0.7	1.2S	1.5	2.0
25,000	0.5	0.9	1.5	1.9	2.5
30,000	0.6	1.0	1.9	2.3	3.0

For comparison, Terra = 13,000 km diameter (dense) with 1.00 G.

15.4 PLANETARY SIZE, DENSITY, & GRAVITY

Planetary densities tend to vary between 0.75 (0.75 mass of an equal volume of water to 7.00). Density represents the relative amount of mass in a given volume. Planets are divided into three groups:

Low Density Planets: Planets composed of materials of low specific gravity. Gas Giants like Jupiter and Saturn fall into this category. "Heavy" metals will be, relative to the total mass present, very rare indeed. Porous rock and "ice" would seem to be the major constituents of the "solid" planet, while the atmosphere would tend' to be a significant proportion of the total mass. Examples: Jupiter, Neptune, Saturn, Uranus.

Moderate Density Planets: Planets composed of rock with low specific gravity. Some heavy metals will be present, but not in truly significant quantities. Light metals might be abundant, however. Examples: Mars.

High Density Planets: Planets composed of materials of high specific gravity, with considerable heavy metals present. Such planets might be termed "Terran" planets, for Terra is quite typical of this class.

Gravity: The surface gravitational acceleration of the various planets in the tables is always stated in terms of 1 Terran G (9.76 in/sec^2 or 32 ft./sec^2). In order to find the mass/weight of a being or object in a gravity field, simply multiply its Terran weight/mass (in metric or English units) times the gravity factor. Gravity field strength is stated in terms of Terran G 1.00.

15.5 GENERAL PLANETARY CONDITIONS

The overall conditions encountered on a planet will depend upon many factors. This section deals with the broad effects of the orbital position of the planet in or outside the stellar Ecosphere, the eccentricity of the planet's orbit around its sun, the period of planetary rotation on its axis (length of "day"), and the inclination of the planet's axis to the plane of the orbit. Such factors have significant implications for the climate:

Planetary Type 1: The planet is at a favourable position in the Ecosphere. Axial tilt is between 10° and 30°, orbital eccentricity is less than 0.2, and the length of the day is 6-72 hours. All conditions of illumination and heating are Terran normal. In short, the planet exhibits those characteristics of climate and temperature which would make it a veritable "twin" of Terra. Type One planets are highly prized for colonisation.

Planetary Type 2: The planet is at a favourable position in the Ecosphere, orbital eccentricity is less than 0.2, and the length of the day is 6-72 hours. The axial tilt is under 10°, and this factor significantly affects climate and temperatures on the planet.

The planet is marked by clearly defined and relatively unchanging belts of climate. illumination and temperatures are quite high in equatorial regions, with temperatures over 60°C (140°F) not unlikely. Depending upon available moisture, either a dense jungle or desert belt will develop along the equator. Middle latitudes have temperate to tropical climates and temperatures. Because there is little seasonality, the climate exhibits a spring-summer-fall pattern, and freezing temperatures are rarely experienced. High latitudes "enjoy" a standard four-season climate, with spring, summer, and fall all marked by night-time temperatures around the 0^0C mark (320 F). Winters in high latitudes are as cold as on Terra, but do not last nearly so long.

Planetary Type 3: The planet is at the optimum position in the Ecosphere, orbital eccentricity is less than 0.2, and the length of the day is 6-72 hours. The axial tilt is more than 30^0,and this factor significantly affects climate and temperatures on the planet.

Large portions of the planet experience continuous day or continuous night for long periods. Illumination and temperatures will be high over much of the planetary surface during the summer. Even polar regions enjoy temperature conditions at that time. Summers are tropical in middle latitudes. Equatorial regions are hot for all year.

Winters are Sub-Arctic in middle latitudes. Regions immediately bordering the equatorial zone have temperate conditions in the winter. High latitudes experience winter conditions comparable to those in Antarctica, with temperatures of -60^0C to -87^0C (about -75^0F to -125^0F). Continual darkness prevails over much of the globe tilted away from the sun.

Such extremes in climate and temperature prevent tropical jungles from developing outside of a narrow band along the equator. Middle latitudes largely possess stunted trees, extensive steppe, and deserts. Higher latitudes are steppe and tundra. All life forms are tough and highly adapted to the severe changes in the climate. Animals will embark on migrations to warmer regions at the onset of fall and winter. Those which remain either hibernate or develop rich pelts and fatty tissue to guard against the cold.

Planetary Type 4: The planet's orbital eccentricity is less than 0.2, the axial tilt is within 10° to 30°, and the day/night cycle is 6-72 hours. The planet is placed at the extreme outer edge of the stellar Ecosphere, so illumination and temperatures are lower than on Terra.

Conditions are somewhat "chilly" but not overly severe. The equatorial belt enjoys temperate conditions, with warm summers and cool winters. The only forests on the planet would be located here, as even in the middle latitudes the conditions are too cold in winter to permit survival of anything except stunted trees. Middle latitudes are Sub-Arctic, with steppe being typical. High latitudes are Polar, with summers marked by cool days and freezing night-time temperatures. Vegetation is similar to Arctic tundra, and a good third of the planet will have permafrost. High latitude winters will be bitterly cold. As in the case of Type 3 planets, the life forms will be quite tough and adapted to the planetary conditions. "Cold deserts" will predominate in poorly watered regions.

Planetary Type 5: The planet's orbital eccentricity is less than 0.2, and the day/night cycle is 6-72 hours. The planet is placed at the extreme outer edge of the stellar Ecosphere, and the axial tilt is under 10°.
Illumination and temperatures will, again, be less than Terran normal. The equatorial zone has a temperate climate ranging through a spring-summer-fall pattern, with a relatively mild "winter" in the zone separating the equatorial region from middle latitudes. Indeed, because there is no pronounced seasonality, "winter" actually consists of a few days or weeks of temperatures around the freezing mark between the "spring" and "fall" seasons. Middle latitudes will have Sub-Arctic climates. High latitudes are gripped in eternal winter. Such a world is an "ice Planet." Most life forms would tend to concentrate in or near the temperate equatorial zone, with plants virtually non-existent beyond it. Animals living above the equatorial zone are superbly adapted to extreme cold (temperatures would range as low as -90^0C in high latitudes), and are fierce carnivores because of the relative absence of viable plant life on land. Their pelts would be very thick and rich.

Planetary Type 6: The planet's orbital eccentricity is less than 0.2, and the day/night cycle is 6-72 hours. The planet is placed at the extreme outer edge of the stellar Ecosphere, and the axial tilt is more than 30°.

The entire planet experiences Polar conditions. The equatorial zone experiences a brief "summer." Vast areas of the planet are in long periods of continual darkness during the winter, and temperatures drop as low as -100^0C (-150^0F) in polar regions. Summer temperatures above the equatorial zone rarely are much above freezing. in the short growing season of the equatorial region, plants grow almost visibly to take advantage of every minute of favourable conditions. Animals eat anything that looks like food, and are adequately equipped with the physical characteristics needed to acquire that food. Their ferocity is clearly indescribable. The toughness of plant life should not be minimised either: plants will develop tough outer coverings, nasty thorns, and other defences to protect them from hungry animals. if the planet does have seas, large portions will be icebound throughout the year.

Planetary Type 7: The planet's orbital eccentricity is less than 0.2, the axial tilt is within normal limits of 10° to 30°, and the day/night cycle is 6-72 hours. The planet is placed at the extreme inner edge of the stellar Ecosphere, so illumination and temperatures are higher than on Terra.

Depending on the amount of moisture available, the planet will be either a "Desert Planet" or a "Jungle Planet." Only polar regions have any chance of experiencing a real winter, which would be quite mild, Ice caps are small or non-existent. Equatorial regions are hot, with temperatures ranging as high as 70^0C (about 160^0F) in desert regions. Middle latitudes are tropical jungles or deserts. Only very high latitudes could experience temperate conditions.

Jungle planets would be teeming with lush vegetation and numerous forms of animal life, Indeed, conditions could be considered ideal for various forms of "Dinosaurian" life or its equivalent, as the planet would consist of large expanses of dense forest, lush tropical savannah, swamps, and shallow seas.

Desert planets would tend to approximate the conditions recounted in the novel Dune, with very limited amounts of water available.

Planetary Type 8: The planet's orbital eccentricity is less than 0.2, and the day/night cycle is 6-72 hours. The planet is placed at the extreme inner edge of the stellar Ecosphere, and the axial tilt is under 10**°**. Illumination and temperatures are higher than on Terra.

Because of the limited seasonality, distinct climate belts develop. Receiving intense sunlight all year around, the equatorial region experiences very high temperatures—definitely in the 70^{0}C range. The equatorial belt might prove to be uninhabitable. A broad desert belt develops if water is not abundant. If water is available, the humidity of the equatorial region is equivalent to a steam bath. Middle latitudes are tropical. High latitudes are sub-tropical. Polar regions exhibit temperate climates, with ice caps being very small or non-existent.

On planets with abundant water, strong frontal activity between the well-defined climate belts produces violent storms. Severe dust and sand storms result on arid planets. Life forms are tough and adapted to above "normal" temperatures, although some forms will be capable of tolerating cool weather if such conditions exist anywhere on the planet.

Water-abundant planets will be humid, and vegetation will be tropical and sub-tropical, as will the animal life. Arid planets will have desert and steppe life forms.

Planetary Type 9: The planet's orbital eccentricity is less than 0.2, and the day/night cycle is 6-72 hours. The planet is placed at the extreme inner edge of the stellar Ecosphere, and the axial tilt is over 30**°**. illumination and temperatures are higher than on Terra.

Extreme seasonality is experienced because of the extreme axial tilt of the planet. The extreme seasonal conditions are felt across the face of the planet. The equatorial zone is blistering hot in the summer, and sweltering in the winter, never cooling to "reasonable" tropical temperatures. Higher latitudes fare little better.

Vegetation has adapted to the radical seasonal changes, perhaps maintaining a dormant state in the fiercest heat of summer and growing in the "cooler" conditions of fall, winter, and spring. Animal life is migratory and continually moves away from the regions in which the sunlight is most direct, or else it burrows deep to take cover from the hottest temperatures. Such planets will tend to be "Desert Planets" in the hot seasons but, if adequate water is available, the cooler seasons could see an abundance of lush vegetation.

Planetary Type 10: The orbit of the planet is highly eccentric (above 0.2) and carries the planet beyond the outer edge of the stellar Ecosphere. Axial tilt ranges between 10**°** and 30**°**, and the day is 6-72 hours long.

To distinguish the "northern" and "southern" hemispheres, we shall refer to NH and SH. At the time the planet passes beyond the outer edge of the stellar Ecosphere, one hemisphere will be tilted away from the sun; let us assume it is NH. Winter conditions will be experienced by NH, with savagely cold temperatures decidedly below Terran-normal. At that time, even the equatorial region will experience temperate conditions at best because the planet is too far away from its primary to receive enough heat to maintain "tropical" conditions there. The Southern Hemisphere SH will be enjoying "summer" conditions during the period of farthest passage from the sun. Middle latitudes will have temperate conditions, somewhat cooler than Terran-normal. Higher latitudes will have sub-polar conditions, with night-time temperatures often dropping below 0^{0}C (32^{0}F). Polar regions of SH will probably attain temperatures above freezing only rarely, despite the "summer" season in that hemisphere.

As the planet re-enters the stellar Ecosphere, NH will begin to warm up. In spring, summer, and fall months, the temperatures could rise to near Terran-normal. The equatorial region would now attain climate conditions of a "tropical" or "semi-tropical" nature. The middle latitudes of NH would attain temperate conditions by midsummer, while the high latitudes would attain sub-Arctic and Polar summer conditions as on Terra. Meanwhile, SH, now tilted away from the sun, would experience a fairly typical Terran winter.

Life forms on such a planet would differ considerably between the two hemispheres. Life in NH would be adapted to cold conditions. Forests would end above the equator, giving way to taiga and finally to Arctic-like tundra characterising much of NH. The polar region of NH likely would be a permanent ice cap, with glaciation extending well southward in places. Animal life would be comparable to types found in Terra's Sub-Arctic and Arctic. On the other hand, SH would exhibit a range of life not dissimilar to Terra's temperate regions in lower and middle latitudes, as heating is sufficient to restrict the sub-polar/polar regions to the high latitudes.

Planetary Type 11: The orbit of the planet is highly eccentric (above 0.2) and carries the planet beyond the inner edge of the stellar Ecosphere. Axial tilt ranges between 10**°** and 30^0,and the day is 6-72 hours long.

Again, we distinguish the two hemispheres by NH and SH. While the planet is in the stellar Ecosphere, hemisphere NH is experiencing a fairly typical Terran summer, albeit somewhat warmer than Terran-normal because total heating received by the planet is greater. Climate belts would be shifted northward, with tropical and sub-tropical conditions prevailing well into the middle latitudes. Temperate climates would be found even in sub-polar regions. Meanwhile, SH would be experiencing mild "winter" conditions, with freezing temperatures rare below the high latitudes.

As the planet passes the inner boundary of the stellar Ecosphere, NH will be experiencing "winter" conditions. At this time, the amount of solar heating received by the planet is considerably higher, so no really significant changes will occur except that middle latitudes will experience occasional freezing temperatures. High latitudes in NH will experience a proper winter, of course. It is SH and the equatorial region which evidence the most dramatic change in climate. Exposed to the intense direct sunlight of the period of closest passage to the sun, SH is heated to temperatures far above Terran-normal. Desert and semi-arid conditions will prevail within the interiors of land masses, with lakes and streams drying up even in middle and high latitudes. Equatorial temperatures could easily reach 50^{0}C to 60^{0}C (122**°** F to 140**°** F) or higher, and even in high latitudes the continual, intense sunlight could produce sub-tropical temperatures.

On such a planet, life forms evidence considerable differences between the two hemispheres. Since warm "Terran" conditions prevail in NH fairly much throughout the year, vegetation and animals are largely tropical, semi-tropical, and temperate forms. In SH, however, life is adapted to the dramatic changes in temperature and especially to the availability/scarcity of water. Mass migrations of animals occur to escape the heat and drought of the summer of closest passage to the sun. Vegetation becomes dormant in the summer drought and have tough outer layers and capacity to store water. Since drought conditions prevail over most of SH during its summer, all life forms are desert and steppe types. In extreme conditions, where the orbit carries the planet well inside the inner edge of the stellar Ecosphere, summer conditions in SH could be so hot and dry that all life forms would "go to ground" during the daylight hours, venturing out only in the "cool" 40^{0}C to 50^{0}C temperatures of the night. Plants would definitely be dormant at that time, as daytime temperatures would be 70^{0}C or higher—

too high for even the toughest desert plants to retain sufficient moisture if they are biologically "active."

Planetary Type 12: The orbit of the planet is so eccentric that the planet is carried right through the Ecosphere! Axial tilt ranges between 10° and 30°, and the day is 6-72 hours long.

The climate in such a situation can only be described as a "horror." Seasonality is so extreme that NH would be experiencing the equivalent of a Terran Antarctic winter over most of its surface during the period of farthest passage from the sun. At the same time, SH would be enjoying a winter roughly equivalent to a normal Terran winter. During the time of closest passage to the sun, SH would enjoy temperatures and climatic conditions roughly equivalent to a Terran spring and early summer during its "winter" period because of the vast amounts of solar energy now reaching the planet. Meanwhile. NH would be experiencing a summer similar to that described for Planetary Type 11. The range between the hottest and coldest temperatures might be as much as 160°C, from 70°C in the NH summer to —90°C in the SH "summer." (This is equivalent to a 290° F temperature range!) Such "mixed up" conditions would result in a very unusual ecology. NH plants have their growing season in the warm "winter" months (where temperatures are, paradoxically, higher than in the theoretical summer when the hemisphere is tilted toward the very distant sun), and are dormant during the Antarctic "summer." Animals of the hemisphere are very tough and adapted to the savage winters, probably migrating toward the equator during the cold "summer" and then back north again in the warmer "winter." Along the equatorial belt, the growing seasons would be the spring and fall periods when the planet is in the stellar Ecosphere. When the planet is at its period of farthest passage from the sun, even the equatorial region would sometimes experience freezing conditions. In the period of closest passage, temperatures would be furnace hot and drought inevitable. In hemisphere SH, adaptation of plants and animals to prevailing conditions will be extreme, as they will have to contend with relatively cold weather on one hand and desert heat and dry weather on the other. Migration of animals is likely. In general, life forms would be truly "tough" by Terran standards and very competitive.

Planetary Types 10, 11, and 12 -A or -B: The conditions given for Type 10, 11, and 12 planets assume a normal axial tilt. Extreme minimum's (denoted by the suffix -A) and extreme maximums (denoted by the suffix -B) in axial tilt would produce conditions so harsh that life either would not evolve/survive or else would be so tough and adaptive as to challenge belief. To work out the general climatic conditions for such planets is just short of a nightmare: if one combines the worst of Planetary Types 5 or 6 with those of Types 8 or 9, as applicable, and then modifies the result in terms of Types 10, 11, or 12, one may obtain an idea of just how "difficult" things really are on these planetary types.

P**lanetary Type 13:** The planet lies up to 10% closer to the primary than the inner stellar Ecosphere limit given in the Stellar Primaries table. Conditions on such planets approximate those of Type 7, 8, or 9 planets, except that temperatures will be somewhat higher. Planetary variations of this type are denoted as Type 13/7, 13/8, or 13/9 to indicate the comparative planetary types. Generally, conditions on such planets are "minimal" and require some life support measures for Terrans and other life forms originating on more temperate planets. The native life forms are very highly adapted to high temperature environments.

Planetary Type 14: The planet lies as much as 30% farther from the primary than the outer stellar Ecosphere limit given in the Stellar Primaries table. Conditions on such planets approximate those of Type 4, 5, or 6 planets, except that temperatures will be somewhat lower. The planetary variations of this type are denoted as Type 14/4, 14/5, or 14/6 to indicate the comparative planetary types. Conditions on such planets are "minimal" and may require extensive life support measures for Terrans and other life forms originating on more temperate planets. The native life forms are very highly adapted to low temperature environments.

Planetary Type 15: The planet lies too close to the primary to be considered as inhabitable by any form of hydrocarbon life. Surface temperatures could easily range from 100°C to 750°C (cf.: Venus and Mercury as examples of such planetary types).

Planetary Type 16: The planet is significantly removed from the stellar Ecosphere to be totally uninhabitable by hydrocarbon life. Temperature range (noontime maximums): -80°C to -185°C.

Planetary Type 17: The planet is very far removed from the stellar Ecosphere, and conditions approach those of the outer planets of the Sol System. Temperature range (noontime maximums): -1850 C to -225°C.

Planetary Type 18: The planet is extremely removed from the stellar Ecosphere, and surface conditions are approaching Absolute Zero (-273°C). Atmospheres, if any, are "frozen."

Planetary Type 19: The planet is a "rogue" in interstellar space or else is in a comet like orbit about a distant primary. Such worlds have temperatures approaching Absolute Zero (-273°C). Atmospheres, if any, are "frozen."

Planetary Type 20: The planet is a "Gas Giant" with low density. When indicating orbital placement, this type is denoted as Type 20/15 (close to primary), 20/E (within stellar Ecosphere limits), 20/16, 20/17, or 20/18.

VS Planets: When a planet is orbiting a variable star, the prefix VS- is placed in front of the planetary Type number; e.g.: Type VS-9. In determining planetary classification, conditions at minimum brightness of the variable star are considered. In most instances, conditions would be too extreme for life to evolve or to survive on planets placed within the theoretical Ecosphere or closer to the primary. When the star brightens, temperatures in such a zone would rise considerably. Temperatures would fall just as dramatically. If the variable star is a long term variable with a relatively minimal increase in brightness (under 0.5 magnitude or 1.6 times its minimum luminosity), surface conditions might prove liveable. Indeed, such a planet would be located in Type 14 position, but would evidence Type 12 characteristics: VS-14/12. Stars with higher ranges of brightness/dimness would not support habitable planets, while eruptive variables would be so inimical to hydrocarbon life that survival on their planets would require extensive life support, especially shielding against high temperatures, intense hard radiation, and shrivelling ultraviolet levels which would bathe during flare periods.

Planetary Type MS: The planet is in a multiple star system. If a planet is orbiting in a system with two or more stars, the prefix MS- is placed in front of the planetary type number. If the stars are very close together or are very far apart, there is a chance that the planet will lie in an orbit such that illumination and heating are more or less constant. However, if the stars are only moderate distances apart, such a planet would experience periods of intense illumination and heat alternating with periods of dimness and cold. In fact, this situation is summed up by the notation MS-12 (extreme eccentricity of orbit) and may be even more severe.

Effects of lighting will be unusual in multiple star systems, as there will sometimes be two or more suns in the sky at the same time, casting multiple shadows as a result. If one of the stars is far distant, an exceedingly bright star will be seen at night.

In those instances where one of the stars in a binary system is small and dim, conditions will not be significantly different than in a single star system; for the effect of the dim star will be minimal unless the planet makes an exceedingly close passage. Where a clear danger lies is in the ability of a smaller star in a multiple system to render a planet's orbit unstable and carry it to a less favourable thermal zone.

15.6 LENGTH OF "DAY"

The planetary types outlined above generally indicated a "day" varying from 6 to 72 hours. It is thought that a period of rotation within these limits will prove acceptable to most forms of hydrocarbon life.

Exceedingly fast planetary rotation:

The faster a planet is rotating, the more oblate (flattened at the poles and bulging at the equator) it will be. If the oblateness becomes too extreme, vulcanism and seismic upheaval will be considerable. Such instability could render the surface of an otherwise promising planet minimally inhabitable or even totally hostile.

Exceedingly slow planetary rotation: If the planet rotates on its axis over a 72-hour period, conditions might become severe. Excessive heating will occur during the long day, while the night will bring excessive heat loss.

15.7 HYDROGRAPHIC FEATURES

Water is essential to all forms of hydrocarbon life. Water is also vital to development of viable climatic and weather patterns.

Dry Planets: A planet with less than 40% free-standing water in lakes, seas, and oceans, will tend toward semi-arid and arid conditions over most of its land surface. There is simply too much land and too little open water for good distribution patterns of precipitation to develop. Regions located around bodies of water will become rich oases in the middle of dry steppes and deserts.

Desert Planets: Free-standing water is under 10% of the planetary surface. Conditions resemble Terran deserts over most of the planet. Extreme conditions approximate those described in Frank Herbert's novel Dune. Human-type personnel require some form of protective clothing and filter masks to prevent dehydration and to protect against high dust concentrations in the air. Shelters have to be sealed to maintain the humidity of the interior air, and some form of insulation/air conditioning would be required to keep interior temperatures within comfortable limits. (Such planets could also be "cold deserts" if their orbital placements and other factors result in low temperature conditions, again requiring appropriate life-support measures.) "Water discipline" is mandatory.

Arid Planets: Free-standing water is under 25% of the planetary surface. Conditions tend toward desert in the interiors of land masses. Better watered regions resemble Terran prairies and steppe-lands like those of the American West, Russia's steppes, and the African veldt. Cold planets or regions have steppe/wasteland conditions comparable to the Mongolian plain. Extreme conditions compare to those encountered in America's Death Valley or the worst parts of the interior deserts of Australia, the Sahara, and Arabia. Polar and sub-polar regions compare to the Terran Arctic. Some forested regions might be encountered in areas receiving adequate precipitation, and narrow strips of woodland exist along permanent waterways and around lakes.

Steppe Planets: Free-standing water is under 40% of the planetary surface. Conditions resemble those of the Arid Planets, except that forested and well-watered steppe lands would be considerably larger in extent. Precipitation patterns permitting, some tropical forests might appear in equatorial regions, with true jungles and rainforests. On the whole, water is still scarce but relatively more abundant than on Arid Planets.

Tundra Planets: When planetary temperatures are low, a large portion of the water will be "locked in" by surface or by permafrost lying 20 to 50 cm below the surface of the soil. The effect is quite "desert like," and tundra conditions could be described as "cold desert." Type 14 planets will often be Tundra Planets. Generally, conditions would resemble those of the High Arctic and Antarctic.

"Terran" Planets: For a planet to evidence conditions similar to those on Terra, the amount of open free-standing water will have to range from 40% to 80% of the planetary surface. There will be a number of large seas and oceans, and many streams and lakes will be found in the interiors of the large land masses. Climatic types will be similar to those on Terra, and present in as great a variety. Those planets with 40% to 60% surface water will be "transitional," standing between Steppe Planets and Terran-normal. Typical planets are Type 1.

Swamp & Jungle Planets: Free standing water ranges from 70% to 85% of the planetary surface on Swamp/Jungle Planets, with much of the land surface low-lying. Arms of the shallow seas often penetrate far inland, providing ready sources of moisture for precipitation. The low-lying land will be poorly drained and therefore often swampy. Such planets tend to be located toward the inner edge of the stellar Ecosphere and experience above Terran-normal temperatures. Humidity levels are high and precipitation heavier than on Terra. Type 13 planets are the most likely candidates if sufficient water is available; otherwise they could develop into Dry Planets. "Terran" Planets could also be of this type if a "heat trap" effect is produced by excessive carbon dioxide levels in the atmosphere and land forms are of the type described above.

Swamp/Jungle Planets could also be "young" in development, comparable to Terra during the Age of Dinosaurs or the Carboniferous Period. Such planets could therefore have giant amphibians and dinosaurs (or their local equivalent) as well as dense and lush vegetation. Otherwise, life forms will tend toward tropical and semi-tropical varieties like those of Terra. Some of the early SF stories about Venus (before its furnace-hot nature was confirmed by U.S. and Soviet probes) serve as an excellent description of planetary conditions.

Ocean Planets: When the free-standing water is in excess of 80% of the planetary surface, conditions across most of the planet will tend to be "maritime" in nature. Land masses tend to be small, with many island archipelagos and individual islands dotting the planetary seas and oceans. The humidity will be high and the precipitation adequate to heavy, especially where temperatures are high. Because of the large amounts of water vapour present in the atmosphere, storms will be violent in the warm seasons, with hurricanes and typhoons common in equatorial and middle latitudes. Even polar latitudes will enjoy moderate marine climates in the winter.

The presence of vast amounts of water vapour in the atmosphere will create extensive cloud cover which will protect the planetary surface from both excessive heating and excessive cooling. Thus extreme conditions caused by axial tilt or orbital position will be moderated, and conditions will be quite liveable where they might otherwise have been unacceptable.

15.8 BREATHABLE ATMOSPHERES

Some planets will have atmospheres much like Terra's, with pressure and atmospheric gases within the tolerance limits of most races. Others will have thin or dense atmospheres, or may have concentrations of gases at narcotic or toxic levels. Sensorscan analysis will tend to reveal such conditions in general, but local variations may produce problems for the PCs.

Terran Atmospheres: For Terran life forms, the essential ingredients of a breathable atmosphere are oxygen and minor amounts of water vapour. Nitrogen is essential to Terran plants and serves as an atmospheric "dillutant." Other gases may be present. A planet rated as having a "Terran" atmosphere will be acceptable to most races.

Thin Atmospheres: When the inspired pressure of oxygen falls below 60 mm, Terrans will suffer from hypoxia. This condition will be encountered on planets with low atmospheric pressures or at high altitudes. Also, since the atmosphere does act as a heat-trap and heat-engine to hold and distribute solar energy over the planetary surface, a thin atmosphere will not effectively maintain temperatures at comfortable or tolerable levels. Daytime temperatures might be reasonably satisfactory, but heat loss on darkside could result in very low temperatures. What is worse, thin atmospheres will likely not contain sufficient ozone to filter out ultraviolet radiation.

Dense Atmospheres: Planets with dense atmospheres may have concentrations of gases which approach or exceed the maximum limits tolerable by Terrans. Local conditions could easily push concentrations over the limit into the narcotic/toxic zone.

Exotic Atmospheres: Planets with "exotic" atmospheres contain unusually high concentrations of gases. These may have narcotic effects producing erratic behaviour and eventual unconsciousness. Use the drug effects rules (section 6.20) to determine effects on characters. The time to take effect will vary, depending on the concentrations of gases present, usually a period of some minutes. Regular checks can be made for personnel who do not succumb on the first CR. Toxic gases can similarly be treated, The StarMaster can also rule that gas concentrations will effect members of some races, but not others. See the race descriptions at the start of volume one.

Corrosive Atmospheres: Some atmospheres will have corrosive components which may increase the breakdown numbers of some exposed equipment or which may cause physical damage (burns skin, etc.) The effects might be checked at regular intervals (hourly, daily, etc.), with a 1d20% chance of actually causing breakdowns or "wounds." If the probability turns up on a 1d100 roll, roll 1d6 and either apply the result to the breakdown number or to the character as a "minor" wound.

Humidity: An important constituent of any Terran-breathable atmosphere is humidity. The amount of water vapour in the atmosphere has profound implications for Terran life forms and ecologies. High humidity at high temperatures can prove to be uncomfortable and sometimes dangerous. Low humidity, especially at high temperatures, will cause serious physiological complications: rapid drying of mucus membranes of the nose, mouth, and throat; dehydration, and eventual delirium, coma, and death as dehydration becomes extreme. Even when sufficient liquid water is present for drinking dehydration of the moist tissues will bring respiratory complaints and eventual illness.

Dust: Terrans will find dust concentrations in excess of 1765 million particles per cubic meter of air to be unhealthy if the silica content is under 5%. High silicate dust (over 50% free silica) should not exceed 175 million particles per cubic meter of air. Dust concentrations higher than these are harmful to the respiratory system, and prolonged exposure could cause silicosis and other lung degenerative diseases.

"Hot Planet" Atmospheres: Planets located close to a star might have fairly "exotic" atmospheres, like that of Venus. Venus could be taken as a model of such highly exotic conditions: primarily carbon dioxide, with traces or water vapour, oxygen, some hydrocarbons, and other "trace" gases. Temperature conditions on such planets will be furnace-like. Light gases (helium, hydrogen, etc.) will "escape" over the millennia because of the high-intensity solar heating in the upper atmosphere, and minute traces would remain. High concentrations of carbon dioxide would produce such a "greenhouse effect" that surface temperatures could approach 400°C or more.

"Cold Planet" Atmospheres: Planets distant from a star will have "unusual" atmospheres by normal Terran standards. As the distance becomes progressively farther, certain gases will become liquid or solid. Water freezes at 0^0C, and by -75^0C only minute traces of tiny ice crystals would be present in the atmosphere. Carbon dioxide turns to "dry ice" at -78.5° C. Nitrogen liquefies somewhat over
-100^0C. Methane liquefies at -161 .5^0C and is slushy by -184^0C, at 1 TSP. Oxygen liquefies at -183^0C. Some gases, like helium, remain liquid near absolute zero and exhibit highly unusual effects. Most, however, will be in a solid state by the time that -400^0C is reached (73.15°K).

Surface conditions on planets with very cold temperatures will prove onerous and dangerous. Terran personnel will require heavily insulated pressure suits to avoid rapid and fatal heat loss to the environment. Many of the gases and liquefied gases are very heat conductive at low temperatures and will draw heat away from warmer objects with ease. Other less pleasant phenomena may also result.

non-existent & Trace Atmospheres: Some planets will have no atmosphere or else only trace amounts of some gases. Surface conditions will approximate those of space itself. Close to a star, daytime temperatures are "hot" in the sense that any object in sunlight are heated by the direct rays of the star. In shadow, an object might be a great many degrees cooler than a nearby object in sunlight, although heat conductivity through the ground might heat it considerably if the day is long. On the darkside of such a planet, cooling may result in objects on the surface being many degrees below 0°C by the following dawn.

In such conditions, insulated pressure suits and sun-screens will be necessary protective

Designing Planetary Atmospheres: The StarMaster should exercise his own discretion when the question of a planet's atmosphere arises, rather than depending on a dice roll. Unusual effects can be noted. For instance, a planet might have an "exotic" atmosphere, with drug D4 effects, checked hourly with a CR, for Terrans. Other races will be susceptible as noted for their racial types under D4 drugs.

On a final note, the general age and state of development of a planet will be important when designing its atmosphere. Young planets would not have had the time to develop truly Terran atmospheres. Old planets would have suffered the escape of some gases and, if not possessed of a high gravity field, pressures might be fairly low.

15.9 METEOR INFALL

Some planets may be so unfortunately placed as to be subject to intense meteor infalls. As evidenced by the Moon and Mars, the destructive effects of meteor infalls can be immense. The novel Lucifer's Hammer provides an excellent description of the possible effects caused by the impact of large fragments of a comet, destroying civilisation on Terra, altering weather patterns, and producing mighty upheavals of the earth, vast tidal waves, and the like.

Generally, the thicker the planetary atmosphere and the farther a planet is removed from asteroid belts, the fewer meteors will reach the surface.

Planets with thin or no atmosphere would be more susceptible to meteor strikes. Conditions on such planets would definitely not be equivalent to walking through a machine-gun barrage, but an installation or, less commonly, a man could be struck from time to time by meteorites.

15.10 VULCANISM

Some planets may have very active volcanoes and/or severe seismic activity. Generally, the younger the planet, the more likely there will be incidence of extreme vulcanism. Such planets are still cooling, the solid crust is thin, and outbreaks of subterranean violence would be relatively frequent. Older

planets, on the other hand, would be less prone to severe and frequent vulcanism.

Another source of extensive seismic upheaval might lie in the passage of two planets at very close distances or in the pairing of a planet with relatively massive moons orbiting at close distances. The now classic When Worlds Collide presents an example of close passage by a Terran-sized planet which results in world-wide earthquakes. It is possible that two planets could, at periodic intervals, pass at close range, causing tidal strains in the planetary crust, earthquakes, and increased vulcanism. If the Moon were, say, half the mass of Terra, ocean tides would be several time higher than they are now. Internal stresses would produce tidal effects in the solid crusts and less solid or molten interiors of both bodies.

16.0 THE NPC RACES

NPCs (non-player characters) do not have to be rolled out in detail. Indeed, little more needs to be known than their identities until situations arise in which a particular characteristic or skill will come to bear. All need not be known of the NPC, it is even better if the StarMaster and players are uncertain of some things. This provides for general surprise when an NPC turns out to be other than what everyone expected.

The following is a system to rapidly generate the important traits of NPCs in appropriate situations. NPCs need not be 'whole characters' as they are simply 'passing through' an adventure and this system is to give the StarMaster a general idea of how NPCs relate to the PCs. The StarMaster is free to modify NPCs to provide variety and in the interests of fair play.

NPC characteristics are stated as a range rather than as a dice roll precisely setting the characteristic. A generally 'inadequate' NPC might have a brilliant intelligence although his other characteristics are substandard. Such an NPC might be a superb Scientist, but utterly hopeless as a fighter or technician because he is fumble fingered and a weakling. A totally incompetent NPC is unskilled or has very low skill levels in general, but he might also have expertise/10 in one field — his personal speciality!

16.1 NPC EXPERTISE

Whether or not an NPC has expertise in a required area will be an unknown until the subject arises — either because some task has to be performed or because PCs are making active inquiries into the NPCs skills in order to decide whether or not to hire him, etc. It should be taken into account that NPCs in certain roles will have some level of expertise within their chosen callings. A Power/Tech aboard a Starship, for in. stance, would have some skill as a Power Room Technician or he would not have been engaged for the position. Similarly, an Armsman will have skill with some weapon types. Such factors are not simply reduced to a simplistic die roll and the StarMaster should feel free to overrule the 'idiot dice.'

NPC Capability	Chance of Meeting (1d100)	Chance of Expertise in Appropriate Area (1d100)	Level of NPC Expertise	Chance of Expertise Outside Chosen Field (1d100)	Level of NPC Expertise
Inadequate	01—10	45%	1d6	15%	1d5*
Below Average	11—20	50%	1d6	30%	1d5*
Average	21—55	70%	1+1d6	45%	1d6
Above Average	56—75	85%	1+1d6.	60%	1d6
Competent	76—85	90%	2+1d6	75%	1+1d6
Superior	86—95	95%	3+1d6	80%	3+1d6
Exceptional	96—00	99%	4+1d6	90%	4+1d6

*1d6 roll, with a '6' signifying 'roll again.'

Modifiers may be applied to the percentage chance of meeting for the following:

NPC of rank/grade/5+	+5%
NPC in 'elite' unit	+10%
NPC in 'regular' unit	+5%
'Bug' workers	Average in work area assigned
'Bug' Warriors	Competent in combat skills
'Bug' Brains	Exceptional

The ratings for rank and grade are universally applicable. The StarMaster has the option of deciding the rank/grade level of any NPC en-countered. Dice rolling here can be too 'iffy.' The guidelines here hold good for Humans (Terrans, Azurachs, Galactic Peoples Republicans, Mercantile Leaguers), Humanoids (IRSOL), Felines (MekPurrs and Avatars), Canines (Rauwoofs), Ursoids (Balrads), Saurians (Hiss), Pithecines and Transhumans.

16.2 NPC CHARACTERISTICS & ATTRIBUTES

In addition to expertise possessed by an NPC of the races mentioned, he will need hard data on the dexterity levels, intelligence, and so on, as well as hand-to-hand combat ability or carrying capacity. The following tables are presented by race and each gives the scores that typically will be found in an NPC of that rating. There will always be exceptions, as noted above.

NPC Capability Rating	Chance of Meeting (roll 1d100)	Personal Characteristics	Transhuman Personal Characteristics
Inadequate	01—10	1—10 (6)	12—20 (13)
Below Average	11—25	4—12 (8)	13—20 (14)
Average	26—60	6—16 (11)	14—20 (15)
Above Average	61—80	7—18 (12)	15—20 (16)
Competent	81—90	8—20 (13)	16—20 (17)
Superior	91—97	10—20 (14)	17—20 (18)
Exceptional	98—00	12—20 (15)	18—20 (19)

Bracketed values are averages' for the type of NPC. Transhumans have certain characteristics well above the levels normally expected for some characteristics (Psionics/15+, etc.), and these can be checked against the PC descriptions at the beginning of volume 1. Some of the other races will have exceptionally high strength or dexterity, and these can be adjusted upward to give the NPCs a degree of correspondence to racial norms.

Players should realise that the Shock CR is the range on 1d20 required to survive a shock test. These values can be modified slightly. They also reflect the probable Constitution of an NPC. The hand-to-hand combat factors have been stated in a range corresponding to possible expertise levels an NPC may have with weapons known to him/her. Average NPCs are rated for expertise/1-5 while Superior NPCs are rated for expertise/1-9.

Race & Rating	Body Mass	Carrying Capacity	Damage Factor		Stamina Factor	Shock CR	Hand-to-Hand	
			Armsman	Other			Armsman	Other
Humans								
Inadequate	60	25	22	20	30	1-8	21-35	15-18
Below Average	70	30	26	24	45	1-9	23-28	17-20
Average	77	40	30	28	60	1-11	28-33	20-24
Above Average	85	50	32	30	70	1-12	30-35	22-26
Competent	90	60	35	33	80	1-13	33-39	24-28
Superior	93	70	38	36	90	1-15	36-41	29-33
Exceptional	96	80	40	38	100	1-17	45-58	33-42
Transhumans								
'Inadequate'	60	90	39	37	100	1-15	53-60	
Below Average	70	105	43	41	105	1-16	56-63	
Average	77	115	46	44	110	1-16	56-63	
Above Average	85	135	~0	48	115	1-17	63-72	
Competent	90	150	52	50	120	1-18	67-75	
Superior	93	165	55	53	125	1-19	75-82	
Exceptional	96	180	57	55	135	1-19	77-86	
Feline/MekPurr								
Inadequate	75	30	32	30	60	1-11	38-44	31-36
Below Average	82	40	35	33	66	112	41-47	3439
Average	89	60	38	36	72	1-13	44-51	37-43
Above Average	100	75	43	40	78	1-14	47-56	39-46
Competent	110	85~	47	43	84	1-15	51-60	43-50
Superior	115	100	50	45	90	1-16	57-65	48-54
Exceptional	120	115	55	48	100	1-17	62-78	51-65
Feline/Avatar								
Inadequate	75	30	32	30	60	1-11	44-51	38-44
Below Average	82	40	35	33	66	1-12	48-56	41-47
Average	89	60	38	36	72	1-13	51-60	44-51
Above Average	100	75	43	40	78	1-14	54-64	47-56
Competent	110	85	47	43	84	1-15	60-70	51-60
Superior	115	100	50	45	90	1-16	68-78	57-65
Exceptional	120	115	55	48	100	1-17	74-91	62-70
Pithecines								
Inadequate	75	60	32	30	88	1-14	44-51	38-44
Below Average	82	70	35	33	94	1-15	40-56	41-47
Average	89	90	38	36	100	1-16	51-60	44-51
Above Average	100	105	43	40	104	1-16	54-64	47-56
Competent	110	120	47	43	107	1-17	60-70	51-60
Superior	115	130	50	45	110	1-17	68-78	57-65
Exceptional	120	145	55	48	115	1-18	74-91	62-70
Humanoid								
Inadequate	60	25	22	20	27	1-8	19-23	15-18
Below Average	70	30	26	24	40	1-9	21.25	17-20
Average	77	40	30	28	54	1-11	25-30	20-24
Above Average	85	50	32	30	63	1-12	27-32	22-26
Competent	90	60	35	33	72	1-13	30.35	24-28
Superior	93	70	38	36	80	1-15	36-41	29-33
Exceptional	96	80	40	38	90	1-17	41-52	33-42
Canine								
Inadequate	60	25	22	20	30	1-8	17-21	15-18
Below Average	70	30	26	24	45	1-9	19-23	17-20
Average	77	40	30	28	60	1.11	23-27	20-24
Above Average	85	50	32	30	70	1-12	24-29	22-26
Competent	90	60	35	33	80	1-13	27-32	24-28
Superior	93	70	38	36	90	1-15	33-37	29-33
Exceptional	96	80	40	38	100	1-17	37-47	33.42
Ursoid								
Inadequate	105	140	52	48	90	1-14	42-50	32-38
Below Average	115	170	56	52	98	1-15	48-56	36-42
Average	121	190	60	55	104	1-16	57-68	39-51
Above Average	140	235	68	62	108	1-17	62-72	47-54
Competent	155	275	75	68	113	1-18	67-77	50-58
Superior	165	295	80	72	117	1-18	72-82	54-62
Exceptional	177	335	85	76	124	1-19	80-104	60-70
Avians								
Inadequate	60	25	22	20	27	1-8	15-18	13-16
Below Average	70	30	26	24	40	1-9	17-20	15-18
Average	77	40	30	28	54	1-11	20-24	18-21
Above Average	85	50	32	30	63	1-12	22.26	19-23
Competent	90	60	35	33	72	1-13	24-28	21-25
Superior	93	70	38	36	80	1-15	29-33	23-26
Exceptional	96	80	40	30	90	1-17	33-42	26-33

Saurians								
Average	105	110	45	43	84	1-14	47.54	32-36
Above Average	123	135	53	50	90	1-15	50.57	34-38
Competent	135	165	67	54	96	1-16	54-62	36-42
Superior	142	180	60	57	102	1-17	60-68	40-46
Exceptional	148	200	65	60	108	1-18	65-78	44-52

16.3 'BUG—EYED MONSTERS'

However much Mankind may come to an accommodation with many of the diverse races it will encounter in the universe, there will always be some so starkly 'alien' that no common ground will be found on which to build friendly relations. Such races are the 'monsters' of the galaxy.

16.4 THE BUGS

Of all the races encountered by Terrans, the 'Bugs' (Mobile Infantry term for the species) are amongst the most incomprehensible. Most races are composed of individuals. The Bugs are not individuals, but rather are 'units' in a vast 'hive consciousness.' They are individually devoted to only one great task: maintenance of the survival of the Hive and its Queen. All they know is Duty, pursued with an instinctive and all-encompassing drive ingrained by thousands of generations of selective breeding and genetic perfecting of the qualities desired in each of the three castes.

Brain Bugs: Highly sensitive psionic Adepts who are able to attune themselves (barely) to the thought frequencies of the Bugs have con-firmed that the function of the 'Brain Bugs' is not to lead, but to maintain a psionic link, joining all members/units in the 'Hive Mind.' Only the 'Hive Mind' has awareness and intelligence. Individual units have only instinct to guide them when not in contact with the Hive. 'Brains' act as communicators to express the will of the 'Hive Mind' and to supply information on local situations to the collective consciousness for evaluation and decision. This explains why slaying a 'Brain Bug leader' does not cause permanent confusion. Any replacement can perform literally the same functions of command with the same level of efficiency. 'Brains' do not join in battle themselves. They are, in fact, quite incapable of defending themselves from anything larger than a small dog or cat.

Warriors: Maintaining security of the Hive and its territory, property, and members is the task of the Warrior Caste. They resemble giant soldier ants, armoured in chitin and armed with strong mandibles. They must remain in contact with a Brain Bug (usually within 500m) or they will stop still, continue moving in the last direction ordered, or range randomly to and fro. However, blind instinct will send the isolated Warrior into ferocious attack at the sight of any non-Bug vehicle or individual. Any enemy within 100m of an undirected Warrior can expect to be locked in close combat. Nor is Warrior morale a problem. Every Bug Warrior follows orders in the face of impossible odds. The Bug 'Leadership' regards them as expendable as the human leader regards the ammunition fired by his men.

When first encountered (in the time period covered by Space Marines), the Bugs were rather primitively armed with single fire blast rifles and other early Tech/7 weapons. Later on, 'elite' swarms of Warriors are encountered with fairly up-to-date weapons and protection from gas, etc. The Hive Minds have apparently recognised the threat and have acted to increase the fighting efficiency of their Warriors.

Workers: Workers perform all other duties in the Hive, technical and otherwise. They are the most numerous members of the Hive. All are non-combatants bred for work, not war. Personnel who have not en-countered Bugs before will confuse them for Warriors 75% of the time, while experienced personnel are still confused 25% of the time. The Bugs often send in diversionary 'attacks' of Workers to draw enemy fire. They also mix Warriors into a mob of Workers to divide enemy fire. Workers evidence technical expertise equal to level/2-6.

The Hive: Bugs live underground in vast tunnel and chamber complexes covering many square kilometres, and extending several thousand meters below the surface. Deep in the Hive the Royal Chambers shelter the Queen, who lays hundreds of eggs per day. Each Hive is apparently independent of the others, but there is a good deal of co-operation despite the lack of central authority.

General Traits: Bugs prefer Steppe Planets with fairly warm temperatures, but they do not like desert conditions. They have unbelievably high tolerances to most noxious gases, yet are susceptible to high silica dust concentrations in the air. Radiation is tolerated with little observable effect. Unless struck in the head or body, wounds have virtually no effect upon the life force of the creatures, and shock effects simply do not occur even from mortal hits. Stun Beams, Neuronic Whips, and Paralysis Rods have no effect, but Coagulators will penetrate their chitin armour automatically.

Bug Type	% in Hive	Armour	Expert.	Body Mass	Carrying Capacity	Damage Factor	Hand-to Hand	Stamina Factor
Brain	1%	G/G/G	6-8	100	100	20	0	120
Worker	80%	G/G/G	2-6	350	1000	40	0	120
Warrior I	10%	D/D/F	3-6	350	500	60	70	120
Warrior II	6%	D/D/E	3-6	400	600	70	75	120
Warrior III	4%	C/D/E	3-6	450	700	80	80	120

Personal characteristics have little meaning for Bugs, but roll 1d20 for Brain Intelligence. All Brains are Psionic/20 and have mind shielded equivalent against Psionics as their minds operate on a very different frequency.

16.5 THE KLACKONS

The Klackons are loosely classed as Icthyoids because they are aquatic, but they are more properly crustaceans. Klackons are amphibious, crab-like beings with heavily armoured shells and large pincer claws which can be used to manipulate objects or to tear food and enemies apart. They are omnivorous and eat anything that does not eat them first. The fact that the 'food' is sentient disturbs Klackons not at all.

Klackons have an incomprehensible language and an equally incomprehensible social structure. It is possible to conduct trade with Klackons, using sign language and the pidgin evolved for spoken communication. It is a good idea to have weapons close to hand in case the Klackon's hunger overcomes the desire to do business. One feature of Klackon culture which bears mention is their obsessive pre-occupation with the number '7.' All organisation, military and otherwise, appears to be based on sevens.

Klackons live along the tide lines of seas and oceans, and in the nearby waters up to a depth of 100m. Their vehicles are amphibious or even triphibious. reflecting their ability to move on the land or under the sea at will. Aircraft are often capable of functioning as land tanks or submersibles as well.

Klackons are immune to Stunners, Paralysis Rods, and Neuronic Whips, like 'Bugs.' They are similarly vulnerable to attack with a

Coagulator, which penetrates the hard shell of the Klackon with ease. Radiation has little effect upon them. The creatures can survive out of water for hours, but they use protective gear to prevent dehydration. Klackons prefer planets rich in water, and with fairly temperate to warm temperatures. Jungle planets are especially prized because of the extensive shallow seas, most favourable to Klackon life forms.

Mertun	Body Mass	Carrying Capacity	Damage Factor	Hand-to-Hand	Stamina Factor	Shock CR
Inadequate	100	100	35	25	50	10
Below Average	125	125	40	30	60	12
Average	150	150	50	35	70	13
Above Average	175	175	55	40	80	14
Competent	200	200	60	45	90	15
Superior	225	225	65	50	100	16
Exceptional	250	250	70	55	110	17

Klackor	Armour	Body Mass	Carrying Capacity	Damage Factor	Hand-to-Hand	Stamina Factor
Male	B/C/E	175	200	60	75	100
Female	D/D/E	125	125	40	50	80

16.6 THE MERTUNS

The Mertuns are an octopoidal 'race from low gravity planets and may be regarded as similar to H.G.Wells' Martians in War of the Worlds. The Mertuns are a totally unemotional race devoted to cold, hard logic. Somewhat shy and retiring, the Mertuns will retreat If a battle is going against them, but they show no great fear or courage — which are emotions. Mertuns appear to have no set social organisation, but it is suspected that individual communities function on a pattern not dissimilar to 'Athenian Democracy,' While not overly hostile, neither are they a 'friendly' race

The Mertuns are quite advanced technologically. All individuals wear personal body armour at all times, equivalent to CBA/7C 'combination' combat body armour or CBA/6E exoskeleton combat armour. They also use heavy Tripod Walkers, equivalent to PAM/1-4 Marauder Powered Armour in battle, with a significant number of Mertun soldiers so equipped.

While the Mertuns often live on planets poor in water resources, they are amphibious and adapt to aquatic conditions with ease. They are as resistant to radiation as 'Bugs.'

17.0 THE BEASTS

All animal forms are classified according to their size. However, body armour and fighting characteristics will vary widely, and - size alone will not determine the deadliness of an animal.

Animal Class (Size)	Approx. Body Mass	Carrying Capacity	Damage Factor	Stamina Factor	Shock CR*	Hand-to-Hand	Natural Weapon
AAAA	5000-10,000kg	10.d6%	100+6.d6	50+7.d10	9+ 1d10	60+4.d10	A to E
AAA	3000-5000 kg	10.d6%	90 + 6.d6	50 + 7.d10	9 + 1d10	50 + 4.d10	A to E
AA	2000-3000 kg	10.d6%	80 + 6.d6	50 + 7.d10	9 + 1d10	40 + 4.d10	A to E
A	1000-2000kg	10.d6%	70+6.d6	50+7.d10	9+1d10	35+4.d10	A to F
B	900kg	10.d6%	60+6.d6	50+6.d10	9+1d10	35+4.d10	A to F
C	800kg	10.d6%	50+6.d6	50+6.d10	9+1d10	30+4.d10	A to G
D	700kg	10.d6%	S0+5.d6	50+6.d10	8+1d10	30+4.d10	A to G
E	600kg	10.d6%	50+4.d6	50+6.d10	8+1d10	30+4.d10	B to G
F	500kg	10.d6%	40+5.d6	50+6.d10	8+1d10	30+3.d10	B to G
G	400kg	10.d6%	40+4.d6	50+6.d10	7+1d10	30+3.d10	B to G
H	300kg	10.d6%	30+5.d6	50+6.d10	7+1d10	30+3.d10	C to H
	200kg	10.d6%	30+4.d6	50+.6.d10	7+1d10	25+3.d10	C to I
J	100kg	10.d10%	20+5.d6	S0+5.d10	6+1d10	20+3.d10	D to J
K	50kg	10.d10%	10+4.d6	50+5.d10	6+1d10	10+2.d10	E to J
L	25kg	10.d10%	10+2.d6	50+5.d10	5+1d10	10+2.d10	F to J
M	15kg	10.d10%	10+1d6	50+5.d10	4+1d10	10+1d10	G to J
N	10kg	10.d10%	5+1d6	50+5.d10	3+1d10	10+1d10	H to J
O	5kg	10.d10%	1+1d6	50+5.d10	2+1d10	10+1d10	L to J

Animal Creation Procedure: The StarMaster has the freedom to 'design' animals to suit the circumstances. The basic characteristics are general guidelines. They can be subjected to random dice rolls or they can be assigned at the StarMaster's discretion.

Animal size establishes the approximate mass. For instance, a type AAA animal is somewhere in the 3000-6000 kg range. A C type is somewhere between 800 and 900 kg. Carrying capacity is a percentage of the animal's body mass, and refers to objects/creatures in the beast's 'arms', dragged with the teeth, on its back, or whatever. The amount of damage an animal may sustain reflects general size, but smaller beasts can sustain as much or more damage than larger creatures, reflecting special toughness. Stamina reflects the endurance levels of the creature, while the Shock CR reflects its ability to absorb serious damage without being knocked down or stunned. The hand-to-hand combat factor places the beast on the same system as 'human' and related PCs and NPCs, with high values showing considerable proficiency when employing natural weapons. As for those 'natural weapons', rather than declare the beast has fangs or claws, or whatever, that detail is left to the StarMaster to set out. The relative danger posed by the beast and its armament is denoted by a letter rating from 'A' (very dangerous) to 'J'. These natural weapon categories are given in the Close Combat section, along with those belonging to character and NPC races.

Animal Movement: All animals are rated for a particular movement rate. General guidelines are given in the following sections.

Movement Class	Movement in 6 Seconds				Speed in km/h			
	Walk	Trot	Run	Sprint	Walk	Trot	Run	Sprint
Very Slow	2m	5m	10m	20m	1.2	3	6	12
Slow	6m	20m	40m	60m	3.6	12	24	48
Average	6m	20m	50m	90m	3.6	12	30	54
Fast	6m	30m	60m	120m	3.6	18	36	72
Very Fast	6m	30m	80m	140m	3.6	18	48	96
Fleet	6m	40m	100m	200m	3.6	24	60	120

Crawling speeds are about 1/2 to full walking speed. Flying speeds can vary considerably, but average flyers will cruise around 100m (60 km/h) per six seconds and can 'sprint' at double to triple that rate for short times. Fast flyers could do double those rates. Only sprints will cause flyers severe fatigue. Also, terrain will affect ground movement.

Road	100%
Clear	100%
Light Woods	90%
Thicket/Jungle	80%
Swamp	50%
Swim	Walk Speed
Rough	90%
Gentle Slope	90%
Steep Slope	80%
Mountain	70%
Cliff	Variable

Amphibians may have double or triple swimming speed-Natural swimmers will swim at 20m-90m per six seconds.

Animal Armour: Size has little to do with the protection provided by hide, scales, chitin, etc. Animals have armour from 'skin' to 'C' or 'D' class, with high classes signifying hard-shells or chitinous exoskeletons. Most have natural armour of low class, rarely over 'I'. See the Close Combat section for an idea of the relative values of armour.

Animal Types: All animals fall into ecological niches, like those on Terra. All beasts will be carnivores, omnivores, scavengers, or herbivores. Food gathering habits determine general behaviour, aggressiveness, and likely fighting ability, with carnivores probably possessing the best natural weapons of all.

Carnivores are meat-eaters which attack and kill other animals. A carnivore will not necessarily attack anyone or anything on sight; some are specialists and are wary of unfamiliar 'prey' unless especially hungry.

1. Hunting Packs are carnivores which hunt in groups, relying on numbers to run down prey and to overwhelm the victim with multiple and simultaneous attacks. Examples are wolves, dingoes, and other canine species. Speed: Fast to very fast.

2. Stalkers/Ambushers are carnivores which tend to be solitary hunters, but sometimes hunt as mated pairs, relying on stealthy approaches to the quarry before a sudden, killing rush or spring, or else lying in ambush along a game trail or watering place to await the appearance of the prey. Examples are Terran hunting cats. Speed: Fast or very fast.

3. Lurkers are carnivores which 'passively' await their quarry. Such creatures rarely hunt aggressively, preferring to have the quarry fall into a prepared trap (like insect SandLion) or to pass close to a hidden lair (like arachnid Trap Door Spider). Web-spinners fall into this category. A trap holds the victim until the arrival of the lurker. Some rely on colour, scent, etc. to entice prey close enough to be attacked. The lure is specific to given animals, but it may attract sentient personnel (15% chance) who become curious. Such creatures include species whose outward appearance hides their carnivorous natures. Examples are angler fish, Venus fly trap. Speed: Slow or very slow.

Most carnivores hunt for food Out of hunger, and only the rare species with a killing 'blood-lust' will attack on sight, disregarding the size or apparent dangerousness of the quarry. Such beasts could be termed 'murderers' or 'killers' because they slay for sheer joy of killing, Examples would be wolverines, sharks or weasels.

Omnivores are animals who specialise in a wide range of foods, vegetable and animal.

1. Classic Omnivores are animals which 'graze' on berries, roots, herbs, etc., but are not above killing smaller prey when it chances along or even scavenging on dead animals left by other hunters. Examples are apes, chimpanzees, racoons. Speed: Slow to average.

2. Aggressors are omnivores which feed on vegetable materials but also exhibit a strong tendency toward hunting, although they do not have the skill of carnivores. Examples are bears, baboons, man. Speed: Slow to average. Some Aggressors are surprisingly well equipped with natural weapons like the bear, while others tend to rely on primitive 'tools' (sticks or rocks) to kill prey.

3. Voracious Omnivores are animals which will eat almost anything that comes their way, and often will not be intimidated by size or apparent danger. Example' the army ant which both grazes and hunts in a vast swarm. Speed: Slow to average.

Scavengers are animals which feed on carrion remains of the kills of others and/or which hijack the kills made by others. They are meat eaters but cannot be classed with the carnivores because they rarely set out to actually kill their food themselves.
1. Standard Scavengers take carrion meat where they find it. Scavengers will gather around the site of a kill, waiting patiently for the carnivore to finish its meal, then moving in to claim the rest. Example: Vulture. Speed: Slow to average.

2. intimidators/Robbers are scavengers who approach a kill and frighten off the slayer or other scavengers by either appearing to be a threat or actually posing a threat. An example of an Intimidator is the coyote, while the wolverine or lion (also carnivores) are examples of Robbers. Speed: Average to fast.

Note: Some scavengers exhibit carnivore behaviours. Hyenas, for instance are full-fledged hunters at night but scavenge in the day. Similarly, hunters can also turn into scavengers. The line is drawn at the activity most typical of the animal.

Herbivores are animals which eat plants, but can include animals which eat other animal life forms which cannot resist them (anteaters, etc.).

1. Grazers are animals which spend most of their waking hours either cropping forage or sitting quietly chewing the cud. They may be herd animals or solitary grazers. Herd animals are prone to stampede at the first sign of danger. Some are passive to the end, but others may be surprisingly well armed with natural weapons and fight fiercely when cornered. Examples are deer, cattle, bison, antelope. Speed: Fast to very fast.

2. Intermittent Grazers are animals which spend only part of each day grazing for food. Examples include horses or elephants. They again may be herd animals or solitaries. Some are very fierce adversaries when threatened. Speed: Slow to very fast (depending upon size.)

Special Features' The above descriptions assume land-dwelling animals. Aquatic species will spend all their time in water (fish, whales, dolphins) and may be gravely threatened when thrown on land. Amphibious creatures (even animals like otters or alligators) are capable of functioning on land or in the water. Flyers are capable of flight and tend to be slow and clumsy on the ground. Finally, there are some triphibians (ducks or geese) which can fly, move on land, or swim. Such features should be noted for 'special' creatures. However, large, heavy animals will rarely have any flight ability.

Pelts: Animals, particularly carnivores, will have pelts, making it possible to go into the hunting and trapping business. The best fur pelts typically come from the most dangerous carnivores and from smaller carnivores living in cold climates. Ice Planets generally support a good percentage of the population from the fur trade, as pelts are especially rich. StarMasters should assign the value of pelts. Note: animals killed by energy weapon fire have a flat 75% chance of the pelt being ruined (100% with flamers, explosives, etc.)

Encounters: The nature of animal encounters is so variable, because of local conditions, that StarMasters are encouraged to make up their own 'encounter tables' for each world or

world type. This permits the fullest expression of the StarMaster's own conception of what a particular world's animal forms are like and the probability of encountering them. Some common sense and authenticity should be observed. Attacks by carnivores every few minutes ignores the fact that carnivores are relatively limited in numbers and spread out, compared to grazers and other less dangerous creatures. Planets with starkly limited environments (low pressure, desert, etc.) will have low animal populations. Such factors should be considered when populating planets with animal life and assigning encounter probabilities.

18.0 PERSONAL LIVING EXPENSES

The following short list includes the basic expenditures a PC will probably incur when on the surface of a planet. Expenses could vary by +/-20% on any given item. Also, one's Merchant and/or Streetwise expertise can be applied as a -1% to -10% cost modifier, reducing the cost to reflect the PC's ability to 'sniff out' a bargain.

	Planetary Economy Type					
Item	**RI**	**AI**	**P1**	**RA**	**AA**	**PA**
Superb Room/day	100	75	50	75	50	25
Good Room/day	50	40	25	40	25	15
Average Room/day	25	20	15	20	15	10
Poor Room/day	15	10	7	10	7	5
Flop House/day	5	4	2	4	2	1
Superb Meal	50	40	35	30	25	20
Good Meal	35	30	25	20	15	10
Average Meal	15	12	10	10	7.5	4
Greasy Spoon Meal	3	2	2	2	1	1
Formal Clothes	750	750	750	750	750	750
Business Clothes	350	300	200	250	200	150
Work Clothes	75	60	40	60	50	35
Outback Clothes	300	275	200	275	250	200
Food (raw)/day	3	2.5	2	.1.5	1	.5

Cost of drinks in a bar, etc. can be related to 20th century Terran prices, as can the price of other incidental items by equating $1 U.S. to CR 1.00. A range of prices can be projected to reflect local conditions. For instance, in a StarPort 'dive,' the price of liquor may be considerably inflated, especially when compared to prices in the hinterlands of the same planet.

18.1 AIRCRAFT & VEHICLE RENTAL

Rather than buying an aircraft or vehicle for transportation on a planetary surface, characters may be able to rent a unit from a local agency. Generally, a deposit of 5% to 10% of the vehicle's retail value will be required from off-worlders, plus a daily rental and/or distance fee. An Interstellar License (vehicle expertise for the appropriate vehicle) must be presented to make such a rental or a driver must be hired with the vehicle.

Aircraft/Vehicle To be Rented	**Passengers/ Cargo Cap.**	**Deposit (CR)**	**Daily Fee**
Lt. Prop Plane	1 + 6/1t	1000	200
Lt. SST	1 + 6/1t	2500	450
Lt. 2-Prop Plane	2+ 12/3t	1500	300
Lt. 2-Jet Plane	2 + 1 2/4t	5000	1000
Lt. SST	2 + 12/3t	7500	1500
Lt. SST	2+ 12/6t	18,000	2500
4-Prop Transport	3+ 100/30t	7500	2000
4-Jet Transport	4+ 150/40t	15,000	3500
4-Turbo SST	3 + 100/50t	25,000	5500
4-Prop Hv. Trans.	4+ 200/80t	25,000	6500
4-Jet Hv. Trans	4+300/100t	30,000	7500
Heavy SST	3 + 100/100t	50,000	10,000
Lt. Helicopter	1 + 3/500kg	1000	200
Lt Helicopter	1 + 3/1t	1250	250
Mdm. Helicopter	2 + 30/5t	4000	750
Mdm. Helicopter	2 + 30/12t	6500	1200
Hv. Helicopter	3 + 50/40t	7500	1500
Groundcar	1 + 5/250 kg	250	50
Lt. Truck	1+1 1/2-3t	250	50
Hv. Truck	1 + 21/5-8t	450	90
ATV Carrier	1+4/1t	400	75
ATV Lt. Truck	1 +9/10t	900	100
ATV Hv. Truck	1 + 18/30t	1500	150
Hovercar	1+5/1t	600	65
HoverLorry	1 + 12/6t	1500	150
HoverCarrier	1 +28/10t	2000	200
HoverTruck	1 + 30/15t	2250	250
Hovercruiser	1 + 50/50t	7500	750
HoverShip	1 + 100/100t	15,000	1500
Lt. Crawler	1 + 6/3-5t	850	85
Mdm. Crawler	1 + 12/10t	1500	150
Hv. Crawler	1 + 20/20t	2500	250
CargoTrek	1 + 40/50t	7500	750
Lt. GravSled	1 + 5/3t	1000	100
Mdm. GravSled	1 + 12/8t	1500	150
Hv. GravSled	1 + 20/18t	2000	200
Motor Boat	1+5/15	175	25
JetBoat	1+5/1t	500	50
JetBoat	2 + 18/10t	2500	250
HydroFoil	1 + 12/5t	1500	150
HydroFoil	3 + 30/25t	5000	750
HydroSkimmer	1+5/1t	500	50
Submersible	2 + 8/10t	40,000	3000
CargoSub	5 + 50/100t	100,000	15,000
Anti-Grav Floater	variable	25 x AFG no.	5 x AFG no.

Weekly rates can be arranged at 50% + 4.di0%.

Charters where a driver and crew are provided cost an additional daily fee appropriate to Tech salary levels for the driver/crew.

Distance rates can be up to CR 0.25/km travelled.

Colonial planet fees and distance rates can be 5.d10% higher than on major planets as listed above.

Merchant skills can be applied to 'dicker' down the rates with a 7% x Merchant expertise chance of reducing the price by 1d10% + (1% x Merchant expertise.)