UNIVERSE: ADDITIONAL

A compilation of articles and variants
from Ares Magazine and other sources
for SPI's UNIVERSE
By Ian Taylor

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0. UNIVERSE: ADDITIONAL

UNIVERSE: ADDITIONAL has been made possible by the contributions of many people.

[1.0] DELTAVEE: The Federation Strikes Back!

By Marvant Duhon

Through most of the 24th century, long range exploration ships were not as numerous as they once had been; nearly all were found at or beyond the periphery of known space. Other spaceships only travelled between bases or kept close to a single base; the bases provided facilities for the crew, supplies, and replacement pods as needed. When a ship ventured out without a friendly base as its destination, on a military operation or pirate foray, its next move was always an immediate return to base. In the five scenarios provided with the DELTAVEE game, surviving ships are usually dangerously low on energy and missiles and badly battered. Between battles a ship might repair damaged equipment and recharge its energy, but it could not replace missiles or repair destroyed equipment.

With the gathering of war clouds, a need exists for warships capable of sustained operations that can fight a series of battles separated by jumps with no intervening return to base. Ships designed for this "main fleet" use require a jump pod, preferably an augmented one, and all but the small Daggers should carry an energy pod and a crew pod as well. Other pods usually fall within a narrow range for each class of ships, with the main choice being whether to outfit larger ships as generalists (with a balanced load of different pod types) or specialists (with some ships bristling with arsenal pods, others outfitted as Battlecraft carriers, and so on).

For main fleet work, a Dagger's two pods are nearly always an energy pod and a hunter. If energy is available from support ships, an energy pod and a heavy weapons pod can be used; for independent scouting, the ship can carry two hunter pods. Three of the five pods of a Sword in a battle fleet should be a jump pod, a crew pod, and an energy pod. The other two could be an arsenal or heavy weapons pod and a battle communications pod. Some Swords could carry two blaster pods to provide flak defence for larger ships.

Spear (8 pod). Pike (12 pod), and Halberd (15 pod) class ships should carry a basic load of one energy pod, one crew pod, and one battle communications pod. Tb this can be added a couple of arsenal pods, one or two Battlecraft pods, and perhaps a tractor beam pod. This alone would fill a Spear. Larger ships could have one or more blaster pods and duplicate energy, jump, and battle communications pods. Two level 8 Tractor beam pods operating upon the same ship would work wonders, but this is a costly capability. When two or four pods of the same type are carried, they should be paired (e.g., pod 1 being the same as pod 9), so that both will be affected by the same die roll on the Hit Table. This gives less choice to the enemy player scoring a hit. A fleet flagship will usually carry a command pod.

[1.1] The Federation Strikes Back!: Terwillicker-X Modifications

As larger military spaceships became more common, the Terwillicker-X Battlecraft became less and less effective. Against a Spear or a heavily-armed Sword, the laser-armed fighters were merely annoying gnats. Both the X model and the earlier model 5000 had been designed for scouting and skirmishing, not fleet actions. However, it was easy to add pylons that could carry unguided or intelligent missiles. Model X-l carried one missile beneath the hull, the X-2 had two (one on each wing), and the X-3 carried one in each of those three positions. The People's Socialist Alliance worlds employed several versions, the X-1G, X-2G, and X-3G. These had the laser removed and guided missile control equipment installed, permitting a guided missile to be carried. Most other fleets considered this a poor trade-off, but the PSA used -these models in droves.

Each missile carried reduces the manoeuvre rating by one until it is fired. No Prepare Missile Command is required. Any number of missiles carried may be fired at once, all with the same direction and velocity. A Battlecraft may not fire its burster in the Phase in which it fires a missile. The X-1G, X-2G, and X-3G may provide guidance to only one missile per Command Phase, in lieu of launching a missile in the previous Fire Phase.

Based on these developments and others, the Terwillicker-Y was built. It carries three missiles, but they are better installed • so that there is no manoeuvrability loss. The burster is retained, and guidance can be provided to any number of its missiles per Command Phase, regardless of its actions in the previous Fire Phase. Its pod possesses 1 Battle Command, which can only be used for Commands involving a fighter.

Fighters are only missile armed on their first sortie. No reloads are carried in the pods, although projects are directed toward correcting that.

With the gathering of war clouds, a need exists for warships

[1.2] The Federation Strikes Back!: Additional Spaceship Types

The Terwillicker 3000 is an older Battlecraft, which still serves in many smaller navies. The Y model, a significant improvement over the X, is found in major battle fleets. Harmonics has its own entry into the Battlecraft field, the Fugue. The Fugue is manoeuvrable enough to fly rings around the opposition, especially at high speeds, but it is lightly armed and armoured.

The old Blades Battleaxe is still the big bruiser in some areas. As is the case with all level 6 ships, a battle communications pod will only improve its Targeting Program to -3. The Mace was a good design for its day, quite well armoured for such a little ship. Although a single pod seems small for a warship, the Mace is found on dozens of worlds. It is used not so much as a part of a navy, but for planetary defence. The Poniard was the standard military two-pod until the vastly superior Dagger came along; it is now relegated to a few backwater areas. The Sai originally served as a leader for a squadron of Poniards. Although it is far from "top of the line," it is retained by many navies.

The Sabre was the model from which the Sword developed. The Pike and Halberd are new classes, built for main battle fleets. A Burster Class of 3 means that the hull burster may fire laser bursts or barrages or particle bursts; a Class 4 means that it may use laser or particle bursts or barrages.
The old Harmonics Oboe is an small exploration ship once sent out in large numbers across the universe. The Saxophone is the current extended exploration model, designed for extensive discovery and investigation missions. It is seldom seen in civilized space.
The Corco Beta is an older model cargo ship, slightly modernized and armoured for use in asteroid belts. It is mainly used for in-system work these days.

[TABLE 1:] ATTRIBUTES OF NEW SPACESHIP TYPES

CLASS	NUMBER OF PODS	VELOCITY RATING	MANOEUVRE RATING	ENERGY CAPACITY	ENERGY BURN RATE	STREAMLINED	BURSTER CLASS	ARMOUR CLASS	FORCEFIELD CLASS	CIV LEVEL	TARGET PROGRAM
BATTLECRAFT											
Terwillicker 3000	**0**	2	6	12	1	**Y**	1	0	0	**6**	-1
Terwillicker –Y	**0**	4	9	18	1	**Y**	2	2	0	**8**	-4
Fugue	**0**	2	12	15	1	**Y**	1	1	0	**8**	-4
SPACESHIPS BLADES RI											
Mace	**1**	2	6	24	2	**Y**	2	2	1	**6**	0
Battleaxe	**6**	1	4	120	12	**N**	2	2	1	**6**	0
Poniard	**2**	2	5	36	4	**Y**	2	1	1	**7**	-2
Sai	**3**	2	5	60	5	**Y**	2	2	1	**7**	-2
Sabre	**5**	2	7	72	6	**N**	2	2	1	**7**	-2
Pike	**12**	1	4	144	16	**N**	3	2	2	**8**	-4
Halberd	**15**	1	4	180	18	**N**	4	2	2	**8**	-4
HARMONICS INC											
Oboe	**3**	2	6	60	5	**Y**	1	1	0	**6**	0
Saxophone	**10**	2	5	144	11	**N**	1	1	1	**8**	-4
CORCO GROUP											
Beta	**3**	1	3	48	6	**Y**	1	1	0	**6**	0
Theta	**8**	1	2	120	12	**N**	0	0	0	**6**	0
Nu	**15**	1	3	192	24	**N**	1	0	0	**7**	-2
Epsilon	**3**	3	8	60	6	**Y**	2	2	2	**8**	-4

The Theta was big and clumsy, and is now generally unused. The Epsilon is a new design. Many have been sold to honest adventurers, but Corco developed the Epsilon with the needs of privateers foremost. Federation star fleets have had great difficulty with an owner-modified Epsilon with a manoeuvre rating of 9 and a target program of -6. Unconfirmed reports say the ship and pilot are so good that it can weave into an asteroid or planet hex. Not nearly so popular is the Corco Nu, famous for its large cargo capacity and for a larger appetite for energy. Few have been sold, and those only in settled areas, as they make too easy and attractive a target.

[1.3] The Federation Strikes Back!: New Pod Types

Several weapons pods are provided, plus several support pods. The support pods have little or no effect during battles, but rather are for use between battles, allowing campaign games. It is assumed that ships have on board equipment for repairing damaged equipment and armour, but that destruction is permanent. Note: When there is no battle underway, each spaceship has one additional Battle Command available because the crew can devote itself to other matters. The new spaceship pods available are:

Blaster pod — A damaged blaster pod has only two fires. A destroyed blaster pod does not function.

Command pod — This is the headquarters and quarters for the fleet commander. It may share its Battle Commands with any friendly ship or guided missile within its ship's active search range. (Active search range does not mean that a ship has performed an active search; it is the range the ship could search to). If damaged, it has only two Battle Commands. If destroyed it does not function.

Force Field Generator pod — This pod was originally designed as a way to retrofit a Forcefield generator on large merchantmen fearing pirates, and was later adopted by larger warships. A level 7 pod produces a class 1 field, a level 8 pod produces a class 2 field. The effects of damage and destruction are the same as for hull-mounted force field generators. If a ship has more than one generator, each must be issued separate activation and deactivation commands. Rule 9.8 only applies to hull-mounted generators. There is no additional benefit from having more than one force field activated. A ship receives protection only from the highest-level force field activated.

Missile Reload pod — *A* missile reload pod is a specially constructed cargo pod with interior buffering for its dangerous load. Normally it is designed to provide missiles to other ships, requiring a supply transfer pod. It may provide unprepared missiles to a pod on its ship on the issuing of a Provide Supply Battle Command, providing any number of missiles until the pod is full. A damaged pod does not function. When a missile reload pod with missiles remaining is destroyed, roll the die. On a "1" the ship is destroyed by a secondary explosion. Destroyed missile reload pods do not function and all missiles are lost. Types of missiles carried vary with civilization level.

TABLE II: NUMBER OF MISSILES IN RELOAD PODS

CIV LEVEL	UNGUIDED MISSILES	GUIDED MISSILES	INTELLIGENT MISSILES	MIMS
6	40	20	0	0
7	25	20	10	5
8	20	15	15	10

Major Repair pod — This pod is used to jettison destroyed equipment, or to move such equipment on its own ship or one docked with it between docked ships. A ship may only receive equipment if it has an appropriate empty space (with no equipment, not destroyed equipment there). Except for pods, equipment may only be transferred between ships of the same class. Equipment may only be used after it is installed. Equipment from enemy ships requires one additional turn to transfer or install. By issuing more than one Major Repair Battle Command, repairs may be accomplished more quickly.

TABLE IV: MAJOR REPAIR POD DATA

Equipment Item	Turns / Jettison	Turns / Transfer	Turns / Install
Pods*	1	1	1
Engine	3	4	5
Bridge	2	3	2
Forcefield Generator	1	1	2

* Other than Major Repair Pod itself.

Medium Weapon pod — This pod was called the heavy weapon pod before heavier pods came along. If damaged, all missiles are lost and it retains only the capability to fire laser or particle bursts. If destroyed, it does not function and all missiles are lost.

Supply Transfer pod — *A* supply transfer pod allows transfer of energy and missiles between docked ships. It may be either on the provider ship or the recipient ship. The recipient ship must have the capacity to accept what is transferred; partly empty basic energy capacity and undamaged energy pods for energy, vacancies in undamaged weapons pods **or** undamaged missile reload pods for missiles. The providing ship must have sufficient energy or missiles to transfer, and nothing can be taken from a damaged pod. Provided missiles are not prepared.

A supply transfer pod has a number of ports, each capable of providing missiles or energy (but not both from one port on the same turn). Number of ports and rate of transfer per port varies with civilization levels. On a single "Provide Supply" Battle Command, which may be issued by a recipient or provider ship, one ship may supply one other ship (using as many ports as desired). Additional "Provide Supply" commands allow other ships to be served, although each port may only be used once per turn. A damaged supply transfer pod functions at one level lower than its original level; a destroyed pod does not function.

Level 8 pods (only) may service fighters, but if the pod is damaged, destroyed, or made vulnerable, any fighters docked for such servicing are destroyed.

TABLE III: SUPPLY TRANSFER POD DATA

CIV LEVEL	MISSILES / PORT	ENERGY / PORT	PORTS
5	1	1 Unit	1
6	To fill 1 Pod	12 Units	2
7	To fill 2 Pods	144 Units	3
8	To fill a ship	To fill a ship	4

Electronics Warfare pod — The EW pod jams enemy communications. At the beginning of the enemy Command Phase, it may subtract up to four Battle Commands from those available to enemy ships within active search range of its ship. Some of those Battle Command subtractions may be applied to enemy missiles within active search range. Unguided missiles are unaffected, but other missiles have a manoeuvre rating one lower that turn. A guided missile so affected also requires that its owner expend an extra Battle Command to control it for each subtraction.
Intelligent and guided missiles and MIMS rolling for interception with a ship with an undamaged EW pod subtract two from the die required for interception (an A becomes an 8). Two is added to the firing program of enemy ships when they fire at a ship with an undamaged EW pod. A damaged EW pod may subtract two battle commands from enemy ships or missiles, but does not otherwise function. A destroyed EW pod does not function.

TABLE V: NEW POD TYPES ATTRIBUTE CHART

POD TYPE	LASER / PARTICLE WEAPONS	UNGUIDED MISSILE	GUIDED MISSILE	INTELLIGENT MISSILE	MIMS	BATTLE COMMANDS	CIV LEVEL	TARGET PROGRAM	FTL / JUMP	SPECIAL RULES	NUMBER OF FIRES	ARMOUR
Blaster	**Y**	0	0	0	0	0	**7**	-4	N	**N**	5	2
Command	**N**	0	0	0	0	4	**8**	-	N	**Y**	0	2
Force Field	**N**	0	0	0	0	0	**7-8**	-	N	**Y**	0	1-2
Electronics Warfare	**N**	0	0	0	0	0	**8**	-	N	**Y**	0	1-2
Supply Transfer	**N**	0	0	0	0	0	**6-8**	-	N	**Y**	0	0-2
Missile Reload	**N**	0	0	0	0	0	**6-8**	-	N	**Y**	0	2
Major Repair	**N**	0	0	0	0	0	**6**	-	N	**Y**	0	0-2
Medium Weapon	**Y**	8	6	0	0	1	**6**	-1	N	**N**	1	1-2

[1.4] The Federation Strikes Back!: Homing Missiles

Homing missiles act like guided missiles, which have received no Control Missile Commands, until a friendly Command Phase when they are six or fewer hexes from an enemy unit, which was issued Manoeuvre Commands in its previous command phase. Each time this occurs, the homing missile homes on that enemy unit. The phasing player issues the homing Missile Manoeuvre Commands as if it were a Guided Missile being provided guidance, subject to the requirement that the homing missile end the phase pointing as directly as possible at its target. This will not always be the best intercept trajectory.

If more than one enemy'\init within six hexes has been issued Manoeuvre Commands, the target selected will be the one with the highest Relative Energy Score. The Relative Energy Score is the amount of energy expended on manoeuvre commands (which may be zero) minus the range. If there is a tie for the highest Relative Energy Score, the Phasing Player selects the target from those with the highest score. Homing missiles are unaffected by electronics warfare pods.

Homing missiles may be substituted for intelligent or guided missiles in a scenario. Whether homing missiles require preparation before firing is determined by whether the missile it replaces would have.

TABLE VI: HOMING MISSILES

CIV LEVEL	Velocity Rating	Manoeuvre Rating	Energy Units
6	1	5	8
7	2	6	9
8	2	7	10

[1.5] The Federation Strikes Back!: Planetary Installations

These rules are intended for minor outposts on unsettled planets or moons, or defensive remnants on civilized planets whose main defences have been destroyed. The planetary atmosphere is assumed to be light or not present.

1. The rule that missiles entering a planetary hex are immediately destroyed is modified. The missile is destroyed at the end of the movement phase in which it enters the planet's hex.

2. Installations can only fire and be fired at through a single hex side. Even a small asteroid can stop heavy fire.

3. An installation is laid out just like a spaceship. It lacks a hull force field and burster. Its bridge and engine do not perform Manoeuvre Commands but help determine when an installation is completely destroyed (rule 11.0). Velocity is always 0, direction is as initialised (the installation may be partially protected by terrain).

4. The installation is assumed to be relatively camouflaged. The direction of the installation is not directly revealed to the enemy player. The installation's owner announces relative velocity figures for combats, so the direction it faces is soon obvious. The pod arrangement is not revealed, although the other player knows the number of pods and the effects (missiles, Battlecraft, lasers, particle fire, tractor beams, jamming, or active force field) coming from each pod.

5. When the phasing player chooses a pod to inflict a hit upon, he does so without seeing the Log, choosing the pod by its number. Hits on a pod are known, and it is known when a pod is destroyed, but damage and vulnerability are not revealed.

6. If an Active Search (7.4) or Detection (3.0) of the installation is conducted, roll three times on the Hit Table. Any pod "hit" is revealed. Its type and damage or vulnerability status are revealed, but not missiles or energy remaining.

[1.6] The Federation Strikes Back!: Scenarios

Scenario one: The Flight of Sambu

After a long career, Sambu the Pirate, known to his friends and associates as Sambu the Magnificent, had gone too far. His very successful raid on the Spaceship Resupply Depot on Gameer had provided him with the best assortment of pods ever possessed by a pirate, but now the Federation fleet was bearing down on him with a vengeance. If he didn't hyper-jump fast, his fat was fried. Sambu had already equipped his fleet with his choice of pods when three Spears arrived.

Map Deployment:

A	B	C	D	E

PLAYER 1 DEPLOYMENT: One Corco Iota (Spaceship Counter A) with Sambu aboard, one Corco Mu (Spaceship Counter B), three Corco Gammas (Spaceship Counters D, E, and F). All pods are Armour Class 2. Sambu may choose any pods for his ships within the following restrictions: No command or electronics warfare pods are permitted, only one Battlecraft pod (Terwillicker-X) is available due to a shortage of pilots, and each ship must have a jump capability. Set up first speed and direction 3, on any hex of Map A. No force fields may be activated, but Battlecraft and one missile per weapon pod may be prepared.

PLAYER 2 DEPLOYMENT: Set up second, direction 9 and speed 3, on any hex of Map B. One Spear (one crew pod, one energy pod, one battle communications pod, one augmented jump pod, one tractor beam pod, two Battlecraft pods (with Terwillicker-X) and one arsenal pod (Spaceship Counter A)). Two Spears (Counters B and C), each with one crew pod, one energy pod, two battle communications pods, one augmented jump pod, one Battlecraft pod (with Terwillicker-X) and two arsenal pods. No force fields may be up but Battlecraft and one missile per pod may be prepared. All pods are Armour Class 2.

VICTORY CONDITIONS: Sambu wins by hyperjumping from any map to the 3 o'clock of Map D or a map above or below such a map. No other jumping is permitted. Player 2 wins by preventing this. Player 2's victory is especially sweet if he can board the ship with Sambu on it (capturing him), especially if no pirate ships hyperjump. If the bridge of Sambu's ship is destroyed, Sambu is killed.

SPECIAL RULES: A person or persons (Sambu in this case) may freely and secretly move between docked friendly ships. This holds for docked ships in other scenarios. Any ship of Player 1 which is beyond active search range of the ship holding Sambu, is on a map where jumping is permitted, and has a jump capability will "turn rabbit." That means that he must issue a jump command as soon as possible, if necessary issuing first a Prepare Jump command. Exception: He need not drop his force field if it means an enemy missile will hit him unshielded. This reflects the fact that Sambu was ready to sacrifice everyone else, and they knew it and were looking out for themselves.

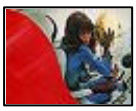
PLAYER NOTES: Sambu chose to outfit the Gammas each with a hunter, a battle communications, and an arsenal pod. He demonstrated his famous ingenuity by previously docking ,the Mu (with 2 augmented jump pods, 2 energy pods, 1 battle communications pod, 2 arsenal pods, 2 force field pods, 2 burster pods, and 1 supply transfer pod) to his Iota (with 2 augmented jump pods, 1 energy pod, 1 battle communications pod, 1 Battlecraft pod, 2 force field pods, and 2 burster pods), and trying to blast straight through.

Scenario two: The Battle of Yamani

Space is generally very, very empty, with light years between stars, but this area was emptier than most. The only bodies of any consequence were a rogue planetoid, Dragor, and its moon Yamani. On Yamani the People's Socialist Alliance had set up a small base facility that was very useful to their lines of communications in their war against the Federation of Planets. It was here that the long-awaited first clash of main battle fleets occurred.

Map Deployment:

A	B	C	D



The planet Dragor is in hex D0101. Yamani is in hex B1313, moving with direction 6 and velocity 1. It maintains that velocity and a distance of 12 hexes from Dragor, changing directions at hexes D1307 (to 8), D0113 (to 10), C0507 (to 12), A0513 (to 2), B0107 (to 4), and B1313 (to 6). It maintains a constant facing relative to Dragor, so any installation on it maintains its alignment relative to Dragor. A base on the side of Yamani farthest from Dragor is always on the side farthest from Dragor, regardless of Yamani's direction. No star is nearby and these are rather small pieces of rock, so jumping is permitted at any point over 24 hexes from Dragor.

PLAYER 1 (FP) DEPLOYMENT: One Halberd command ship with 1 command pod, 2 battle communications pods, 1 electronics warfare pod, 3 energy pods, 2 augmented jump pods, 2 level 8 tractor beam pods, 1 arsenal pod, 1 Battlecraft pod (with Harmonics Fugue), 1 blaster pod, and 1 crew pod; Two Pike carriers, each with 1 battle communications pod, 2 energy pods, 1 augmented jump pod, 1 level 8 tractor pod, 6 Battlecraft pods (with Terwillicker-Y), and 1 crew pod. On their first sortie, the Y's carry 2 homing missiles and 1 intelligent missile; Two Spear battlewagons, each with 2 battle communications pods, 1 energy pod, 1 level 8 force field pod, 1 augmented jump pod, 2 arsenal pods, and 1 crew pod; Four Sword flak cruisers, each with 1 energy pod, 1 jump pod, 2 Blaster pods, and 1 crew pod). All pods are Armour Class 2.

Set up in the bottom 3 rows of Map C, with at least one hex between each ship. Direction must be between 0 and 2 for each ship. Velocity must be the same for all ships, and be between 1 and 3. Missiles and Battlecraft may be prepared (1 per appropriate pod).

PLAYER 2 (PSA) DEPLOYMENT: One 15-pod communications base on Yamani with 1 command pod, 1 long range communications pod, 1 battle communications pod, 3 energy pods, 1 level 7 tractor pod, 1 blaster pod, 1 crew pod, 1 level 7 supply transfer pod, 2 level 7 force field pods, 1 equipment pod, 1 major repair pod, and 1 level 7 missile reload pod. One 12-pod fighter base on Yamani with 2 battle communications pods, 2 energy pods, 5 Battlecraft pods with Terwillicker X-1G, 1 crew pod, and 2 equipment pods. As long as there is an undamaged equipment pod, each fighter may reload 1 guided missile each time it refuels. One Pike with 1 battle communications pod, 1 energy pod, 1 augmented jump pod, 1 hunter pod, 1 tractor pod, 2 arsenal pods, 3 Battlecraft pods (with Terwillicker X-3G), 1 blaster pod, and 1 crew pod.

On its first sortie, each fighter is armed with 3 guided missiles; Two Spears, each with 1 battle communications pod, 1 energy pod, 1 standard jump pod, 1 heavy weapons pod, 2 battle craft pods (with Terwillicker X3G), 1 blaster pod, and 1 crew pod; Four Swords, each With 1 battle communications pod, 1 standard jump pod, 2 heavy weapons pods, and 1 crew pod; One Sai guard ship with 2 medium weapons pods and 1 heavy weapons pod. The Sai is in orbit around Yamani. It must remain in orbit until enemy ships are within 12 hexes. Until then it is invulnerable to unguided and guided missiles. All other PSA ships are between 2 and 6 hexes from Yamani, in adjacent hexes. They must all have a common velocity between 0 and 3 and a common direction between 6 and 9.

VICTORY CONDITIONS: The PSA Player wins if his communications base is undestroyed. If it is destroyed, the player with the highest number of undestroyed pods at the end of the battle wins. The pods of a boarded enemy ship count toward the total of the side that captured it, not the previous owner. The end of the battle is determined by mutual consent, and the battle is automatically over when only one player has units on Maps A, B, C, and D.

[2.0] DELTAVEE: DeltaVee Enhanced

By Justin Leites

[2.1] DeltaVee Enhanced: Scenarios

Tactical space combat games, which use a relatively realistic game system, tend to be exceedingly deadly. Even when one side has a large advantage, there will still be heavy casualties in any battle. For this reason, character-players in SPI's science fiction role-playing game *Universe* will largely prefer to avoid combat as much as possible. The tactical combat rules as embodied in *DeltaVee* and the way the scenarios have been set up favour manoeuvre over actual combat. Most of ^-the scenarios in *DeltaVee* are escape manoeuvres, for logical reasons within a role-playing universe.

In an offensive combat, laser and particle beam weapons are intended to damage individual pods while a missile may be able to destroy an entire ship. There is no such thing as a defensive posture in space combat; both sides are going for victory at any expense.

When one considers that in a role-play-»g game the whole idea is to keep a character alive and growing through adventures, a head-to-head confrontation will probably see some, if not all, the characters killed. While on a planetary expedition a character may be able to escape through his use of skills or quick wit, in a space combat these abilities will be of limited advantage. Furthermore, the costs involved in building and owning a ship, particularly a merchant ship, may make any combat prohibitively expensive. Though the costs of building a ship is not as expensive in *Universe* as in *Traveller,* it will take a long period of adventuring to replace any lost ship.

Thus, the scenarios for ***Delta Vee*** were designed to keep the characters and their ships in existence for further adventures. In addition to escape, another popular manoeuvre is threaten-and-board, in which a more heavily armed ship can threaten a weaker ship. Once more, the character interaction takes place in an environment (inside a ship) where the characters' skills and wits can best be utilized. It is not unusual in a game to have a merchant ship yield a rich cargo simply under the threat of combat, an exceptionally cost-efficient method of gaining wealth.

The *DeltaVee* scenarios played down combat in favour of escape. The most important lesson to be gleaned was that a player should never exceed the manoeuvre rating of a ship with the velocity gating. A ship that can no longer weave is an easy target for missiles. A player who manoeuvres a ship properly should be able to escape with only minor damage about fifty percent of the time.

For players who are more interested in testing *DeltaVee* as a tactical *combat* system, the following scenarios offer a chance to explore the tactics of such an approach. These scenarios will give players a better, albeit bloodier, feeling of ship-to-ship combat.

SCENARIO 6: Battle for B'Mali

B'Mali, a small, mineral rich planet on the periphery of the Federation, has decided to break off its ties with the central government. Normally, the Federation would let the peripheral planets have a certain amount of autonomy, but B'Mali has large quantities of rare fissionables the Federation requires. Thus, a punitive action is begun to bring B'Mali back in line.

Map Deployment:

A	B	C

Note: B'Mali is positioned in hex 0707 on Map A.

Player 1 (B'Mali) Deployment:

The B'Mali player has 100,000 Trans with which to purchase his fleet (the colonists traded plutonium to a rather shady — i.e., piratical — trade conglomeration in exchange for the ships). Expenditures for the ships and pods are listed in the accompanying Craft and Pod Cost Chart (left over Trans are lost;
no partial expenditures may be made). Ships are set up on hex 0707 of Map A using any facing and with a velocity of 1.

Player2 (Federation) Deployment:

One *Spear* (spaceship counter A) with two arsenal pods, one battle communications pod, one tractor pod, one crew pod, and one energy pod. Two *Swords* counters B and C), each with two heavy weapons pods, one battle communications pod, one Battlecraft pod, (with a *Terwillicker-X}* and an energy pod. All ships begin in hex 0101 of map C facing any direction and with a velocity of 7.

Victory Conditions:

The B'Mali player must destroy two of the Federation ships or he loses. Also, in order to win he must keep all Federation ships from landing on the planet. The Federation player wins if he lands any ship on the planet.

SCENARIO 7: Battle of Tau-Kati

Not long after the Federation took control of Tau-Kati, the Federation scouts encountered an alien patrol ship. Though communications were attempted, the aliens proved hostile, firing on the scouts who barely were able to escape safely into hyperspace. Now the aliens are sending a fleet into human space. For the first time, two cultures will meet in combat to determine the fate of two expanding hegemonies.

Map Deployment:

A	B	C

Player 1 (Alien) Deployment:

The Alien player gets 14 ships equivalent to the *Terwillicker-X.* These ships never expend Energy Units (though they are considered to carry the normal number of units as indicated on the Spaceship Attribute Chart, 4.9) unless they receive damage to their engines. The ships then suffer all penalties for such damage to their engines. All ships are deployed within two hexes of 0707 on Map A facing in any direction and with a velocity from 1 to 6. (Note: Players may wish to experiment with other alien vessels as outlined in the accompanying module.)

Player 2 (Federation) Deployment:

Three *Swords* (spaceship counters A, B and C) each with one arsenal pod, one heavy weapons pod, one battle communications pod, one energy pod, and one tractor beam pod. All ships start within 1 hex of 0707 on Map C with any facing and an initial velocity from 2 to 5.

Victory Conditions:

The first player to destroy more than 50% of the other player's ships automatically becomes the winner.

SCENARIO 8: The Bomb

The terrorist organization, *Basqua Re-vista,* has secretly manufactured a hydrogen bomb in the prison colony on Ganymede and has commandeered one transfer and one guard ship to transport the bomb to earth. They threaten to destroy the Federation headquarters unless their demands are met. Inside sources on Ganymede were able to alert the Federation in time, and now a hastily assembled fleet is being sent out to intercept the terrorists and save earth.

Map Deployment:

A	B	C	D

Note; Earth is in hex 0707 on Map E.

Player 1 (Terrorist) Deployment:

One Corco *Gamma* (spaceship counter A)

• with three Battlecraft pods (with a *Terwillicker-X* Battlecraft) and one *Piccolo* (counter B) with one buffered cargo pod.

The ships are deployed facing in any direction in hex 0808 on Map A with a velocity of 3.

Player 2 (Federation) Deployment:

Two *Daggers* (spaceship counters A and B) with a heavy weapon pod and a crew pod each. On each turn after the Terrorists have

• fired their first shot (either particle, laser, or missile, but *not a* shot from the Battlecraft), the Federation player rolls a 10-sided die twice. On each roll of 1, another *Dagger* (counters may have to be created) appears on hex 0707 of map E (earth) with any facing and a velocity of 0; each new *Dagger* contains an arsenal pod and an energy pod. **(Note:** Players will have to move Map A to the position of Map E when all ships have left Map A.)

Victory Conditions:

The Federation player must destroy the cargo pod on the *Piccolo* before the ship enters into earth's orbit. The Terrorist player wins if the *Piccolo* enters earth's hex with the cargo pod intact (he does not have to land the ship in order to win).

[2.2] Delta Vee Enhanced: HEAVY CRUISER AND TRANSPORT

The two ships covered in this section were the ultimate products of the Federation's weaponry. The Military Transport could carry one entire fleet, and the Heavy Cruiser *was* an entire fleet's worth of weaponry. As the Federation's territory expanded and potential hot spots developed, nine Cruisers were finally commissioned. For over three hundred years these Cruisers, accompanied by the Transports with their complement of *Swords to* act as scouts, preserved peace throughout the Federation space.

No scenarios have been included for these ships, since they proved to be all but invincible in combat (when used properly). Players are encouraged to create their own scenarios if they wish to test the limits of these space dreadnoughts. Players should use the Hit Table at lower left when using these ships in battle in addition to the Heavy Cruiser Hit Table and Missile Hit Chart in this section.

Each Heavy Cruiser has four independent Forcefields, which should be numbered on the Spaceship Log. Whenever a Forcefield is hit as indicated on the Hit Table, roll a 10-sided die to determine which Forcefield is affected on the Heavy Cruiser Forcefield Table. If one or more Forcefields is destroyed on a Heavy Cruiser and a missile subsequently hits the ship, refer to the Missile Hit Chart to determine which pods are destroyed. In addition, the player must spread three additional hits over the Heavy Cruiser as per 9.8, using the accompanying Hit Table.

MISSILE HIT CHART

#1	Destroys Engines, Bridge, and Pods 1-10.
#2	Destroys Pods 11-20.
#3	Destroys Pods 21-30.
#4	Destroys Pods31-40.

If a missile hits a Heavy Cruiser, each area not protected by an intact Forcefield is destroyed. Example: If Forcefield #2 is destroyed, a missile hit would destroy Pods 11-20, though the other Forcefields would not suffer immediate destruction. However, the player must also roll for three additional hits on the Hit Table, as per 9.8 of the ***DeltaVee*** rules.

HEAVY CRUISER FORCEFIELD HIT TABLE

DIE	FORCEFIELD HIT
1	1
2	1
3	1
4	2
5	2
6	3
7	3
8	4
9	4
10	Roll Twice

When a Forcefield is hit on the Hit Table, roll a 10-sided die. The number indicates which of the four Forcefields was affected. If a 10 is rolled, then massive circuitry damage has occurred; roll the die twice more to determine the two Forcefields affected. If another 10 is rolled during this process, two more Forcefields are affected. It is possible for a multitude of forcefields to be affected by this process.

CRUISER / TRANSPORT ATTRIBUTE CHART

ATTRIBUTES	CRUISER	TRANSPORT
Cost	Classified	Classified
Number of Pods	39	39
Velocity Rating	1	1
Manoeuvre Rating	3	2
Energy Capacity	288	264
Energy Burn Rate	24	24
Streamlined	NO	NO
Burster Class	2	1
Armour Class	2	1
Forcefield Class	2	1
Civ Level	8	7
Target Program	-6	-4
Number of Forcefields	4	1
Storage Pod Ability*	YES	YES

*A Storage Pod takes up four pods worth of space on a ship. It can store any other military ship (except another Heavy Cruiser or Transport Vehicle), which may be launched following the same procedure as launching Battlecraft.

[2.3] Delta Vee Enhanced: ALIEN ENCOUNTERS

The scenarios included in *DeltaVee* (and in this article) take place in human occupied space. No alien races have yet been discovered, though such an encounter is inevitable as exploration ships continue to chart unknown stellar systems. Players who wish to experiment with possible alien spaceships in combat may create scenarios using the ships described in this module.

Ram Jet

The alien culture, which designed this ship, has not yet achieved hyperjump ability for interstellar travel. Existing within a closely packed stellar cluster, they have instead developed travel by ramjet, which takes much more time for transit from one system to the next. The ramjet uses a vast electronic grid to trap the hydrogen atoms that exist in the interstellar medium. The hydrogen is either stored for later interplanetary travel or burned directly by fusion in the massive ramjets. This alien vessel does not use pods. To interpret how damage applies from the Hit Table, use the following modifications: 1) if a result is rolled for a *bridge, engine* or *Forcefield* hit, it is considered a *hull* hit and treated like a bridge hit on normal ships; 2) if a result is rolled for a hit on *Pods 1-5,* it is considered a *grid* hit and is treated like an engine hit on a nor-, mal ship; 3) if any other Pod number if rolled, it is considered a *miss* and there is no damage involved (the human player does not roll the die a second time as indicated in the instruction for the Hit Table). Other specifications for the alien ramjet are given in the accompanying chart. **(Note:** The ramjet has one Forcefield.)

Solar ship

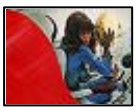
Another slow interstellar form of travel, this alien ship uses a large, thin, reflective sail to gather the light from a star to propel it through space, ft too is used primarily by alien cultures in tightly packed stellar clusters. Since travel is so slow, taking hundreds of years per transit, these cultures rely heavily on robots to handle the craft during their long trips. Only one such ship has ever entered human occupied space; the guiding robots immediately opened fire on the scout ship, forcing the crew to return fire. The ship was destroyed and its point of origin never properly established.
In combat the solar ship has damage applied to it using the modifications as specified for the ramjet. Other specifications are listed in the accompanying chart.

Modular Ship

These alien vessels are really a number of individual pods which are loosely connected and which can act independently. In battle the pods break apart and act like individual ships, or they can keep bunched together as the alien commander wishes. Due to the mind link technique developed by this species, the individual pods are able to attack as one; however, they are disadvantaged in that if one pod leader is hurt, the others also share his distress and ship's damage. Each ship is made up of a variable number of pods. To interpret how damage applies from the Hit Table, use the following modifications: 1) if a result is rolled for a *bridge, engine,* or *Forcefield* hit, it is considered a ***miss;*** and there is no effect; 2) if a result is rolled for a hit on *any of the Pods* of the ship, then *all* the Pods will suffer the same damage (thus, if the ship were composed of 4 Pods, then each Pod would take the same damage if the human player rolls a 1, 2, 3 or 4); if any other Pod number above the number actually composing the ship is rolled, it is considered a *miss* and no damage is taken (the human player does not roll the die a second time).
Each pod has the same specifications as indicated in the accompanying chart.

Pulsor

The alien culture, which developed this ship, has never established communications with humans. Though several of these ships have been sighted, none has ever been caught or studied thoroughly. These ships have been called the "ghosties" and "Flying Dutchmen" by humans; the few readings gathered by pilots seem to indicate that these ships are pure energy. Standing Federation Orders state that no ship will fire on these pulsors, though an occasional hot shot pilot has been known to let loose a few laser blasts at the strange vessels all to no effect. The pulsor is known to have a velocity rating and manoeuvre rating of **10,** and the one observation of its fire power (destroying an asteroid in the ship's path) indicates that it has a burster class of at least 2. No other specifications have been determined (the ship is too atypical for the standard ***Delta Vee*** system).



ALIEN SPACECRAFT ATTRIBUTE CHART

	RAMJET	SOLARSHIP	MODULAR SHIP[1]
Number of Pods	See 2	See 2	See 3
Velocity Rating	2	4	4
Manoeuvre Rating	3	4	7
Energy Capacity	See 4	See 4	288
Energy Burn Rate	See 4	See 4	12
Streamlined	yes	yes	yes
Burster Class	1	2	2
Armour Class	1	2	2
Forcefield Class	1	1	2
Civ Level	8	7	8
Target Program	-4	-6	-6

Notes:
1. Each Pod of the Modular Ship has these specifications.
2. These ships do not have pods.
3. The Modular Ship has a variable number of pods, depending on the size of ship encountered.
4. These ships are always considered to have sufficient fuel to function throughout the length of any battle.

[2.4] Alternative Delta Vee Hit Table

EXPANDED DELTAVEE HIT TABLE

SECOND DIE / FIRST DIE	1-2	3-4	5-6	7-8	9-10
1	Critical	-	-	-	-
2	Bridge	Engine	Bridge	Engine	-
3	Force Field	Pod 8	Pod	Pod	Pod
4	Pod	Pod	Pod	Pod	Pod
5	Pod	Pod	Pod	Pod	Pod
6	Pod	Pod	Pod	Pod	Pod
7	Pod	Pod	Pod	Pod	Pod
8	Pod	Pod	Pod	Pod	Pod
9	Pod	Pod	Pod	Pod	Pod
10	Pod	Pod	Pod	Pod	Pod

When a ship is hit, roll a 10-sided die to determine which row of the Hit Table to use. Roll the die again and cross –reference the second die result with the first to find where the ship was hit. If a ship does not have sufficient pods to match the result, roll the second die again until one of the Pods on the ship is hit. **-** = No Effect.

[3.0] Designer Notes: There's Only One Universe ...and How it Came to Be That Way

by Gerry Klug

My first assignment upon being hired by SPI was to assist in the development of the science fiction role-playing game. *Universe.* Being a veteran of role-playing, I was intrigued with the possibility of being in a position to "fix" all the ill written and illogical rules I felt had been perpetrated on the science fiction role-playing community beforehand. When I started on the project, John Butterfield, the game's designer, had done much of the preliminary work already and what I saw excited me. Here was a science fiction role-playing game which seemed to solve the problems its predecessors had created.

John and I discussed what we felt the game should do and contain, and we came up with a number of items which we knew should be specifically addressed: 1) the rules should be tightly written so even a non-role-player could attempt to play the game without the need for a consultation every other page, 2) the game should be playable shortly after purchase, so it had to have an adventure included, and 3) everything the rules implied could be done with a skill or in a situation should be defined and delineated so as to make life easy for the GM. We feel we've succeeded and have created a game which is at least possible for a novice GM to pick up and referee, and at the same time, designed a game which stands up to comparison with any other in its field.

What should the veteran role-player look for when he purchases *Universe?* Among the many systems which the game features are two which stand out as unique: the Skills and World Generation systems. Both of these provide information and utilities not found anywhere else in role-playing game design.

When John was writing the Skills section, he was very concerned that the phrase, "up to the GM's discretion" did not become a catchall cop-out for us when we couldn't explain something. This concern led John to use a *task* system, whereby each skill has a set list of tasks which the skilled individual may attempt to perform and, if successful, yield specific results and/or information.

Each task is defined by a formula which figures the percentage chance a character has of performing it. The formula takes into account the proficiency of the character with the skill and any applicable characteristic of the character, which may affect the outcome. Various modifiers may be applied also. Therefore, even characters with the same skill level may have a slightly different chance to succeed in the same task due to differing characteristics.

This task system allows the GM to rationalize any other situation, which the player feels his character's skill should apply to. By comparing the unknown situation to the examples given, the GM may derive a chance of success (if any), which would apply in the situation, and be fair. The GM is not left out in the dark attempting to define what a certain skill means (you don't have to have a degree in planetology to use the skill).

Also unique is the way in which skills are improved. Whenever a character uses a skill, percentile dice are rolled. Each skill has a range of several numbers indicated which add an experience point to the character's skill if one of those numbers appears on either die. These points are accumulated and cashed in later on to raise the skill by one level. In most cases, the numbers needed combine in such a manner that a successful use of the skill will, more often than not, gain an experience point whereas an unsuccessful use would not. Experience Points are not arbitrarily awarded in the game (unlike many other role-playing games) by the GM; the players themselves keep track of their advancement. There are guidelines for skills' use so none can be over-used in a manner designed to simply gain skill points.

The World Generation system is interesting enough to play as its own game. Science fiction role-playing has been crying out for a good, simple, complete and easy World (including both planets and moons) Generation system for a long time, and *Universe* may have the answer. In my experience as a *Traveller* referee, I always felt the need for an easy system for rapid star system generation. Often the players would travel in unexpected directions, and I would have to stop the games for long periods of time while I rolled dice. Needless to say, this was very boring for the players.

The *Universe* World Generation system is three tiered so that first, a cursory generation may be accomplished to give broad generalizations of the system and its worlds; second, a detailed look is then established for each world's geography and planetology;
and third, specific details are given about settlements, resources, spaceports, law levels, etc. While the highly detailed examination of each world is lengthy, the cursory glance takes 5 minutes and gives both the GM and the players enough information to make such basic decisions as whether or not to stay and explore this system, what there is of interest, and so forth. This quick glance assumes all the players have done is hyper-jumped into the system and are examining it from the jump point with their scanners.

The World Generation system also details how to actually draw the worlds in a system. Rather than simply generating a series of numbers, the *Universe* system helps you portray the geographic features of the world on a *world log.* The world logs contain graphic layouts of the various size worlds as viewed from both the north and south poles. The GM generates the details of the world and draws in each *environ* (a space on the world which is a square 4000km across) the geographic type, which exists there. As each environ is drawn in, the visual picture of the world begins to take form, and the GM mixes and matches environs to form the kind of world picture he desires.

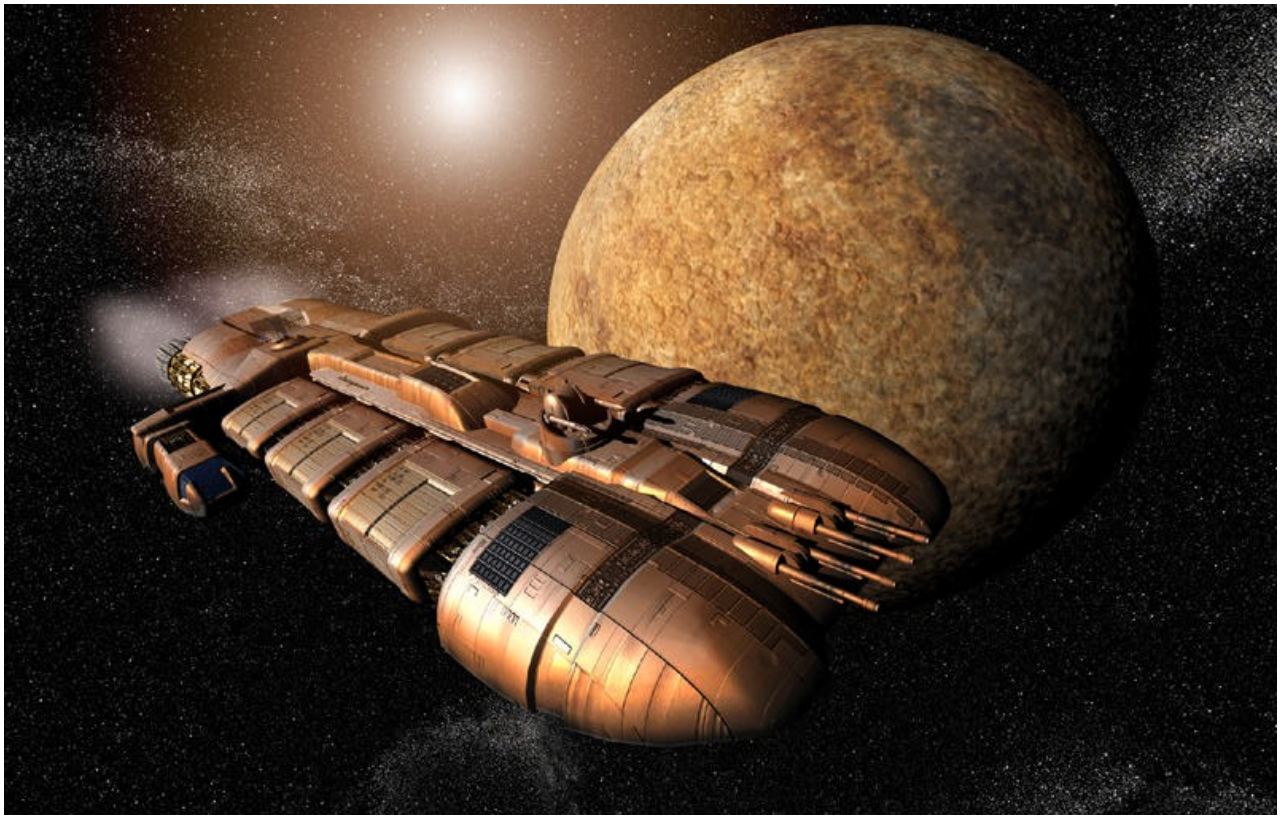
Along with Skills and World Generation, the rules for *Universe* detail Character Generation, Equipment, Robots, Character Action, Space Travel, Creatures, NPC's and gives a full adventure to start the GM and the players right off, once they've invested their hard earned money in the game.

Included in the *Universe* package (both basic set and boxed version) is an Interstellar Display, which details all stars, located within a 30-light year radius of Sol (our sun). Each star is located using a Cartesian coordinate (X, Y, and Z) system, and its astronomical data is detailed. Various binary and trinary stars are also detailed with their configurations and data noted. All of the major stars' distances (in light years) are also given in a road-map style matrix (hmm, let's see; the distance from Alpha Centauri to Sigma Draconis is...) for easy travel planning. All of *Universe* (for now) takes place within this sphere of stars and the GM generates the characteristics for each himself. Thus, while the map would remain the same from campaign to campaign, each GM's details of the stars would differ, creating interesting comparisons.

The Display itself is a work of art, being visually stunning as well as absolutely practical for play. We at SPI are wondering whether *any* map of its kind is really accessible to the public at this time, or do we have the only one? Many people have mentioned they would buy the map just for itself, gaining the information it contains. Alone it would be a valuable addition to a GM's science fiction source library.

Concern about the problems facing novice players or GM's when they picked up *Universe* for the first time was expressed often during the project, but especially in regards to the Adventure Guide. *Universe* has three rules booklets: the Gamesmaster's Guide (containing the rules), an Adventure Guide (containing creatures, non-player characters, and the adventure), and *DeltaVee* (the spaceship combat system). In the Adventure Guide we gave the fledgling GM as much guidance by example as we had room for. A crucial element for any beginning GM is the creation of other people with whom the characters interact. The list of 40 non-player characters provides the GM with examples of the myriad kinds of people to place in the characters' path. Some are deadly, some serious, some humorous, some inconsequential, but all interesting and, I hope, inspirational. GM's may use these NPC's straight out of the booklet as they are or change them to fit individual tastes. It is through the GM's non-player characters that the players most directly interact with the GM, which may be the single most enjoyable element of role-playing.

Also detailed in the Adventure Guide are various creatures. With the laws of probability being what they are, there is no way we could have listed every kind of alien creature explorers might find outside our solar system, and our list of 40 doesn't pretend to include all possibilities. What it does do, however, is set up an easily adapted system of mix-and-match powers, which the GM can use to create creatures of his very own.



[4.0] Article: The 11 Billion Dollar Bottle of Wine - The Possibilities of Interstellar Trade

By Greg Costikyan.

This article originally appeared in Ares nr. 12 (Jan 1982), *a science fiction/gaming magazine published by SPI. I was a contributing editor at the time. Despite its age, it holds up quite well, I believe (Greg Costikyan)*.

Given what scientists say about the probability of intelligent life in the galaxy, it seems almost inevitable that, sooner or later, we will come into contact with another technological species. We can expect that the same kind of interrelationships which existed between primitive peoples on our planet will occur between the two species.

There are basically two ways which individuals or groups can interact--peacefully and violently. Peaceful interaction implies voluntary exchange between two groups which benefit both--that is, trade. Violent interaction implies the attempt by one group to coerce the other--that is, war. Much attention has been paid to the second possibility in the gaming field, but only recently has much been paid to the first.

The reason trade exists is that different groups are efficient at doing different things. For example, let us say there are two countries, A and B. A takes 15 man-hours to make a widget, but only 5 to make a thingummy. B takes 5 to make a widget and 15 to make a thingummy. Suppose each country produces as many thingummies as widgets, and each has 100 man-hours to allocate. Each will then produce 5 thingummies and 5 widgets ((5*15) + (5*5) = 75 + 25 = 100 man-hours). If A and B now open trade, each may concentrate on producing the item which it produces more efficiently; A will produce thingummies and B widgets. Since a thingummy costs A 5 man-hours, it can produce 20; similarly, B produces 20 widgets. They trade 10 thingummies for 10 widgets, since each wants as many thingummies as widgets. The final result is that each country has 10 thingummies and 10 widgets and each is twice as well off as before. (Indeed, trade is even in the best interest of both when one party has an efficiency advantage in *both* products, because trade will allow him to shift production into areas where his efficiency is greater.)

One problem not taken into account in the above analysis is the cost of transportation (and other barrier costs, such as import and export duties) which raise the cost of doing business with another group. Let us say that it takes 5 man-hours to transfer a unit of widgets or thingummies from country A to country B or vice versa. Each country will then have to allocate 10 man-hours to each unit of a good transported to the other country, and 5 to each unit consumed at home. It is still more efficient for A to concentrate on making widgets and B on making thingummies. However, the best A can do is to make 14 widgets (70 man-hours) and transport 6 to B (30 man-hours) while B does the reverse. Each country is still better off engaging in trade than not, but not as well off as they would be if transportation were costless.

This is, of course, an extremely important result for interstellar trade because the costs of transporting anything over interstellar distances is bound to be high, even given some kind of faster-than-light (FTL) drive.
In essence, in order to make trade in a good worthwhile, the cost of creating a good in one location and transporting it to another must be less than the cost of creating it in that distant location. To determine what interstellar trade (if any) is feasible, there are then two questions we must answer, at least in principle: 1.) what are the costs of interstellar transportation, and 2.) what are the costs of production in a highly advanced civilization capable of interstellar trade? Neither question can be easily answered, but we can, at least, make some conjectures.

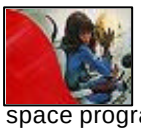
[4.1] Costs

In the simple analysis above, we assumed that the cost of production or transportation could be measured in "man-hours." For any more sophisticated investigation, this is inappropriate. An hour of a PhD's time is worth considerably more than an hour of an unskilled labourer's time. Furthermore, such things as the relative efficiency of production machinery (and other capital goods) and the cost of resources cannot easily be measured in man-hours. That is the primary reason why money exists--because it is an easy tool to measure relative costs.

Extrapolating costs into the future is difficult or impossible because technology constantly advances--changing both costs and relative costs--population trends are not entirely predictable, and the cost of resources may change dramatically as terrestrial resources become scarcer and extraterrestrial resources begin to be exploited. However, the cost of transportation is dependent on three primary factors: the cost of building and operating transport vessels, time, and energy required for transportation.
The first factor is very difficult to figure, but the second two are easily calculable, at least for sublight travel. Given a particular transportation system, it is possible to calculate the amount of energy needed to move something from point *x* to point *y* in a given amount of time. This will be discussed in more detail later.

Ignoring the cost of maintaining and building a transportation system, the amount of energy needed to transport a unit of mass is roughly proportional to the cost of transporting it. Thus, the less energy transportation requires, the more likely trade can occur and the more commodities it is profitable to trade.

Time is also an important factor, because the longer it takes to transport a good, the further in advance an investor must put up his capital before he will see a return. At sublight speeds, interstellar transportation will necessarily require between 10 and 10,000 years for a round trip. In America, there are few companies who are willing to wait even 10 years for an investment to provide a return. Government tends to think in even shorter terms; the insistence of Congress on



space programs which produce short-term return and its reluctance to engage in projects that may prove immensely profitable over a period of decades, but costly in the short-term, is an example of this thinking.

Quite apart from this psychological reluctance to think too far ahead is the very real economic cost of delayed return on investment. When determining whether an endeavour will be profitable, an investor must keep "opportunity costs" in mind. If an investor has a choice of two investments, both profitable, and chooses the one which is less profitable, he has, in real terms, lost money; he could have made more by taking the more profitable investment. If one can earn 17% of one's money in a money market fund, and investing in a small game company is likely to produce a profit of 10%, there is no reason to invest in the company.

If, say, an investor can earn 10% of his money per year by investing in his own planet, over a period of ten years he can increase his wealth by 160%. To be profitable, an interstellar trading voyage would have to generate more profit than this. So the high time required for interstellar voyages result in high opportunity costs. (In 100 years, at 10% an investor would have increased his wealth by more than 15,000 times.) High opportunity costs combined with high transportation costs make interstellar trade extremely (though not necessarily prohibitively) expensive.

[4.2] Energy Costs of Sub-Light Travel

Many different interstellar propulsion systems have been proposed, and the energy required for each is different. Since we want to encourage interstellar trade, it behoves us to make relatively optimistic assumptions. In *Ares* nr. 1, John Boardman investigated the times and costs in energy entailed in using an anti-matter drive capable of 100 percent conversion of energy into gamma rays, accelerating off reaction from such conversion. It is possible to conceive of even less costly drives--such as a ramscoop, which gathers its reaction mass en route--but Boardman's drive is at least theoretically feasible while the ramscoop concept has some real technical problems. The Boardman anti-matter drive can then be taken as the most optimistic drive for sublight transportation.

Boardman derived a formula to determine the mass ratio needed between the initial mass of a ship and the mass of the final payload (see table below) assuming the ship accelerated to a given speed, coasted at that speed, and decelerated to rest at its target. He also derived a figure (5704 megawatt-years) for the amount of energy required to produce a kilogram of anti-matter. Combining these two, we can determine the amount of energy needed to accelerate a ship to a given speed and then decelerate to rest. Evidently, the higher the "coasting" speed, the greater the initial investment and the faster the ship will get to its target.

Historically, the US economy has grown at an average annual rate of 3% (corrected for inflation) over the past 150 years. If we assume that net human growth will continue at the rate of 3% in the future, we can calculate the opportunity cost of tying capital up in an interstellar voyage by assuming an average 3% rate of return were the capital invested at home. Obviously, the longer the voyage, the higher the opportunity cost. Compound interest mounts up very rapidly.

The important point is that the opportunity cost goes *down* if the maximum velocity of the ship goes *up* (because the ship gets to its destination and back sooner, so the interest is compounded for fewer years). The initial investment goes *up,* however as the maximum velocity of the ship goes up (because more energy is required to accelerate it to a higher velocity). Evidently, there is, for a voyage of a given length, a maximum velocity at which the minimum net cost is achieved.

Table 1 shows the minimum costs for voyages of several lengths between 5 and 100 light-years.

Table 1: Minimum Cost Journeys Using Anti-Matter Drive

Distance	Velocity	Time	Invest (MW-yrs)	Invest 1981$	OM	Cost (MW-yrs)	Cost 1981$
5	.23c	43.9	6,820	2.99	3.66	25,000	10.9
10	.38c	53.4	14,000	6.13	4.85	67,900	29.7
25	.59c	86.0	32,800	14.40	12.70	417,000	183.0
50	.74c	136.9	64,900	28.40	57.20	3,710,000	1,630.0
100	.84c	240.2	120,000	52.60	1,120.00	145,000,000	63,600.0

Key:
Distance: distance in light-years from earth to star. **Velocity:** maximum velocity of ship as percentage of speed of light.
Time: time for a round trip in years. **Invest (MY-yrs):** initial investment in megawatt-years per kilogram.
Invest (1981$): initial investment in billions of 1981 US dollars per kilogram. **OM:** opportunity multiple.
Cost (MY-yrs): total cost in megawatt-years per kilogram. **Cost (1981$):** total cost in billions of 1981 US dollars per kilogram.

Assumptions: The figures in this table are drawn using the following assumptions: Boardman anti-matter drive; refuelling at destination; vehicle mass neglected; 100% efficiency drive; acceleration = 9.8 m/sec^2; rate of return on investments at home is 3% annually; $.05 in 1981 dollars per kilowatt-hour ($438,000 per megawatt-year).

The cost of the energy needed to move a kilogram of matter at the minimum cost velocity of .23 times light-speed to a point 5 light-years away and back is 6,820 megawatt-years, which at average American prices of 5 cents per kilowatt hour works out to about $3 billion in 1981 dollars. When including opportunity costs, the total cost rises to about 25,000 megawatt-years, or about $11 billion. Costs increase rather more than linearly; the total cost of a 100 light-year trip is about $64 *trillion* dollars (about 20 times the US Gross National Product in 1981).

Actually, $11 billion is not bad when one considers that the Apollo program cost around $10 billion. To look at the energy figures, the initial investment of 6,820 megawatt-years is about 3% of the installed electrical generating capacity of the US as of 1975 -- it would take 6 fairly large nuclear plants operating full-blast for a year to produce the antimatter needed for the trip. That is a lot of energy, but it is by no means beyond our capabilities. (Of course, the technology does not exist at the moment, and is likely never to exist at least in the idealized form postulated by Boardman.) This limitation implies that sending miniaturized, robot probes to the nearer stars is well within the realm of feasibility and will, barring nuclear war or some other catastrophic end to human civilization, probably occur sooner or later.

However, the cost is *per kilogram,* which means that human beings are unlikely ever to go to the stars, given the mass entailed in the life support system necessary to keep a human alive for several decades.

[4.3] Standards of Living

Eleven billion dollars is a lot of money -- or is it? We have postulated that the economy will continue to grow, world-wide (or perhaps I should say solar-system-wide), at a rate of 3% per annum. Many countries have growth-rates higher than this (and quite a few less), so it seems a reasonable presumption -- assuming 1.) technology continues to advance, 2.) we begin to exploit the vast resources available in the solar system off earth, and 3.) economic growth does not get choked off by the continued growth of parasitic government at the expense of the productive sector of the economy (the last is the most questionable assumption).

As an example, let us say that the average individual on the earth commands about $1,000 per year (the figure is probably somewhat, but not much, lower, averaged over the earth's population). Figure 1 shows how much money individuals will, on the average, be able to command in the future. Talking of "money" in this context may be confusing; we are talking, actually, about the resources, energy, and goods which an individual commands. The average individual will be able to command $1 billion in about 500 years -- which means he will be able to afford the equivalent of a Cray computer and a fleet of space shuttles. He will not be able to hire huge numbers of domestic servants -- because the average servant will, after all, make somewhere around $1 billion himself.

Real economic growth comes from technological advances that permit increased productivity. Mechanization, division of labor, computerization, robots, etc., mean that fewer and fewer man-hours are needed to produce a given good, and thus that individuals can be paid more (in terms of goods and services) than they could be paid under less productive arrangements. There may be a limit to this process, but we are nowhere near it; indeed, mechanization of services (as opposed to industries) has only begun to occur with the computer revolution. Economic growth means a greater ability to command goods and services; it does not mean a greater ability to command others.

Some things, however, are *not* susceptible to growth of this kind. There are only so many Rembrandts; the soil of Burgundy can only support so many *grand cru* vineyards. If a Rembrandt sells for $1 million today, when the average income is $1000, it will sell for $1 trillion when the average income is $1 billion. (All things being equal.)

Historically, per capita energy consumption has been very closely linked to economic growth. Both have increased in the US at an average rate of around 3%. Consequently, as standards of living increase, the amount of energy which an individual can command increases -- and his ability to contribute to what now seems an incredibly expensive sublight trading mission increases. If an average income of $1 billion does not make everyone able to own a Rembrandt, it does make it much more possible to engage in interstellar trade. If a Rembrandt sells for $1 trillion, spending $11 billion to import the equivalent of a Rembrandt from Alpha Centauri does not sound so bad.

How reasonable is it to expect that per capita incomes will increase a million fold over the next 500 years or so? Assume that the population increases at a rate of 2% per annum (roughly the current global average). Total energy use will increase at a rate of 5% (3% per capita plus 2% increase in population). Current total world consumption of energy is around 8×10^9 MW-years per year. The sun puts out about 1.28×10^{20} MW; in 500 years at a growth rate of 5%, humanity would consume a little bit more than twice the energy produced by the sun (and the human population would be about 8×10^{13}, eighty-thousand billion people). It seems unlikely that we could produce enough energy to provide the equivalent of a second sun for humanity. However, if we assume that the population would level off at 100 billion people, humanity would consume about 5×10^{17} MW, about 1/2% of the sun's output. Thus, if we solve the population problem sometime in the 22nd Century, all will be well and our children will be billionaires.

Assume that this picture is over-optimistic. Assume that the $11 billion/kg is off by a factor of ten, and that a better figure is $100 billion/kg. Even today, such a cost, though huge, could be paid. And barring the collapse of civilization, growth *will* continue. The relative cost of interstellar trade should decline. Doubtless, it will never be as common as trans-Atlantic traffic is today; nonetheless, it seems feasible.

[4.4] Commodities

We said that in order to determine the feasibility of trade in a given good we would have to know 1.) the cost of transportation and 2.) something about the cost of production of the good. The first question we have answered, and the second we can talk about. If the standard of living has increased a million fold, what this really means is that the cost of goods has decreased a million fold. If per capita income increases from $1,000 to $1 billion, an individual can command a million times as much energy or resources. Effectively, we are holding the dollar cost of goods constant while increasing the number of dollars available to individuals.

This being so, it is obvious that common resources and products are not going to be worth trading over interstellar distances. Spending 25,000 MY-years to import a kilogram of lead makes no sense. What might be worth importing?

First, perhaps there are extremely valuable resources which cannot easily be produced in our solar system: monopoles, or superheavy metals, perhaps (if such things exist at all). If, however, there are monopoles on Alpha Centauri because the Centaurians can manufacture them, it is likely that it will be more efficient to purchase the techniques from them rather than to import monopoles.
Which brings up the point that manufactured goods of any kind are probably not worth trading, because given the high costs of transportation, selling the manufacturing technology makes more sense than trading in the goods themselves. What does this leave?
This leaves goods the value of which is not transmittable, which cannot be described and reconstructed, but have somehow intrinsic value. A Rembrandt can certainly be described and the Centaurians could certainly print copies of Rembrandt paintings from information we send them, but those copies would not be the originals. Lithographs sell for prices about 5 orders of magnitude less than originals. Originals have intrinsic value; any copy, no matter how perfect, is but a copy.

So one possible category of trade objects is luxury items, not only *objets d'art,* but such things as exotic wines and liqueurs and the like. (I refuse to believe that any reproduction technology, no matter how sophisticated, can reproduce the bouquet of wine to the complete satisfaction of a wine snob. The future may see the trillion dollar wine.)

The last category of goods it might make sense to trade is genetic information, or something similar. Given sophisticated genetic manipulation techniques, getting the raw material -- the genetic codes -- of alien species might prove extremely beneficial, especially if the species is very alien in biology. By manipulating such beasties, we might be able to engineer new genetic products that could not be created with the genetic material available on earth. On the other hand, the genetic code is a code; and one day we may be able to read the precise order of amino acids on a strand of DNA, and thus be able to precisely describe a gene to an interested party. There is, naturally, a hell of a lot of information encoded in even the simplest bacterium, and transmitting this much information might be difficult. On the other hand, radio data transmission rates have increased by several orders of magnitude over the last few decades, and it may be that we will be able to transmit instructions for building genes in the future, thus obviating the need for trade in genes.
In summary then, though human civilization is likely to be engaged in interstellar trade, there probably will not be much worth trading, since any society capable of doing so on a major scale can probably produce almost anything it needs at home. Trade in esoteric and extremely rare resources like superheavy metals might be possible; genetic material is another possibility. The most likely trade good would seem to be the relatively frivolous trade in luxuries.

[4.5] Trade via Radio

There are immense gains to be made from trade with other stars through exchange of information. A space-going civilization is almost certain to have developed technologies, which we have not, and vice versa. Exchange of scientific information would also be worthwhile, and surely both our cultures would be enriched by exchange of the artistic masterpieces of our two heritages. Such trade would not require physical transportation of objects, however; a more likely possibility is telecommunication. Getting into radio contact with another civilization would be extremely profitable to both of us, and the cost to operate a large radio transmitter would be immensely less than the cost of operating an interstellar trading vessel.

This kind of trade, however, cannot be built on a direct, bargained exchange. If it takes, say, ten years to send a message and get a response, making a deal would be an effort requiring a lifetime. If making a profitable exchange necessarily requires first coming to an agreement on the terms of that exchange, information will be exchanged at a very slow rate. Instead, it seems likely that both of us will transmit whatever information we think the other might find useful or interesting, transmitting other information as requested. In essence, as Asimov suggests in one of his stories, we will both be talking at once. Whether this kind of exchange can even be termed "trade" in the classical sense is debatable, since there is no agreed exchange of items of value; but it is certainly a voluntary arrangement benefiting both parties. It is also evidently the most cost-effective and simplest way to deal with alien friends.

[4.6] Trade Faster than the Speed of Light

In this article, I have talked about the possibilities of sublight trade at some length. Trade in FTL vessels may be a more interesting topic, despite the fact that FTL will probably never exist.

The problem is that any FTL drive will necessarily depend on physical principles of which we have not the slightest glimmer at the present time. Consequently, we can not make any assumptions and have no real way of speculating about the costs of such trade or the forms which it will entail. The basic principles, however, remain the same. The lower the cost of transportation of goods, the more trade will go on. One expects that any mechanism for traversing distances measured in light-years is going to be very expensive, even if it involves (or perhaps especially if it involves) somehow transcending Einsteinian mechanics. Consequently, interstellar trade is always likely to be limited. The fact that travel can occur at trans-light speeds means that opportunity costs are much reduced, of course; the cost of building and operating an FTL-drive ship, however, cannot even be guessed at. In the accompanying module, we investigate the costs of travel using the *Traveller* system, and how that system reflects (or fails to reflect) reality.

[4.7] Calculating the Cost of Interstellar Trade

The cost C of a round trip is equal to an opportunity multiple (OP_m) times the investment required to make the trip. The opportunity multiple arises from the fact that investment could be made at home instead, and is equal to:

$$OP_m = (1 + I\%)^{2T}$$

Where T is the time required for one leg of the journey (out or back) and $I\%$ is the rate of return possible if the money were invested at home instead of on the interstellar voyage.

Ignoring the cost of building and maintaining a ship (as well as the costs of overhead, employees, etc.), the investment required to send a sublight trading mission using the Boardman anti-matter drive is calculated from:

$$I = 2 * R_m * P * 5704 \text{ MWy/kg}$$

where I is the investment, R_m is the number of kilograms of anti-matter required per kilogram of payload, the factor "2" entering because anti-matter must be purchased at the destination before the return trip (doubling the cost), and $5704 MWy/kg$ is the amount of energy (in megawatt-years, MWy) required to produce a kilogram of anti-matter. For a one-way trip, the value of R_m is:

$$R_m = \left(\frac{c + u}{c - u} - 1 \right)$$

Assuming the ship is capable of refuelling at its destination, where c is light speed (3×10^5 km/sec) and u is the maximum velocity of the ship. Cost C is then:

$$C = (1 + 1\%)^{2T} * \left(\frac{c + u}{c - u} - 1 \right) * 2 * P * 5704 MWy/kg$$

T, however, is a function of u, the maximum velocity. If we plug an equation for T into the equation for C and assume values for u and $I\%$, we can calculate the cost per kilogram of trade goods. T is calculated from:

$$T = \frac{d}{u} + \frac{2}{g} * \left[\frac{c^2}{u} + \left(1 - \frac{u^2}{c^2}\right)^{-1/2} * \left(u - \frac{c^2}{u}\right) \right]$$

Where d is the distance to be travelled and g is the rate of acceleration. One of the interesting things about the equation for C is that the opportunity multiple *decreases* as u increases (because the journey takes less time) while the investment *increases* as u increases (because more anti-matter is required). This implies that there is, for a given set of conditions, some maximum velocity u at which minimum cost is achieved. Table 1 (in the parent article) shows minimum costs for a number of journeys of different lengths.

[4.8] Trade Costs in *Traveller*

The Free Trader, the standard *Traveller* small trading vessel, costs 37.098 Mcr (Megacredits). It is capable of a one-parsec (3.26 light-year) jump every three weeks with normal maintenance; the purchase cost amortized over a period of ten years means an effective cost of 71,000 Cr per journey. Other costs are:

Amortized ship cost	71,000Cr
Fuel, 20 tons at 500Cr/ton	10,000Cr
Maintenance, 0.1% ship cost/jump	37,000Cr
Total crew salaries/month	19,000Cr
Total cost per jump	**137,000Cr**

The cargo capacity of a Free Trader is 82 tons, so the cost of transporting 1 kg a distance of one parsec is about 1 2/3 credits. For comparison, a shotgun costs 160 Cr. This implies that, relative to other costs prevailing in the Imperium, the cost of interstellar transportation is relatively low, and a high level of interstellar trade is to be expected.

However, there is a major flaw in the *Traveller* ship system which Marc Miller apparently does not realize and the implications of which are not reflected in other aspects of the game. The smallest power plant that can be mounted on a spaceship is an A-rating plant. An A-plant consumes 20 *tons* of hydrogen in the course of a standard one-week interstellar jump. Now, starships do not in *Traveller* carry liquid oxygen, so it is clear that the hydrogen is not being burned to create energy. Instead, the power plant must be operating as a fusion device. Further, Miller does not permit ships to separate out the deuterium (heavy hydrogen, the easiest atom to fuse) and use only that to generate power. If he did, ships could carry vastly less fuel and would thus have much more space available for cargo. So the energy must be created by proton-proton fusion of raw hydrogen, tons of which are consumed each week -- the same fusion reaction which produces most of the sun's energy. (Actually, considering the energetics of proton-proton reactions, Imperial technology must be extremely advanced, since even at temperatures of millions of degrees, proton-proton fusion occurs very rarely. The Imperium must have some mechanism for catalysing such reactions, something beyond the slightest glimmer of our comprehension at the moment.)

In proton-proton fusion, through a series of three reactions, four protons fuse to produce a single helium atom plus about 25Mev (million electron-volts), plus some stray gamma rays, neutrinos, and positrons. H^1 weights 1.008 g/mole, so 1 kilogram contains about 992 moles of hydrogen, or 5.97×10^{26} atoms. Fusing these atoms produces 3.73×10^{27} Mev. There are 1.60×10^{-19} J/ev, so this is about equivalent to 5.97×10^{14} Joules, or about 19 MW-years. So there are about 19 MW-years of energy per kilogram of hydrogen.

The smallest power plant which may be installed on a ship in *Traveller* is a standard "A" power plan. The A-plant can consume 20 tons of hydrogen over a period of a week, convert it to energy, and feed it to an "A" FTL drive. (This is how much energy is needed by the smallest FTL drive to make a jump of 1 parsec if installed in a 200 ton ship.) If we assume Miller is using metric tons (1 ton = 1,000 kg), an A power plant then can deliver 380,000 MW-years of energy over a period of one week. Over a year, it could deliver 19,800,000 MW-years. Thus, a single A power plant produces about 86 times as much energy in a year as all of the electrical generating plants in the United States. A single jump in *Traveller* uses about 160% of the energy the US produces in a single year.

A "Jump 1" in *Traveller* corresponds to a travel distance of one parsec, about 3 1/3 light-years. Let us be generous and say a ship can travel 5 light-years at Jump 1, consuming 380,000 MW-years in the process. A Free Trader carries 82 tons of cargo, so the cost in energy to transport a kilogram is 380,000 divided by 82,000, or roughly 4.6 MW-years. This is about 5,000 times as good as the Boardman anti-matter drive, so that there is no doubt that interstellar trade in the *Traveller* universe is a good deal cheaper than in an Einsteinian one.

It still takes 6.7 million KW-hours of energy to transport a kilogram, however. That is a lot of energy. Now it is true that energy is very cheap (in terms of Imperial credits) in *Traveller* -- it has to be, given the cost of owning and operation an "A" power plant -- but the cheapness of energy means that other manufactured goods must be very cheap. So there still will be few goods worth trading in *Traveller.* What goods will be worth trading is debatable, since it is very difficult to estimate costs of production. However, certainly trade in bulk goods like metal ores, pig iron, or grains can be ruled out. The *Traveller* trading system does make it possible to make a profit trading such goods, but that is a peculiarity of the system. I think we can say with some assurance that in *Traveller* the primary items of trade will be 1.) luxuries, 2.) extremely rare resources such as superheavy metals and -- possibly -- radioactives, and 3.) high-tech goods to be sold on planets where they cannot easily be produced locally.

II. Variants from SPI's Star Trader

Presented below is copy except from SPI's Star Trader rules – those wishing to create a Star Trader / Universe campaign will require the Star Trader Rules for much of the following to make sense. Section 24.0 is presented here as a jump point for ideas or to explore the possibilities if integrating Star Trader appeals.

[24.0] Using *Star Trader* in a *Universe* Campaign

GENERAL RULE:
There are two distinct ways in which *Star Trader* may be used in a *Universe* campaign. It may be used as a play aid, to help gamesmasters deal with the players' interstellar trading; and it may serve as a scenario generator. In the former case, one or more players are actually owners or lessors of one or more interstellar vessels, and are out to make a profit through trade. In the latter, the players are not involved directly with interstellar trade, and the GM uses *Star Trader* to provide background for the campaign.

PROCEDURE:
Whenever *Star Trader* is used in a *Universe campaign,* the GM must fill out System Displays for the Systems involved in the campaign. If players are actually trading, the GM converts their attributes and possessions into those used in *Star Trader.* The GM then uses (plays) *Star Trader,* moving and conducting transactions as indicated by the trading player and informing the player of the results of his decisions. If *Star Trader* is simply being used as a scenario generator, the GM plays the game himself (or with other persons who are not players in the campaign) and uses the information and events of the campaign to simulate interaction and activity on the part of the players.

CASES:

[24.1] A Star System Display Master is included in these rules. When a new System is introduced, a photocopy of the master is filled out.

Spaceport Class is the highest class of any Spaceport in the System (round up if a System's highest Spaceport Class is ½).

Law Level is the highest Law Level of any world or Spaceport in the System.

Security Rating is the sum of the Spaceport Class and Law Level found above, plus **2**.

Patrol Rating is the sum of the Spaceport Class and Law Level.

Commodities which are abundant anywhere in the system (see *Universe,* 25.7) should be so indicated in the On Planet box of the System. The GM must then decide what commodities will be traded; if players are actually trading, the players should take some part in the decision; otherwise the GM should simply choose four or five commodities that he thinks will be actively traded in the area of the campaign. The GM then determines whether or not there is a market for each commodity at each of the Systems in the game; if a commodity is abundant anywhere in a System it automatically has a market in that System. Other commodities have a 50% chance of having a market at any System (plus **10%** times the Spaceport Class). The price of each commodity at each System where it is traded is determined as follows: Multiply the commodity's price on the World Resource Table (25.7 of *Universe)* by **0.15**. If the commodity's price on that table is per ton, or by **10** if the commodity's price is per gram or kilo; if the good is abundant, multiply this product by **50%**; if limited, multiply the product by **75%**; otherwise, do not multiply by anything. The Spaceport Class of the System is then added to the product. The commodity's price will then be anywhere within 2 (either direction) of the final quantity (GM's discretion).

Example: The GM has determined that silver is abundant at a System with a Spaceport Class of 3. Silver is priced at **0.5** per kilo on the World Resource Table. Silver's price is thus **0.5** (basic price) *times* **10** (because it is traded in kilos) *times* **50%** (because it is abundant) *plus* **3** (Spaceport Class), for a total of **5.5**. Silver's price will fall within 2 of this amount (i.e., it will be **4**, **5**, **6**, or **7**), at the GM's discretion.
The S/D modifier for each commodity will be:

- **-10**, **-9** if not available at a System.
- **-6**, **-7**, **-8** if limited, measured in kilos or ions.
- **-5**, **-4, -3** it limited, measured in grams.
- **-2**, **-1**, **0**, **+1** if abundant.

The GM determines the exact S/D modifiers within the spans given.

[24.2] A player's possessions translate into *Star Trader as* follows:
A player must have ships to trade; ships can be transferred directly, however — the pods and hulls in *Universe* are identical to those in *Star Trader* (a few new hull classes are added in the latter). The pod capacities of hulls are slightly tower in *Star Trader,* as Energy and Jump pods have been factored into hulls. Ship prices in *Star Trader* have also been rounded off because of the huge quantities of funds involved; the prices of illegal hulls and pods have been multiplied greatly to account for the assumption that they will always be purchased on the black market in *Star Trader.* Nevertheless, the hulls and pods themselves are the same. Ship records should be filled our for all ships using the Summary of Ship Hull and Pod Characteristics. The GM should determine the Crew Value of ship's crew involved.

Money in *Star Trader* is measured in Hecto Trans (units of **100** *Universe* "Transfers", or about $50,000 to the HT); funds a player might invest should therefore be divided by **100** to convert to HT's.
Each point of Warehouse Capacity in *Star Trader* represents one large warehouse, and each factory unit represents facilities capable of producing **60** tons a year of goods measured in tons, **4** tons a year of goods measured in kilos, or **4** kilos a year of goods measured in grams. Agents essentially represent very capable or influential persons. If a player, employee, or other NPC is particularly apt, his ability can be represented through an agent.

[24.3] A player's attributes translate into *Star Trader* as follows:
The GM should determine a player's Connection and Reputation Levels based upon the player's NPC contacts, the degree to which he is known and respected in the business community, and the levels of any appropriate skills. These include primarily Economics and Trading, and secondarily Diplomacy, Forgery/Counterfeiting, Law, Recruiting, Streetwise, and Mining. If a player has done nothing of particular note, his Reputation Level will be around **20**. A Merchant or an Interstellar Trader may be provided with warehouses or even factories depending on his initial Benefit Level and activities previous to use in *Star Trader.*

[24.4] A different procedure is used for hyperjumping when players or their ships are involved.
Use the formula for calculating jump percentage in *Universe* (10.0, Navigation) rather than basing the number on Crew Value. Treat all results of **+ 30** or less on the Hyperjump Table (32.2 of *Universe}* as successful jumps (in *Star Trader* terms) and results of **31-50** as unsuccessful jumps. Results of **51 +** should be handled as *Universe* events, rather than through the *Star Trader* system. If the GM wishes to use the *Universe* hyperjump system for a *Star Trader* crew, assume that a **D** crew has a navigator with a Skill Level of **1** and a Mental Power of **5.** A **C** crew navigator has a Skill Level of **3** and Mental Power of **5**; a **B** Crew navigator has a Skill Level **4** and Mental Power **6**; and an **A** crew navigator has Skill Level **7** and Mental Power **6**.

[24.5] If the players or their ships are involved in interception or combat, the *DeltaVee* combat system should be used to resolve the situation.
When interception is declared in *Star-Trader,* the GM sets up the *DeltaVee* maps as he sees fit. One possible configuration would be that in Scenario 3 *of DeltaVee.* The opposing ships would be placed on opposite sides of Map A. The player attempting to avoid interception and combat must exit Map D towards Map E to escape. Alternatively, a planet could be placed on map D. if a player gets into orbit around or lands on the planet, he has escaped the combat.

[24.6] The GM should present the information and options of *Star Trader* in a role-playing format.
Thus, a player running a trade empire would not actually sit down and play *Star Trader;* the GM would play the game himself and describe the status of the markets, and announce opportunities through NPC's.

[2.0] Variants from SPI's *Star Trader*: *Star Trader* Spacecraft in *Universe*

Ares Inc.

• Phoenix.
The premier deep-space trading vessel. Its size, economy, and combat adaptability make it popular with interstellar traders and pirates.
NUMBER OF PODS: 8. **VELOCITY RATING:** ?. **MANOEUVRE RATING:** ?. **ENERGY CAPACITY:** ?.
ENERGY BURN RATE: ?. **STREAMLINED:** No. **BURSTER CLASS:** 1. **ARMOUR CLASS:** 1.
FORCEFIELD CLASS: 0. **CIV LEVEL:** ?. **TARGET PROGRAM:** -4. **AVAILABILITY:** Open. **CREW REQUIRED:** 5
PASSENGER CAPACITY: 10 **CARGO CAPACITY:** 20. **PERFORMANCE MODIFIER:** +5. **COST:** 8500.
(Additional – From SPI Star Trader)

• Monarch.
The premier deep-space trading vessel. Its size, economy, and combat adaptability make it popular with interstellar traders and pirates.
NUMBER OF PODS: 14. **VELOCITY RATING:** ?. **MANOEUVRE RATING:** ?. **ENERGY CAPACITY:** ?.
ENERGY BURN RATE: ?. **STREAMLINED:** No. **BURSTER CLASS:** 1. **ARMOUR CLASS:** 1. **FORCEFIELD CLASS:** 0.
CIV LEVEL: ?. **TARGET PROGRAM:** -4. **AVAILABILITY:** Open. **CREW REQUIRED:** 15 **PASSENGER CAPACITY:** 30
CARGO CAPACITY: 40. **PERFORMANCE MODIFIER:** +10. **COST:** 15000.
(Additional – From SPI Star Trader)

• Leviathan.
The premier deep-space trading vessel. Its size, economy, and combat adaptability make it popular with interstellar traders and pirates.
NUMBER OF PODS: 20. **VELOCITY RATING:** ?. **MANOEUVRE RATING:** ?. **ENERGY CAPACITY:** ?.
ENERGY BURN RATE: ?. **STREAMLINED:** No. **BURSTER CLASS:** 1. **ARMOUR CLASS:** 1. **FORCEFIELD CLASS:** 0.
CIV LEVEL: ?. **TARGET PROGRAM:** -4. **AVAILABILITY:** Open. **CREW REQUIRED:** 20 **PASSENGER CAPACITY:** 40
CARGO CAPACITY: 60. **PERFORMANCE MODIFIER:** +15. **COST:** 20000.
(Additional – From SPI Star Trader)

III. Other Sources

[1.0] Additional: Skills

NAVIGATION
6 Levels/Limit: Intelligence
The character is learned in the study of celestial bodies and the geography of known space. His services are required when attempting to plot courses between planets in a stellar system, locate an unexplored planet or when attempting to locate one's own position after a Hyperjump error. All spaceships contain equipment necessary to survey the stars. A Civ Level 8 spacecraft or Explorer Pod increases a character's Navigation Skill Level by **1**. A survey pod increases the Level by **2**.

T Locate unexplored planet (when in system space): **90%.**
T Locate uncharted planet (when in system space): **70%.**
T Locate own position after minor jump error: **60%.**
T Locate own position after major jump error: **40%.**
T Locate own position after randomised jump: **20%.**

The time required for any of the above tasks is 6 hours. A dice result for any of the above tasks that is no more than **10** above the modified chance indicates success with a **20%** increase in the time required for each extra percentage point. A dice result that is more than **10** above the modified chance indicates failure.

CLIMBING
6 Levels/Limit: Dexterity
The character is trained in climbing. Climbing tools such as ropes, climbing picks, hammers, pitons etc increases a character's Climbing Skill Level by **1**. A Climb Kit increases the Level by **2**.

T Climb a steep slope with hand or footholds, e.g. an overgrown gully or roof top with antennae or protrusions: **90%.**
T Climb a steep slope with little or no hand or footholds, e.g. a smooth roof top: **80%.**
T Climb a steep face with hand or footholds, e.g. a steep rugged slope with limited vegetation or building with protrusions: **60%.**
T Climb a steep face with little or no hand or footholds, e.g. a sloped cliff face or sloped building wall: **50%.**
T Climb a vertical face with hand and footholds, e.g. the side of a stone wall, rugged cliff face: **30%.**
T Climb a vertical face with little or no hand or footholds, e.g. the side of a building or cliff face: **20%.**

The time required for any of the above tasks is 1 Action Round. A dice result for any of the above tasks that is no more than **10** above the modified chance indicates success with a **20%** increase in the time required for each extra percentage point. A dice result that is more than **10** above the modified chance indicates failure and possible accident.

[2.0] Additional: Robots Systems

Agriculture Civ 7
Functions just like a character with agriculture Skill Level 7.
AVAILABILITY: Open **CIV LEVEL:** 7 **HARDWARE POINTS:** 1 **SOFTWARE POINTS:** 1 **Price:** 20

Aquatic 'Deep Diver'
Allows robot to swim above and beneath water. Robot's speed in an Action Round is twice its Agility in hexes; long distance movement is twice Agility in kilometres per hour. Maximum depth is 1000 meters.
AVAILABILITY: Open **CIV LEVEL:** 7 **HARDWARE POINTS:** 2 **SOFTWARE POINTS:** 0 **Price:** 40

Chemical Civ 7
Aids a character with chemistry skill; adds 2 to his Skill Level. Includes a Civ Level 7 Chemlab
AVAILABILITY: Open **CIV LEVEL:** 7 **HARDWARE POINTS:** 1 **SOFTWARE POINTS:** 1 **Price:** 15

Compu/Robot Tech
Federation prohibits robots with this system.
AVAILABILITY: Forbidden **CIV LEVEL:** Forbidden **HARDWARE POINTS:** Forbidden **SOFTWARE POINTS:** Forbidden **Price:** Forbidden

Electro Tech Civ 6
Functions in all respects as a character with an Electro tech Skill Level of 5 with repair capabilities of a Civ Level 7 Electrokit.
AVAILABILITY: Open **CIV LEVEL:** 6 **HARDWARE POINTS:** 1 **SOFTWARE POINTS:** 1 **Price:** 15

EVA
Allows robot to conduct operate in Zero Gravity. Equipped with Zero G propulsion devices, grapple fittings and tethers for working in that environment. Functions in all respects as a character with an EVA Skill Level of 6.
AVAILABILITY: Open **CIV LEVEL:** 6 **HARDWARE POINTS:** 1 **SOFTWARE POINTS:** 1 **Price:** 15

Planetology
Functions in all respects as a character with a Planetology and Astronomy Skill of Level 3 with the limited hardware capabilities of a Civ Level 8 Survey Pod, provides Skill Level increase of +1 when performing an astronomy task and a Skill Level increase of +2 when performing a planetology task.
AVAILABILITY: Open CIV LEVEL: 8 **HARDWARE POINTS:** 2 **SOFTWARE POINTS:** 1 **Price:** 500

Spacecraft Tech Civ 6
Functions in all respects as a character with a Spaceship Tech Skill of Level 6 with repair capabilities of a Civ Level 6 Spacecraft kit.
AVAILABILITY: Open CIV LEVEL: 6 **HARDWARE POINTS:** 3 **SOFTWARE POINTS:** 1 **Price:** 150

Spacecraft Tech Civ 7
Functions in all respects as a character with a spaceship tech Skill Level of 7 with repair capabilities of a Civ Level 7 Spacecraft kit.
AVAILABILITY: Open **CIV LEVEL:** 7 **HARDWARE POINTS:** 3 **SOFTWARE POINTS:** 1 **Price:** 130

[3.0] Additional: Spacecraft

Spacecraft Hulls

• Auto Drone.
Short-range robot Battlecraft, usually launched from the Drone pod or carried externally on a military spacecraft. Orbiting space stations and commercial complexes often use the Auto Drones to repel, distract and even commence attacks. Auto Drones are perfect for causing intelligent counter measure diversions, suicide tasks and offer the ability to carry a 'pocket' squadron.

On the upside Auto Drones are much smaller than Battlecraft, much more manoeuvrable given the freedom to pull as many G's without concern for a human pilot, cheaper and can be used in larger throw-away quantities. On the downside, what they gain in cheap, compact, conscienceless efficiency they lose in the real skill and experience of the more expensive human piloted original.

Note: As this craft is automated it does not include features associated with manned operation, airlocks are replaced with maintenance accesses, there is no provision for life support, cargo, etc. Drones are handled exactly like Battlecraft with a Pilot and Gunnery Skill of **6**. If communication with the drone is interfered with (ECM, Particle collisions, etc) the drone behaves as an intelligent missile using it's onboard attack or other program loaded at launch. Drones are NOT Self-Aware, but are Self-Activating and can suffer the possibility of malfunction under combat conditions (i.e. Robots with this system may suffer mental malfunction due to a *rare* or *unique* accident…) in the case of Auto Drones this probability is higher under combat conditions particularly when exposed to enemy ECM tactics.

NUMBER OF PODS: 0. **VELOCITY RATING:** 4. **MANOEUVRE RATING:** 10. **ENERGY CAPACITY:** 15.
ENERGY BURN RATE: 1. **STREAMLINED:** Yes. **BURSTER CLASS:** 2. **ARMOUR CLASS:** 2.
FORCEFIELD CLASS: 0. **CIV LEVEL:** 8. **TARGET PROGRAM:** -4. **AVAILABILITY:** Restricted. **CREW REQUIRED:** 0.
PASSENGER CAPACITY: 0. **CARGO CAPACITY:** 0. **PERFORMANCE MODIFIER:** 25. **COST:** 5000.
(Based on Forever War Joe Haldeman)

• Calypso
A basic science vessel based on the robust Corco Mu freighter/liner. This design is fairly uncommon in the Federation, being roughly three years old. The design was introduced in 2292 A.D. and is used mainly by Trans-Solar Expeditions. The Calypso is built by Legacy and only under commission for certain exploration corporations. Provision is made for a Forcefield generator and a Burster but these have to be ordered separately as these two items are not installed as part of the hull. A relatively new hull design, being available only for the last 3 years the Calypso may see open market availability based on demand.
NUMBER OF PODS: 12. **VELOCITY RATING:** 1. **MANOEUVRE RATING:** 5. **ENERGY CAPACITY:** 192. **ENERGY BURN RATE:** 16.
STREAMLINED: No. **BURSTER CLASS:** 0. **ARMOUR CLASS:** 1. **FORCEFIELD CLASS:** 0. **CIV LEVEL:** 8. **TARGET PROGRAM:** -2.
AVAILABILITY: Restricted. **CREW REQUIRED:** 5. **PASSENGER CAPACITY:** 30. **CARGO CAPACITY:** 15.
PERFORMANCE MODIFIER: -10. **COST:** 17,020.
(Additional - Steven P. Ross)

[4.0] Additional: Pods

Spacecraft Pods

• Asteroid Mining Pod.
For surface mining of asteroids. The inherent cargo capacity of the AMP is only 50 tons however the AMP may be linked to other Standard Cargo Pods which would increase the capacity of mined ore.
Availability: Open. **Crew Required:** 1. **Passenger Capacity:** 0. **Cargo:** 50. **Cost:** 0.

• Construction SOP.
Construction Surface Operations Pod aids the construction of surface buildings once landed on a world surface. Contains 30 construction robots, 2 heavy vehicles and various equipment to aid and fulfil equipment requirements for Construction Tasks. Skill increase of 6 when conducting Construction Tasks using this pod. Shared sleeping quarters and galley for construction crew, limited maintenance, repair and recharge capability for robots and vehicles. Fulfils equipment requirements for all Compu/Robot, Electro, Energy, Suit, Vehicle tech repair tasks. Provides Skill Level increase of 3 when attempting to repair any such item brought into the pod.
Availability: Open. **Crew Required:** 0. **Passenger Capacity:** 10. **Cargo:** 5. **Cost:** 1,400. **Civ Level:** 7.

• Expedition SOP.
Expedition Surface Operations Pod combines certain elements of a survey pod and a bio-research pod, designed for small exploration missions staged from the surface of a world. Contains maintenance and storage facilities for a rover and 4 robots, sleeping quarters and galley for 5. Fulfils equipment requirements for biology, geology, physics, planetology, compu/robot, electro, energy, suit, vehicle, weapon tech repair and chemistry tasks. Provides Skill Level increase of 3 when attempting to repair any such item brought into the pod. Provides Skill Level increase of 1 when performing a planetology or vehicle tech task. Provides Skill Level increase of 2 when performing a biology task. Contains chambers for keeping living specimens in their natural environment conditions. This pod is can be used when connected to a spacecraft or deployed independently on the surface of a planet.
Availability: Open. **Crew Required:** 1 (Expedition Commander). **Passenger Capacity:** 5. **Cargo:** 0.5 (contents of environment chambers). **Cost:** 2,000. **Civ Level:** 8.

• Drone.
Launching, retrieving and controlling up to 12 drone craft.
Availability: Open. **Crew Required:** 1. **Passenger Capacity:** 0. **Cargo:** 0. **Cost:** 500. **Civ Level:** 7.

• Grapple.
For the physical manipulation, towing and or retrieval of objects up to masses of 250 Tonnes. Superb for asteroid and salvage haulage
Availability: Open. **Crew Required:** 1. **Passenger Capacity:** 0. **Cargo:** 0. **Cost:** 0. **Civ Level:** 6.

• Probe.
Containment, maintenance, pre-launch prep and control for launching up to 10 robot probes of various types. Control, monitoring and data collection can be patched through the spacecraft's bridge, Explorer, Survey or other similar Pod. The Probe Pod typically carries robot probes of the Satellite Mapping or Surface Survey kind. (See Universe Additional for these ProbeBot types.)
Availability: Restricted. **Crew Required:** 1. **Passenger Capacity:** 0. **Cargo:** 0. **Cost:** 500. **Civ Level:** 7.

• Rescue.
Special docking facilities to enter a stricken or shut down spacecraft by attaching and cutting into its hull to gain entry. Contains assortment of expedition suits, propulsion devices, and tethers for zero-G manoeuvre outside the ship. Contains 3 airlocks. Allows the towing of another spacecraft once connected and if the Rescue enabled spacecraft is capable.
Availability: Restricted. **Crew Required:** 1. **Passenger Capacity:** 0. **Cargo:** 0. **Cost:** 500. **Civ Level:** 7.

[5.0] Additional: An Interpretation of Civilisation Level

By Ian Taylor.

A discussion of Civilisation Level is briefly given in Universe under 25.6 and it reads…

[25.6] The Civ Level of a world indicates the degree of that settlement's contribution to the federation.
The Civ Level of a world corresponds roughly to centuries in Earth's past and indicates the level of industrial output of the world. It does not necessarily indicate the sophistication of the population, nor does it reflect the intelligence of the individuals living on the world. A scientific colony, for instance, would have all the latest equipment, but would not be able to survive if the equipment broke down; they need their technology imported.

The Civ Levels and their corresponding Earth Centuries are:
Level 1 (1600)
Level 2 (1700)
Level 3 (1800)
Level 4 (1900)
Level 5 (2000)
Level 6 (2100)
Level 7 (2200)
Level 8 (2300)

Any experimental equipment or scientific breakthroughs developing during play would be considered Civ Level 9. Most individuals found on any world will be aware that high-tech items exist, and such items may be found on those worlds. However, in order to maintain or produce those items, the world must be of an equivalent or higher Civ Level.

The term 'Civ Level', using the above discussion, clearly falls into two parts, first as a reference to the *Technological Age* from which scientific processes were discovered and employed and secondly as an approximation of the independent ability of a society's *Technological Production*. It is important to have a clear understanding of how these two parallel interpretations work in future settings. Each technological process is unique to it's age, while the ability to produce items of a technological level merely give an approximation of what a society could inherently produce and support with it's limited resources.

Technological Age and Technological Production: Each technological age is unique to Earth history, a break through is made, concepts which were once developed in the laboratory emerge into industry over years and if surviving through a technological evolution become common place for years or decades to come, before succumbing to more advanced methods of doing things.

For instance the methods of building the great pyramids of ancient Egypt were once developed, utilised with great energy and over thousands of years the process was lost entirely. Three thousand years on these structures could easily be built if there was a will, but the mystery of that process that made it unique to that age remains lost.

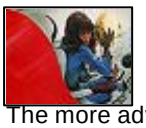
The original and ancient art of sword making, a process that spanned centuries of human history has become a skill handed down over generations and many of the secrets have been lost to time. Yes, it is possible to produce more sophisticated materials and manufacturing processes to create arguably 'better' blades, but the art of manufacturing a Katana from ancient Japan and the methods employed to do it are lost.

What does this mean? It means that while a society in these terms may be classed as Civilisation Level of 1, it does not translate to mean that the society has the mindset or the cunning processes unique to the 1600's. Rather the society of the current age is forced to make do with what it has to produce items broadly equivalent to finished items, which may have been available during the 1600's. Even with better materials and processing technology of the current age, items produced by artisans and guild masters of the 1600's would have used 'state of the art' methods often being superior than the facsimiles produced without this lost knowledge.

An example of this is the art of the Stone Mason, an ancient method of construction using stone. Constructions built by Stone Masons have lasted literally centuries because of the methods used to create them. The art of the Stone Mason was alive and well in the 1600's, but today all but a few know the secrets. Now, put a small 21st Century society of about ten thousand people in a situation where they have only rudimentary tools with no cement or bonding materials, for instance a Civ Level 1 colony, which are forced to build shelters with only local materials, in this case stone, and the result will not be the cunningly crafted, flushed stoned cathedrals of medieval Europe. In a sample group of about ten thousand 21st century people, you may be lucky to find a handful of individuals who's lineage and background could gather the basic skills required lay bricks let alone deal with raw stone.

In summary the Technological Age yields two things – ancient and priceless artefacts whose secrets of production are lost making these items sought after by collectors and museums and a milestone from which basic scientific principles emerged to become processing methods.

What does all this mean in a role-playing situation? Whether your society is based on the 21st or the 24th Century, the greater society, the civilisation of mankind as a whole, is an interwoven society with a linear history.



The more advanced we become the more dependent we are on a society constructed from a complex web of intricate and sophisticated threads of basic scientific principles. As human beings we become more distant from those same basic scientific principles as we develop into specialised individuals to support this web.

If one were to 'pinch' out a section of our society, break it away from the web and maroon it on a desert island, only a very few would know the basics of survival, fewer still would be able to make tools let alone a wheel. Therefore the current age is the deciding factor toward what could reasonably produced by a society outside of the mainstream and gives and indication of how well and of what quality the items produced may be.

Reading Civ Level into Items: In Universe items of equipment are assigned a Civ Level to indicate when the item becomes available. It is reasonable to assume then that a low 'entry level' for some items being offered in a higher Civ Level society would perform better than the data listed for the item. However, given the general nature of the Universe equipment charts, there appear to be some anomalies.

Example. Rifle Civ Level 5 (year equivalent 2000). The principle of the rifle (a spiral bored barrel to impart a stabilising spin on a chemically propelled round and using a bolt or breach loading mechanism) has been around since the mid to late 1800's (Civ Level 3) in various forms and this weapon replaced the broad definition of the Musket Civ Level 2 (year equivalent 1700) also listed in the weapon chart.

Universe uses broad terms to categorise equipment into principles rather than specify a particular model of item, and quite rightly so as the resulting equipment charts would be unmanageable. Therefore the Rifle as listed on the Universe Weapons Chart should have an entry Civ Level of 3 rather than 5 with specifications matching the performance of a rifle produced in the 1800's.

Even without the correction, a rifle produced in the 22nd Century, 100 years later, would ultimately perform better due to the materials and process involved in its manufacture. Propellant would be more efficient, faster muzzle velocity, greater accuracy and better sighting mechanisms perhaps, in short the performance data for the rifle would not be the same. The cost of the rifle may or may not be cheaper depending on the quantity required to supply demand.

Taking this further a rifle produced in the 23rd century, 200 years later, (if the knowledge, market and demand still existed for such a quaint and ancient item), the performance capabilities for the rifle may have 'levelled' off; rifles produced using 'authentic' methods may now only be produced for collectors – it is entirely likely that the market for projectile weapons may have been replaced by something altogether different, perhaps energy weapons.

This line of thought will hold true for any item. At entry level the specifications shown in weight, cost and performance are at their basic level. The next generation of items will be better and probably cheaper as the item reaches it's maximum level of sophistication. Ultimately the item will reach it's 'golden age' and from then on cease being produced, become harder to find and possibly become more expensive simply because of it's rarity.

Using swords as an example, the manufacturing processes for producing surgical steel are the most advanced they have ever been, their tensile strength and ability to hold and edge are second to none, but how many companies produce swords of any type using this process? Replica swords pertaining to be exact in every detail from the American Civil War, the Roman Empire or Medieval Europe abound for collectors but how many approach the real thing? A medieval Samurai would throw away a Katana manufactured in the 21st century in disgust. The technology may be available to create such archaic things, but their use in a martial age is long gone and this holds true for every item on offer.

Every item of equipment has an experimental age, a production age, a golden age and finally an age of decline and then a collector's age. It is not enough to declare when an item of equipment is available as there are two other elements missing; The item's peak performance or the final version of the item that displays the principle in it's highest form and it's rarity or how difficult the item may be to come by based purely on the number of the items manufactured.

From this basis it is possible then to create alternative equipment charts showing at least two versions of 'type' equipment, these being entry level and peak level and then assign a corresponding 'rarity' for items depending on which technological age they originated.

Using the rifle as an example again, and assuming it's entry level is actually Civ Level 3 or the 1800's we can see the rifle reaching a peak level of Civ Level 5, coming to a height of perfection over a hundred years during the 21st century, before giving way to non-chemical propellant projectile weapons such as those based on the Gauss principle. Rarity for rifles then have a range of Civ Level 3 to 5. At the end of Civ Level 2 they would be experimental, very expensive and very difficult to manufacture or come by, at the beginning of Civ Level 6, rifles may be very expensive or hard to come by simply because they are no longer manufactured. Clearly during the 20th century the rifle in its many varied forms was prolific, reaching it's peak of perfection of type during Civ Level 5 or the 21st century.

Translating this to a 'rarity factor' we can assign a 4 to the rifle as this was the Civ Level in which the rifle was at it height of production. For every Civ level away, below or above, 4 the rifle has a lower chance of being available. An approximation for the rifle's rarity therefore may be like this: At Civ Level 1 the percentage chance a rifle is available is: 0% at 2:5%, 3:30%, 4:100%, 5:30%, 6:5%, 7:0%.

[6.0] Additional: DYI Equipment Creation Formulas

By John Frenzel.

Creating your own Robot Chassis

Additional: Formula for generating Robot Chassis:
The formulas to generate Robot Chassis check to within ±10% in most cases; there are a few anomalies. It is a starting point at least. The formulas for robot chassis:

Cost of Robot Chassis equals:
Strength: 1 Tran x ST score
Dexterity: (DX - 4) x 2 Trans
Agility: (AY - 4) x 3 Trans
Projectile Armour: Rating x 3 Trans
Beam Armour: Rating x 3 Trans
Hardware Points: (Rating^2) x 10 Trans
Software Points: (Rating^2) x 10 Trans

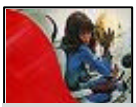
Port Capacity: Unknown - seems to be associated more with the shape or enclosed mass (i.e., something not in the game data).
Weight: Unknown - this is something of a chicken-egg question. A high Agility seems to reduce Weight, though one could also say that lighter chassis are more agile. Likewise regarding Strength and Port Capacity. – *Additional John Frenzel*

Creating your own Protective Attire

Additional: Formula for generating Suit and Armoured Attire: As with the other formulas, this set is accurate to within 10% of expected costs as listed, with a few exceptions. The armours and the expedition suits are very close. The Armour Vest is off by quite a bit, and the helmets are outside the 10% margin as well. Still, the formula is basically solid. Certain items, when checked against these formulas, show vastly different prices than those listed. However, in most cases I feel the formula is a better representation of the items true value. I think it is a good starting point, and can provide some guidelines for anyone interested in generating new items or checking the balance of items they have already created.

Weight: 7 - (Weight / 2) x 1 Tran rounded up +
Air Supply (in hours): Hour / 6 x 1 Trans) +
Encumbrance: 4 – the Encumbrance Rating x 1 Tran +
Projectile Armour: Rating x 2 – 1 in Trans +
Beam Armour: Rating x 2 – 1 in Trans +
Hit Strength: Each point of Hit Strength = 1 Tran

Further Considerations:
If the Hit Strength is *zero*, add nothing for that component
If the item provides only partial protection, such as helmets or vests, divide the cost by **3**
If item prevents the character from moving, divide the cost by **2**
If a force field provides the armour values, multiply the cost by **5**
If a force field provides the Hit Strength or ensures the air supply (i.e., seals the suit or armour), multiply the cost by **2**.
Apply division or multiplication for partial protection or Force Fields as the final step. – *Additional John Frenzel*



Creating your own Ground Vehicles

Additional: Formula for generating Ground Vehicles:
The formula for generating Ground vehicles are spot on for ATVs and standard ground vehicles (cars, trucks, etc), and form the basis for military vehicles before the addition of armaments. Note also that the original costing for the Half-Track has been altered to 100 Trans, instead of the 1000 Trans as originally listed. The Auto Sled is off as well, not sure why. The price in Trans for Vehicles can be worked out thus:

+ **Range (x100km**) * .3 Trans
+ **Speed (km/hr)** * .1 Trans
+ **Terrain Value Limit** squared in Trans
+ **TV Mod** For each –1 of TV Mod * 5 Trans
+ **Passengers** * 1 Trans
+ **Cargo (x100kg)** * 1 Trans
+ **Performance Modifier** / 5 Trans
+ **Projectile Armour** squared in Trans
+ **Beam Armour** squared in Trans

Further Considerations:
1) Add 50 Trans for each airlock
2) Add 5 Trans if nuclear powered
3) Add 33% to the total price if vehicle has 2 ground forms (i.e. Crawler)
4) Add 100% of the total price if vehicle has marine or air forms (i.e. Amphibian)
5) If the rated Cargo capacity is towed, not stored, treat capacity as 10% actual (i.e. Tractor)
6) Generally, if cost is greater than 100 Trans, Repair Time is 24 hours. If less than 100 Trans, Repair Time is 6 hours.
– Additional John Frenzel

Creating your own Spacecraft Hulls (Modification)

[31.3] The GM may design additional spaceship hulls to use during play.
Any hull designed should be given ratings and attributes comparable to those found on the Spaceship Attribute Chart (Delta Vee 38.9) and in 31.2. The spaceship may be made capable of carrying any number of pods. The Energy Burn Rate of a spaceship should be **20%** to **50%** greater than the number of pods it may carry. The cost of a spaceship hull is calculated by adding together the costs of all the following attributes:

- 200 Trans x Velocity Rating x Number of pods.
- 100 Trans x Manoeuvre Rating x Number of pods.
- 100 Trans x Passenger capacity of hull.
- 10 Trans X Energy capacity of hull.
- 100 Trans for a Class 1 burster; 1,000 Trans for a Class 2 burster.
- Armour Class 1: 100 Trans x Number of pods.
- Armour Class 2: 1,000 Trans x Number of pods.
- Force Field Class 1: 200 Trans x Number of pods.
- Force Field Class 2: 1,000 Trans x Number of pods.
- Target Program: 500 Trans for every subtraction of 1.
- Cargo: 100 Trans per ton of capacity.

If the spaceship is streamlined, increase all the preceding by **50%**. These costs are based on the number of pods the ship is capable of carrying, not the number it is actually carrying at any particular time.

Additional considerations: The hull design should take into account the following:

Ships with a pod capacity of zero should be priced as though they carry 0.5 pods.

Ships with burn-out jump engines should add the following cost:
3-jumps: 1000 Trans
2-jumps: 750 Trans
1-jump: 400 Trans

This is simply double the cost to replace such engines. This charge is not increased for streamlined ships. *– Additional John Frenzel*

END UNIVERSE: ADDITIONAL

