Starship Design and Construction

Starships are designed and constructed for specific missions: naval, exploratory, trade, research. The process of design and construction (Naval Architecture) carries the architect through a series of steps which identify ship component requirements and address them.

Ship design is a continuous feedback process: each step seems to mandate changes in what had been decided before. Eventually, however, the ship design appears complete and can be finalized with a ship name.

ACS ADVENTURE CLASS SHIPS

Adventure Class ships are starships and spacecraft suitable for use by groups of player characters. The ships are large enough to carry profitable cargos but small enough that the activities of the individual characters matter.

Tonnages. Adventure Class Ships are built using standard hulls between 100 tons and 2400 ton displacement.

Ships smaller than 100 tons are Small Craft; ships larger than 2400 tons are BCS Battle Class Ships.

Drag And Drop Components. The components for ACS ships are standardized for selection from tables (as opposed to created by formulas or percentages as in BCS ships).

THE NAVAL ARCHITECTURE PROCESS

Starships are designed based on a mission: the specific need for the ship, whether it be commercial, military, scientific, or recreational.

Designed in Tons. Ships are designed in Tons which then easily translate into deck plan squares and into volumetric cubes.

Costs in MegaCredits. Ship component costs are expressed in MegaCredits, Design decisions with considerably smaller costs (the fabrics for interior upholstery) are ignored.

An Interactive Process. The design charts are an interactive process: changing one parameter may require other changes throughout the design.

The process also interacts with other systems within **Traveller:** the combat system, the trade system, and various environmental details may influence the system.

THE COMPONENTS OF A STARSHIP

A starship consists of a variety of components, each with its own particular benefit and requirements.

The Hull. The starship hull is the container into which all other components must be fitted. The hull has a size (in tons) and is further defined by its Configuration (shape and streamlining).

Drives. Every ship has a variety of drives providing power and the ability to move both between planets and between star systems.

Sensors. Each ship has a set of technological eyes and ears for exploring systems and detecting other ships.

Weapons. Ships may be armed for their own protection and to accomplish their missions.

Defenses. Ships may be equipped with a variety of defensive capabilities.

Armor. Even unarmed ships may be equipped with armor to protect them against attack, and against their environment.

Vehicles and Small Craft. It is inefficient for ships to travel to every possible destination within a system; they carry vehicles and small craft to carry crew on excursions and expeditions.

Computers. Ships cannot fulfill all their functions if crew were required to manage each set of controls constantly; each ship is equipped with a set of computers to handle the detail, tedium, and complexity of ship operation.

Software. The computers on a ship require software to actually perform the required functions.

Quarters. The crew and passengers on a ship require living and recreational accommodations.

Fittings. Miscellaneous details of ship operation must be handled with various fittings to allow landing and improve performance.

Describing A Ship

The goal of Naval Architecture is the creation of a starship which can be described by:

The Quick Ship Profile QSP. A short coded description of the mission and capabilities of the ship. The QSP may be elaborated upon by the Crew Extension (detailed the various crew members for the ship) and the Vehicle Extension (detailing the vehicles and small craft carried by the ship).

The ShipSheet. A form showing the components of the ship and which is used to record malfunctions or battle damage.

The FillForm. A form used to record the components as they are assigned to the ship.

DESIGNING A SHIP

The Design Charts 01 to 16 manage the Naval Architecture Process. Begin with Chart 01 (and its Checklist) and proceed through the process.

Ship Design Tech Levels. Ship design is based on common Tech Levels across most of interstellar society; the usual maximum is TL 15.

It is possible to encounter worlds with Tech Levels as high as 21; encountering such a world is an opportunity to acquire higher TL equipment.

01 THE CHECKLIST

The Starship Design Checklist provides an overview of the charts managing ship design.

Arv Dinsha is designing a Scout Ship. His decisions will illuminate the design process as it proceeds.

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02 THE FILLFORM

The Starship FillForm is the document which records the details of every component as it is chosen. The goal is a completed Fillform in which the total component tonnages fits into the hull and the costs do not exceed the ship budget (if any).

Ship Data. Information about the ship, including name, its home port, and its mission may be deferred until the design is complete.

Building Shipyard. Ships are built at Shipyards. The capabilities of the shipyard constrain the design decisions for ship construction.

The most important constraint is the shipyard Tech Level. Components for the ship are available at or less than the shipyard TL.

The FillForm Sections

The Fillform is divided into sections corresponding to each of the Design Charts. They may be completed in any order, but many of the sections depend on others, making the design process highly interactive.

Arv Dinsha will have his ship built at the General Shipyard at Regina A788899-C. The Tech Level of the ship will be C = 12.

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03 STARSHIP MISSIONS

Select the intended mission for the starship. This selection may be revisited based on the final results of the design.

Arv Dinsha has selected the mission for his ship as Type S Scout/Courier.

---

04 THE HULL

The foundation of the starship is the hull. Select a hull of appropriate tonnage and configuration. The challenge is to fit all of the desired components into the selected hull.

Configuration. Select a Configuration. Configuration determines many of the capabilities of the ship, including the ability to enter atmosphere.

Jump Readiness. Determine whether the ship's interstellar drive uses a jump bubble or a jump grid.

Configuration and Jump Readiness both play roles in the creation of the Hit Table later in this process.

The Bridge

Select the Bridge to install on the ship. The Bridge must be large enough to hold the command crew, sensors, and Ship's Computer.

Half of the Bridge tonnage must remain empty (for crew positions). The remaining half must be sufficient to hold a one-ton console for each installed sensor, and to hold the Ship's Computer.

Arv Dinsha selects a 100-ton hull. He wants to be able to enter atmospheres, but remain cost effective.

He selects Configuration-S Streamlined.

He selects Jump Readiness= Jump Bubble. This will require that he place Drives at Hit Location 0.

He selects the minimum available Half Bridge B1.

Hull-A Config-S = MCr3

Half Bridge B1 = MCr1, 10 tons.

---

05 DRIVES AND POWER PLANTS

Starship Hulls are just immobile shells unless they have proper drives.

Select an Interstellar (Jump) Drive.

Select an Interplanetary (Maneuver) Drive. In light of technology restrictions, a Gravitic Drive may be a better choice.

Select a Power Plant.

Drive Potential

Each Drive and Power Plant interacts with the Hull to process a Drive Potential Number which then dictates Drive Performance.

The Drive Potential for the Power Plant must equal or exceed the Drive Potential for the Jump Drive and for the Maneuver Drive.

Tech Level Restrictions. Drives availability is governed by Tech Level.

Arv Dinsha wants a high Jump capability. He reviews the Drive Potential Table and selects Jump-B; it has Drive Potential 4 (thus Jump-4) when installed in a Hull-A. The Power Plant needs to be at least Drive Potential-4 so he selects PPlant-B. Finally, he selects Maneuver-Drive-B.

But there's a potential problem. He consults Drive TL Two, which shows a PPlant-B in this hull is TL 11; an M-Drive is TL 9; and a J-Drive-B is TL 13.

He buys the Early Jump-B (one TL lower; QREBS 1 of 5; double cost). He could have selected J-Drive-A, but he wants the greater jump distance.

Jump Drive-B. MCr30. 15 tons.

Maneuver Drive-B. MCr6. 3 tons.

Power Plant-B. MCr

---

06 SENSORS

Select Sensors for the ship.

The number of available sensors is limited to the number of sensor consoles on the Bridge.

One option is to select a standard pre-designed Sensor Package.

Arv selects the Standard TL-12 Sensor Package. It requires three sensor consoles on the Bridge, but no additional tonnage.

A specific sensor can be designed.

Arv wants a Densitometer. His ship is TL 12. He selects Densitometer-10. The Stage Effects table shows he can upgrade it to Improved or Advanced, and the World Sensor Range Effects table shows he can increase its Range. He elects a bit of both: he increases Range from R=7 to R=8, and he selects the Improved Model. He keeps it as a Surface installation. His Densitometer is:

Imp Orbit Surf Densitomer-12

07 WEAPONS

Select the weapons for the ship. Since hulls have one weapons Hardpoint per 100 tons, this 100-ton hull has one Hardpoint and allows the installation of one weapon mount.

The options available for low tonnage hulls are few. Arv selects the Advanced Triple Turret Y hybrid mounting one each of L Beam Laser, S Sandcaster, and M Missile Launcher.

08 DEFENSES

Select defenses for the ship.

Although Arv will install Armor, he elects not to install any specific defenses (although the Sandcaster in his turret has some defensive capability).

09 ARMOR

Install Armor on the ship. Designate the first layer of Armor (which has no additional cost).

Armor can be installed in layers. Armor layers need not be all the same type.

Arv analyzes the available options at Tech Level. He selects the standard Charged-6 and installs two layers.

10 VEHICLES

Determine if the ship will carry any vehicles and how they will be transported.

Arv wants to carry a 4-ton Grav Flyer. For convenience and maximum flexibility, he installs 4 tons of cargo space to hold it.

11 COMPUTER

Determine the size and model of the Ship's Computer.

Arv analyzes the ship design to this point. Each Major Component has a Local Computer (= J-Drive, M-Drive, P-Plant), as does the weaponry (= Turret) and three Sensors (= Comm, Visor, Scanner). There are seven Local Model/2 computers distributed throughout the ship. For the Ship's Computer he selects another Model/2 and installs it in one of the two empty consoles on the Bridge.

It's a standard Imperial model with Architecture-4.

12 SOFTWARE

Select and install software for the ship.

Each Local and Ship's Computer requires a System process.

Each Local Computer requires an appropriate Component Process.

Finally, Service Processes must be selected and installed.

Arv installs Console XP in each Computer. It's cheap and fulfills his basic needs. The Local Computers come with the appropriate Component Processes; he leaves them as is.

He has seven Model/2 Local Computers, each with a System process and a Component process and two free cells. His Ship's Computer has three free cells, for a total 17 free cells.

He selects a variety of Service Processes: Life Support, Astrogation (he'll need that!), Medical, Entertainment, Maintenance, Damage Control, Accounting, Security, and Library Data, for a total of seven Service Processes. Since they won't all fit into the Ship's Computer, he distributes them one to each Local Computer.

Each of the Local Computers will be sluggish.

Processes in a Computer may provide it with the ability to resolve Tasks on its own.

13 QUARTERS

Determine the crew requirements for the ship and install quarters for them.

Arv's small ship requires a Pilot, and Astrogator, and an Engineer. He anticipates carrying more people at times, so he allocates tonnage for 8 people ((at 4 tons each = 32 tons). He allocates half the tonnage as staterooms and half as common areas.

14 FITTINGS

Allocate fittings for the ship.

Configuration-S provides Lifters and Landing legs automatically. Arv makes no changes.

Arv selects Flotation Hull.

Arv intends to venture beyond the borders of civilization; he selects Fuel Scoops and Fuel Purifier.

Arv notes the fuel tankage for the ship.

15 QUICK SHIP PROFILE

Create the Quick Ship Profile for basic identification of the ship's capabilities.

If the ship carries any vehicles, create a Vehicle Extension.

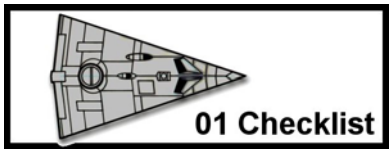
Create the Crew Extension to identify the required crew members.

16 THE SHIPSHEET

Create the ShipSheet for this ship. The ShipSheet records the location of the Major Components for use in combat or malfunction situations.

Starship Design Checklist

This Starship Design Checklist details starship design as a sequence of steps, each addressing a specific aspect of performance or operation.



ACS- ADVENTURE CLASS SHIPS

Starships are designed and produced in a variety of sizes.

The ACS Design System creates Adventure Class Ships-- starships and spacecraft with hulls from 100 tons to 2400 tons. Adventure Class Ships are reasonably capable of being used by adventurers.

The ACS Design System is a **drag-and-drop** system: specifically components are selected and installed in a hull and their interaction determines the performance of the ship.

ACS DESIGN

The Vilani method of Adventure Class Starship Design follows a detailed checklist step by step. Components are selected, their effect on tonnage and performance noted, and the final design evaluated for performance and cost.

The design process is interactive.

SHIPYARDS

Starships are constructed at shipyards, typically located at or near a starport.

Starport Type. Shipyards or construction facilities are present at type A or B starports.

Tech Level. The tech level of the craft being built is the tech level of the world on which it is built. It is possible to import components up to TL +2 at 150% of cost.

Surface or Orbital. Close Structures and Braced Structures may only be built in orbit.

All others may be built in orbit or on the world surface.

Other Design Systems

Two other spacecraft design systems are available.

Small Craft Design (a part of VehicleMaker) produces Small Craft: spacecraft generally smaller than 100 tons.

BCS Design creates Battle Class Ships-- starships and spacecraft with hulls greater than 2400 tons.

NAMING

Starships are named. Select an appropriate name for the ship. This step can be deferred until the end of the process.

Out Of. Ships are commonly registered with a starport authority somewhere. Out Of reflects the ships homeport.

STARSHIP DESIGN CHECKLIST

Use this checklist to control design of starships.

01. Checklist. This checklist.
02. Fillform. Create a blank Fillform for the ship.
03. Determine Mission

04. Select Hull.
- A. Configuration.
- B. Tonnage.
- C. Bridge.
- D. Jump Readiness.
- E. Note Hardpoints.

05. Drives.
- A. Drive1. Interstellar Drive
- B. Drive2. InSystem
- C. Drive3. Power Plant.
- D. Additional Drives.

05a. Drive Potential. Calculate Drive Performance.

06. Sensors.
- A. Sensors.
- B. Standard Sensor Packages.

07. Weaponry.
- A. Count Hardpoints and weapons mounts.
- B. Main Weapon.
- C. Additional Weapons and Installations.

08. Defenses.
- A. Assign Defense installations.

09. Armor.
- A. Determine Armor composition and values.
- B. Assign Armor overlays.

10. Vehicles and Small Craft.
- A. Small Craft
- B. Vehicles.
- C. Hangars and Docking Rings

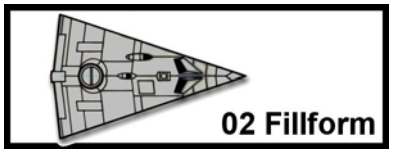
11. Computers.
- A. Determine Required and Add On Processes.
- B. Assign local Brains as needed.
- C. Assign Networks.

12. Quarters
- A. Life Support.
- B.

13. Fittings
14. QSP and Extensions
15. ShipSheet

Starship Fill Form

As the ship is designed insert the design values and details into this Fillform. Values may be inserted in any order as the design is considered: the ultimate requirement is that the values balance and properly reflect the charts and tables.



SHIP

Ship Name		Out Of		
03	**03.** Mission	QSP	Cx	Vx

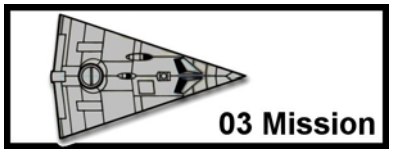
BUILDING SHIPYARD

Construction World	Date Built
Surface or Orbital?	Designer

Section	Component	Comment			Code	Crew	Proc	Tons	Sq		Cost	,000	,000
04 Hull	Hull	Config=											
	Bridge												
	Jump Readiness												
05 Drives	Drive1- Interstellar			J=									
	Drive2- InSystem			M=									
	Drive3- Power Plant			P=									
	Drive4-												
06 Sensors	Sensor1-												
	Sensor2-												
	Sensor3-												
	Sensor4-												
	Sensor5-												
	Sensor6-												
	Sensor7-												
	Sensor8-												
	Sensor9-												
07 Weapons	Main Weapon												
	Hardpoint2												
	Hardpoint3												
	Hardpoint4												
	Hardpoint5												
08 Defenses	Hardpoint6												
	Hardpoint7												
	Hardpoint8												
	Hardpoint9												
09 Armor	Base Armor												
	Layers												
	Overlay-1												
	Overlay-2												
10 Vehicles	SmallCraft1												
	SmallCraft2												
	Vehicle1												
	Vehicle2												
11 Computers	Main Computer												
	Brains												
12 Quarters	Astrogator=	Pilot=	Engineer=										
	Sensor Tech=	Gunner=	Steward=										
	Counsellor=	Troops=	Freightmaster=										
	Medic=												
	High=	Mid=	Low=										
13 Fittings	Fuel1-	Config=	Landing Gear=										
	Fuel2-	Wings=	Flotation=										
	Fuel3-	Fuel Scoops=	Purifiers=										
	Fuel4-												

Starship Missions

Starships are designed to accomplish missions. This standard list of missions covers most of the reasonable uses for which starships are created. Select a mission for the ship (or select a mission after the ship is designed).



ADVENTURE CLASS SHIP TYPES

Anglic Code	Vilani Code	Description
A	𒀸	Trader.
B	𒀹	Bulk Carrier.
C	𒀺	Cruiser (equal guns and armor)
D	𒀻	Defender.
E	𒀼	Escort.
F	𒀽	Freighter.
G	𒀾	Frigate (more guns than armor).
H	𒀿	
I	𒁀	
J	𒁁	Prospector
K	𒁂	Safari. Excursion. Expedition.
L	𒁃	Laboratory
M	𒁄	Liner
N	𒁅	Scientific / Medical
O	𒁆	
P	𒁇	Corsair. Pirate. Raider.
Q	𒁈	Small Craft (prefix)
R	𒁉	Merchant.
S	𒁊	Scout/Courier
T	𒁋	Military Transport
U	𒁌	
V	𒁍	Corvette (fast Frigate)
W	𒁎	Vehicle (prefix)
X	𒁏	Express. Messenger. Courier.
Y	𒁐	Yacht
Z	𒁑	Unclassified

Anglic Code	Alternate Anglic	Vilani Code	Description
A2	AA	𒀸𒁀	Far Trader
B2	BH	𒀹𒁀	Enhanced Bulk Carrier
C2	CH	𒀺𒁀	Enhanced Cruiser
D2	DH	𒀻𒁀	Uparmored Defender (Turtle)
E2	EE	𒀼𒁀	Enhanced Escort
F2	FH	𒀽𒁀	Specialized Freighter
G2	GH	𒀾𒁀	Upgunned Frigate
I2	II	𒁀𒁀	
J2	JH	𒁁𒁀	
K2	KH	𒁂𒁀	Long Range Expedition
L2	LH	𒁃𒁀	
M2	MM	𒁄𒁀	Subsidized Liner
N2	MH	𒁄𒁀	
O2	OO	𒁆𒁀	
P2	PH	𒁇𒁀	Enhanced Raider.
R2	RH	𒁉𒁀	Enhanced Merchant
S2	SH	𒁊𒁀	Enhanced Scout/Courier
T2	TH	𒁋𒁀	Enhanced Transport
U2	UU	𒁌𒁌	
V2	VV	𒁍𒁀	Enhanced Corvette
W2	WW	𒁎𒁀	
X2	XH	𒁏𒁀	Alternate Courier
Y2	YY	𒁐𒁀	Enhanced Yacht.
Z2	ZH	𒁑𒁀	Alternate Unclassified

MISSION CODES

ACS Adventure Class Ships Mission Codes apply to ships with hulls from 100 to 2400 tons, and to small craft 10 to 100 tons.

Single letter codes reflect basic ship missions: for example, a Type A Free Trader.

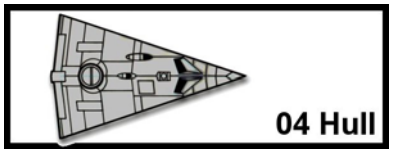
Two letter codes reflect (various) concepts such as Enhanced, Alternate, Upgunned, Uparmored, or Specialized versions of the mission. For example, a Type R2 or RH Enhanced Merchant.

Q0	𒁈𒁕	Pod. Gig. Lifepod.
Q1	𒁈𒁖	Fighter.
Q2	𒁈𒁗	Launch.
Q3	𒁈𒁘	Ship's Boat.
Q4	𒁈𒁙	Pinnace.
Q5	𒁈𒁚	Cutter.
Q6	𒁈𒁛	LR Fighter
Q7	𒁈𒁜	Picket.
Q8	𒁈𒁝	Tanker
Q9	𒁈𒁞	Shuttle.

QG	
QF	
QL	
QB	
QP	
QC	
QR	
QK	
QT	
QS	

Starship Hulls

The Hull is the basic container for the contents of a starship. The challenge is to fill all required (and desired) components within the hull tonnage limitation.



HULL SIZES

Hulls are built in standard 100 ton increments ranging from 100 to 2400 tons.

HULL COSTS----------	Configuration Costs MCr----------							Total	Total		
	Tons	C	B	U	S	A	L	Squares	Cubes	A	B
A	100	1	2	2	3	4	4	200	400	2	10
B	200	4	6	8	10	12	16	400	800	2	10
C	300	6	8	12	15	18	24	600	1200	2	20
D	400	8	11	16	20	24	32	800	1600	2	20
E	500	15	20	30	35	40	60	1000	2000	3	20
F	600	24	32	48	54	60	96	1200	2400	3	20
G	700	32	43	64	71	78	128	1400	2800	3	20
H	800	40	54	80	88	96	160	1600	3200	3	20
J	900	45	60	90	99	108	180	1800	3600	4	20
K	1000	50	67	100	110	120	200	2000	4000	4	30
L	1100	55	74	110	121	132	220	2200	4400	4	40
M	1200	60	80	120	132	144	240	2400	4800	4	40
N	1300	65	87	130	143	156	260	2600	5200	5	40
P	1400	70	93	140	154	168	280	2800	5600	5	40
Q	1500	75	100	150	165	180	300	3000	6000	5	40
R	1600	80	107	160	176	192	320	3200	6400	5	40
S	1700	85	114	170	187	204	340	3400	6800	6	40
T	1800	90	120	180	198	216	360	3600	7200	6	40
U	1900	95	127	190	209	228	380	3800	7600	6	40
V	2000	100	134	200	220	240	400	4000	8000	6	60
W	2100	105	140	210	231	252	420	4200	8400	7	60
X	2200	110	147	220	242	264	440	4400	8800	7	60
Y	2300	115	154	230	253	276	460	4600	9200	7	60
Z	2400	120	160	240	264	288	480	4800	9600	7	60

Hull I and O are omitted to avoid confusion with 1 and 0.

STARSHIP TONS

Hulls are measured in Tons: displacement tons equal to 13.5 cubic meters.

One ton allows two deck plan squares when creating deck plans (with a 3 meter deck separation).

Configuration Costs

Hull costs in the table are pre-calculated based on the Configuration Cost formulas below..

Configuration Costs (in MCr)

C= U / 2
B= U / 1.5
U= Base Cost
S= U + MCr1 per 100 tons
A= U + MCr2 per 100 tons
L= U x 2

Squares= Expected Deck Plan squares (1.5 meters square) for this hull size.

Cubes= Expected cubes (1.5 meters on a side) for this hull size.

A= armor tons per layer (after the first).

B= minimum Bridge tons.

Hardpoints. Hull automatically has one Hardpoint per 100 tons.

CONFIGURATION

	Type	Gs	Atm	Skim	Land	Comment
C	Cluster	1	No	No	No	An accumulation of compartments.
B	Braced	3	No	No	No	A Cluster braced for higher acceleration.
U	Unstreamlined	9	No	Yes	No*	An enclosure whose protrusions increase drag.
S	Streamlined	9	Yes	Yes	Yes	An enclosure with cowlings and farings to decrease drag.
A	Winged Streamlined	9	Yes	Yes	Yes	A winged enclosure with better performance in atmosphere.
L	Lifting Body	9	Yes	Yes	Yes	An enclosure with lifting surfaces for best performance.

Gs= Maximum acceleration possible. Atm= Can the ship enter Atmosphere 2+?
Skim= Can the ship skim Gas Giants for Fuel? Land= Can the ship land on a world surface (*= yes if Atm 0 or 1)?

JUMP READINESS

	Type	Available	Comment	Cost
X	Jump Bubble	Standard	Jump Field centered on Jump Drive.	No Cost
Y	Jump Grid	Option for Config-USAL	Jump Field conforms to the Hull.	Hull Tons x KCr

BRIDGE

	Type	Crew	Tons	Cost
B1	Half Bridge	3	10	MCr1
B2	Bridge	4	20	MCr1
B3	Expanded Bridge	6	30	MCr2
B4	Double Bridge	10	40	MCr3
B5	Triple Bridge	14	50	MCr4

The Bridge is the control center for the ship and contains the primary crew operating positions for a starship.

Bridge Contents. The Bridge contains the Ship's Computer and a 1-ton console per installed Sensor.

Half of Bridge Tonnage remains open for crew and free space.

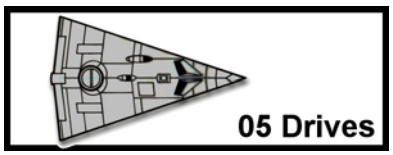
The minimum Bridge required is shown on the Hulls Table.

Auxiliary Bridge. More than one Bridge may be installed.

Starship Drives

The drives for a ship determine its ability to move and maneuver.

Select the Interstellar (J) drive, the Interplanetary (M, G) drive, and the Power Supply (P).



DRIVE TONNAGE

Drive Letter	Rating EP	J J-Drive	M M-Drive	P P-Plant	G G-Drive
A	100	10	2	4	9
B	200	15	3	7	18
C	300	20	5	10	27
D	400	25	7	13	36
E	500	30	9	16	45
F	600	35	11	19	54
G	700	40	13	22	63
H	800	45	15	25	72
J	900	50	17	28	81
K	1000	55	19	31	90
L	1100	60	21	34	99
M	1200	65	23	37	108
N	1300	70	25	40	117
P	1400	75	27	43	126
Q	1500	80	29	46	135
R	1600	85	31	49	144
S	1700	90	33	52	153
T	1800	95	35	55	162
U	1900	100	37	58	171
V	2000	105	39	61	180
W	2100	110	41	64	189
X	2200	115	43	67	198
Y	2300	120	45	70	207
Z	2400	125	47	73	216
N2	2600	140	50	80	234
P2	2800	150	54	86	252
Q2	3000	160	58	92	270
R2	3200	170	62	98	288
S2	3400	180	66	104	306
T2	3600	190	70	110	324
U2	3800	200	74	116	342
V2	4000	210	78	122	360
W2	4200	220	82	128	378
X2	4400	230	86	134	396
Y2	4600	240	90	140	414
Z2	4800	250	94	146	432

DRIVE COSTS

Drive	Cost per Ton
Jump Drive	MCr 1.0
Maneuver Drive	MCr 2.0
Power Plant	MCr 3.0
Gravitic Drive	MCr 0.5

Drive TL One Table. Lookup maximum output potential for a drive by Tech Level.

* Maneuver Drive is further restricted by Power Plant availability.

Drive TL Two Table. Lookup TL by Drive Potential.

DRIVE TL ONE

TL	J	M	P	G
8	-		1	4
9	1	4*	2	7
10	1	7*	3	9
11	2	9*	4	-
12	3	-	5	-
13	4	-	6	-
14	5	-	7	-
15	6	-	8	-
16	6	-	9	-
17	7	-	-	-
18	7	-	-	-
19	8	-	-	-
20	8	-	-	-
21	9	-	-	-

THE BASIC DRIVES

The basic available drives are:

Jump Drive. The interstellar drive. Jumps are measured in parsecs; one Jump (regardless of distance) requires one week.

A Jump Drive requires 10% of Hull Tonnage per Jump number (subject to PPlant Overclock). A Jump Drive can perform any length Jump up to its maximum Potential.

Maneuver Drive. Performance is measured in Gs (= 10 meters per second per second). Because it interacts with gravity sources, it must be within 1000 D of a gravity source (beyond 1000 D, it operates at 1% Performance).

Requires a supporting Power Plant.

Power Plant. A Fusion Power Generator with OverClock capabilities. A Power Plant requires 1 ton of fuel times Drive Potential times Hull Number per week to support normal operations.

Gravitic Drive. A near-world drive. Performance is measured in Gs. Because it interacts with gravity sources, it must be within 10 D of a gravity source.

G-Drive includes an integral Power Source.

DRIVE POTENTIAL

Each Drive has a Potential (an Output Rating) based on the interaction of Drive Tonnage and Hull Tonnage. Drive Potential is calculated from the Drive Potential Table and influences fuel usage and ship performance.

STAGE EFFECTS

	Stage	TL	QREBS	OC	Tons	Cost
Ex	Experimental*	- 3	Full	50	x3	x10
Pr	Prototype**	- 2	3 of 5	80	x2	x3
Er	Early	- 1	1 of 5	90		x2
	(Standard)	+0		100		
Im	Improved	+1	+1 of 5	110		
Ad	Advanced	+2	+3 of 5	120		

OC= Overclock (for Power Plants only; ignore Tons).

OVERCLOCK

Overclock is a measure of the efficiency of a Power Plant. A standard Power Plant operates with Overclock= 100 for Potential based on Tech Level. Power Plants at other TLs have different Overclock. Overclock affects Power Plant tons and Jump Fuel tons.

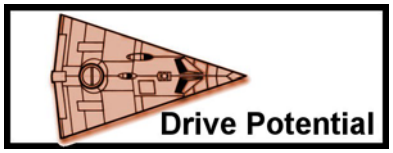
True Power Plant tons = P- Plant Tons / (OC/100)
True Jump Fuel tons= Fuel / (OC/100)

DRIVE TL TWO

	Potential=	1	2	3	4	5	6	7	8	9
M	M-Drive	9	9	9	9	10	10	10	11	11
G	G-Drive	8	8	8	8	9	9	9	10	10
P	P-Plant	8	9	10	11	12	13	14	15	16
J	J-Drive	9	11	12	13	14	15	17	19	21

Drive Potential

Drive Potential determines the performance of drives, and is dependent on an interaction between the drive and the hull.



DRIVE POTENTIAL-1 Determine Drive Potential (in table body) for a Drive (left column) installed in a Hull (top row).

Drive= Hull=	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
A	2	1	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	A
B	4	2	1	1	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	B
C	6	3	2	1	1	1	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	C
D	8	4	2	2	1	1	1	1	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	D
E	9	5	3	2	2	1	1	1	1	1	no	no	no	no	no	no	no	no	no	no	no	no	no	no	E
F	9	6	4	3	2	2	1	1	1	1	1	1	no	no	no	no	no	no	no	no	no	no	no	no	F
G	9	7	4	3	2	2	2	1	1	1	1	1	1	1	no	no	no	no	no	no	no	no	no	no	G
H	9	8	5	4	3	2	2	2	1	1	1	1	1	1	1	1	1	no	no	no	no	no	no	no	H
J	9	9	6	4	3	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	no	no	no	no	J
K	9	9	6	5	4	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	no	K
L	9	9	7	5	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	L
M	9	9	8	6	4	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	M
N	9	9	8	6	5	4	3	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	N
P	9	9	9	7	5	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	P
Q	9	9	9	7	6	5	4	3	3	3	2	2	2	2	2	2	2	1	1	1	1	1	1	1	Q
R	9	9	9	8	6	5	4	4	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	R
S	9	9	9	8	6	5	4	4	4	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	S
T	9	9	9	9	7	6	5	4	4	3	3	3	3	2	2	2	2	2	2	1	1	1	1	1	T
U	9	9	9	9	7	6	5	4	4	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	U
V	9	9	9	9	8	7	6	5	4	4	3	3	3	3	3	2	2	2	2	2	1	1	1	1	V
W	9	9	9	9	8	7	6	5	5	4	4	3	3	3	3	3	2	2	2	2	2	1	1	1	W
X	9	9	9	9	8	8	7	6	5	5	4	4	3	3	3	3	3	2	2	2	2	2	1	1	X
Y	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	2	2	2	2	2	2	1	Y
Z	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	2	2	2	2	2	2	Z
N2	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	3	2	2	2	2	N2
P2	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	3	2	2	2	P2
Q2	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	3	2	2	Q2
R2	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	3	2	R2
S2	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	3	S2
T2	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	3	T2
U2	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	3	U2
V2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	3	V2
W2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	3	W2
X2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	4	X2
Y2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	4	Y2
Z2	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	6	5	5	Z2

no= not possible. Grey 9= Drive is possible with but smaller ones are more efficient.

For example, Jump Drive-A in Hull-A produces a Jump Drive Potential= 2. The Jump Drive can achieve Jump-2. Maneuver Drive-H in Hull-E produces Maneuver Drive Potential = 3. The Maneuver Drive can achieve 3 G acceleration.

DRIVE POTENTIAL-2 Determine the Drive (in table body) for a specific Potential (left column) for a Hull (top row).

Potential= Hull=	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	Pot
1	A	A	B	B	C	C	D	D	E	E	F	F	G	G	H	H	H	J	J	J	K	K	K	L	1
2	A	B	C	D	E	F	G	H	J	K	L	M	N	P	P	Q	Q	S	T	V	W	X	Y	Z	2
3	B	C	E	F	H	J	J	M	N	Q	R	S	T	U	V	W	X	Z	N2	N2	P2	R2	R2	S2	3
4	B	D	F	H	K	M	P	R	S	V	W	X	Y	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	4
5	C	E	H	K	N	Q	T	V	W	X	Y	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	Y2	Z2	5
6	C	F	J	M	Q	T	V	X	Z	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	Y2	Z2	no	no	6
7	D	G	L	P	T	V	X	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	Y2	Z2	no	no	no	no	7
8	D	H	M	R	V	X	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	Y2	Z2	no	no	no	no	no	8
9	E	J	P	T	Y	Z	N2	P2	Q2	R2	S2	T2	U2	V2	W2	X2	Y2	Z2	no	no	no	no	no	no	9

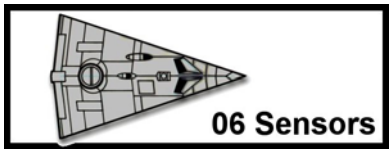
no= not possible.

For example, achieving Jump-6 in a 1000-ton Hull-K requires Jump-Drive-Z. The maximum Potential available for a Hull-R is achieved with a Z2 Drive in row 8 = Potential 8.

Regardless of the Potential on these tables, the actual output of a drive is restricted by its construction Tech Level.

Sensors

Sensors are the eyes and ears of the ship, or of explorers. They gather information and present it to users in an understandable form. Create sensors as needed from this page.



SENSOR DESCRIPTION

Model	LongName = Stage Range Mount Type -TL (C+S)

The basic information required to describe and use a sensor.

IDENTIFYING SPACE SENSORS

R= or S=
Stage Range Mount Type -TL (C+S)

Early DS Ant Radar -9 (10)

THE SENSOR TASK

TL Char Skill Mod

nD < T +C +S +M

n = Range
Uncertain (1D)

Use: C4 C5
Use: Sensor
Passive Benchmark Mount

SPACE SENSORS

	Type	TL	Mount	S=	R=	MCr
A	Activity Sensor	11	Surf		7	0.1
B	Deep Radar	9	Surf		7	0.1
C	Communicator	8	Surf	7		1.0
D	Densitometer	10	Surf		7	0.1
E	EMS	12	Ant	7		1.0
F	Field Sensor	12	Surf		7	0.1
G	Grav Sensor	13	Surf	7		1.0
H	HoloVisor	18	Surf	7		1.0
J	Jammer	8	Surf	7		1.0
K	Analyzer / Sniffer	9	Surf		7	0.1
L	Life Detector	10	Surf		7	0.1
M	Mass Sensor	8	Surf		7	0.1
N	Neutrino Detector	10	Surf	7		1.1
P	Proximeter	10	Surf		7	0.1
Q	Stealth Mask	12	Surf	7		1.0
R	Radar	9	Ant	7		1.0
S	Scanner	19	Ant	7		1.0
T	Scope	9	Surf	7		1.0
V	Visor	14	Surf	7		1.0
U						
W	CommPlus	17	Surf	7		1.0
X						
Y	Sound Sensor	10	Surf		7	0.1
Z						

SENSOR MOUNTS

	Mount Type	Tons	Mod	Skill	MCr
T1	Turret	1	0	Sensor	0.2
B1	Barbette	3	+1	Sensor	3.0
De	Deployable	+2		Sensor	3.0
Bay	Bay	50	+5	Sensor	5.0
LBay	Large Bay	100	+8	Sensor	10.0
M	Main	200	+10	Sensor	20.0
Surf	Surface	0	0	Sensor	0.0
(blank)	Surface	0	0	Sensor	0.0
Ant	Antenna	1	+1	Sensor	0.5
Ext	Extendable	2	+3	Sensor	1.0

Sensors may be installed in weapon **Hardpoints** or in Sensor Mounts. Surface, Antenna, or Extendable.

Deployable. In addition to Turret or Barbette costs.

C+S CHARACTERISTIC PLUS SKILL

Characteristic Use C4 or C5.
Skill Use Skill= Sensors.

STAGE EFFECTS **(applies to Sensor)**

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	+3	x10
Pr	Prototype**	- 2	3 of 5	-3	+2	x3
Er	Early	- 1	1 of 5			x2
	(Standard)	+0				
Im	Improved	+1	+1 of 5			/ 2
Ad	Advanced	+2	+3 of 5	+1		/ 2

Tons in addition to 1-ton Bridge Console; may be anywhere.

SPACE SENSOR RANGE EFFECTS **(applies to Mount)**

S=		Range	TL	R=	Tons	Cost
2	**FR**	Fighter Range	- 2	7	/3	/2
5	**SR**	Short Range	- 1	10	/2	/2
7	**AR**	Attack Range	0	12		
9	**LR**	Long Range	+1	14	+1	x3
12	**DS**	Deep Space	+2	17	+2	x5

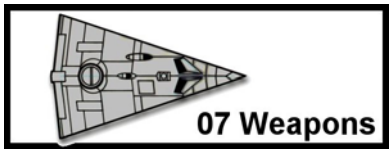
WORLD SENSOR RANGE EFFECTS **(applies to Mount)**

R=		Range	TL	S=	Tons	Cost
5	**L**	Long 1000 m	- 2	B	/3	/2
6	**D**	Distant 5 km	- 1	1	/2	/2
7	**Vd**	Vdistant 50 km	0	2		
8	**Or**	Orbit 500 km	+1	3	x2	x3
9	**Fo**	Far Orbit 5000 km	+2	4	x3	x5
10	**G**	Geo 50,000 km	+3	5	x4	x8

Each Sensor requires a 1-ton Console on the Bridge (which also holds its Local Computer) which is not part of the Sensor tonnage. Stage and Range Effects do not apply to Mounts.

Space Weapons

Space weapons are the offensive tools of starships and spacecraft. They are produced in a variety of types and tech levels. Create weapons as needed from this page.



SPACE WEAPON DESCRIPTION

Model	LongName = Stage Range Mount Type-TL (C+S)

The basic information required to describe and use a space weapon.

IDENTIFYING SPACE WEAPONS

R= or S=

Stage Range Mount Type -TL (C+S)

Adv LR T1 Msl -11 (10)

SPACE WEAPON TYPES

	Space Weapon	TL	Minimum	R=	S=	MCr
A	Particle Accelerator	11	Barbette	7*	7*	2.5
B	Slug Thrower	9	Turret	7		
C	CommCaster	8	Turret		7	
D	DataCaster	10	Turret	7		
E	Stasis	19	Turret	7		
F	Fusion Gun	12	Barbette	7		1.5
G	Meson Gun	13	Main		7	5.0
H	Inducer	18	Turret	7		
I	--- not used ---					
J	Mining Laser	8	Turret	7		0.5
K	Pulse Laser	9	Turret	7		1.0
L	Beam Laser	10	Turret	7		0.5
M	Missile	8	Turret		7	0.2
N	KK Missile	10	Bay		7	3.0
O	--- not used ---					
P	Plasma Gun	10	Barbette	7		1.0
Q	Ortillery	12	Bay	7		
R	Rail Gun	12	Bay		5	
S	SandCaster	9	Turret	7		0.1
T	Jump Damper	14	Barbette	7		
U	Tractor/Pressor	15	Barbette	7		
V	Salvo Rack	10	Bay		7	
W	Disruptor	17	Barbette	7		
X	Hybrid K-S-M	9	Triple Turret*	7		1.5
Y	Hybrid L-S-M	10	Triple Turret*	7		1.0
Z						

Minimum= minimum required mount for this weapon.
* Particle Accelerator uses S= in Space Attacks.
* Only available in this Mount.

C+S CHARACTERISTIC PLUS SKILL

Char	Use C4 or C5.
Skill	Use Skill= Gunner plus Knowledge= Turrets, Bays, Ortillery, or Spines (includes Main). Nuclear Missiles requires Heavy Weapons + WMD in place of any other Skills/Knowledges.

SPACE WEAPON MOUNTS

	Mount Type	Tons	Mod	Hits	Skill	MCr
T1	Single Turret	1	- 3	1	Turret	0.2
T2	Dual Turret	1	- 2	2	Turret	0.5
T3	Triple Turret	1	- 1	3	Turret	1.0
T4	Quad Turret	1		4	Turret	1.5
B1	Barbette	3	0	3	Turret	3.0
B2	Dual Barbette	3	+2	5	Turret	4.0
De	Deployable	+2			Turret	3.0
Bay	Bay	50	+5	10	Bay*	5.0
LBay	Large Bay	100	+8	20	Bay*	10.0
M	Main	200	+10	30	Spine	20.0
S	Spine	Not available for ACS ships.				

*Ortillery and Rail Gun governed by Skill= Ortillery.
Hardpoints. One mount per 100 tons of ship.
Deployable. In addition to Turret or Barbette costs.

STAGE EFFECTS **(applies to Weapon)**

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	+3	+10
Pr	Prototype**	- 2	3 of 5	-3	+2	+3
Er	Early	- 1	1 of 5			+2
	(Standard)	+0				
Im	Improved	+1	+1 of 5			
Ad	Advanced	+2	+3 of 5	+1		

Install added tons adjacent to the Mount.

WEAPON RANGE EFFECTS S= **(applies to Mount)**

S=		Range	TL	Tons	Cost
2	**FR**	Fighter Range	- 2	/3	/2
5	**SR**	Short Range	- 1	/2	/2
7	**AR**	Attack Range	0		(standard)
9	**LR**	Long Range	+1	x2	x3
12	**DS**	Deep Space	+2	x3	x5

Applies to Bays, Large Bays, and Mains

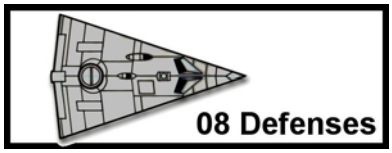
WEAPON RANGE EFFECTS R= **(applies to Mount)**

R=		Range	TL	Tons	Cost
5	**Vl**	Vlong 1000 m	- 2	/3	/2
6	**D**	Distant 5 km	- 1	/2	/2
7	**Vd**	Vdistant 50 km	+0		(standard)
8	**Or**	Orbit 500 km	+1	x2	x3
9	**Fo**	Far Orbit 5000 km	+2	x3	x5
10	**G**	Geo 50,000 km	+3	x4	x8

Applies to Turrets and Barbettes

Space Defenses

Space defenses are creates to reduce or stop the effects of space weapons. Like space weapons, they are produced in a variety of types and tech levels. Create defenses as needed from this page.



SPACE DEFENSE DESCRIPTION

Model	LongName = Stage- Defense -TL (C+S)

The basic information required to describe and use a space defense.

IDENTIFYING SPACE DEFENSES

Stage	Defense	-TL	(C+S)
Imp	**Nuclear Damper**	**-11**	**(10)**

SPACE DEFENSES

	Space Defenses	TL	Absolute Mode vs	MCr
G	Meson Screen	11	G	1.0
N	Nuclear Damper*	12	Nukes	1.0
Q	Mag Scrambler	14	E Magnetics	1.0
R	Proton Screen	19	AM	1.0
T	Black Globe	16	-all-	4.0
U	White Globe	20	-all (except D)	10.0
W	Grav Scrambler	17	H T Gravitics	2.0
Z				

* Nuclear Damper requires TWO separate Mounts.
** Vs Weapon (but not its fire).

SPACE DEFENSE MOUNTS

	Mount Type	Tons	Mod	Skill	MCr
In	Internal	1	+1	Screens	0.5
Bo	Bolt-In	2	-1	Screens	0.5
	Console	1		Screens	0.0

Each Absolute Mode Defense requires an Internal or Bolt-In Mount (anywhere in the ship) and a Console (on the Bridge).

SPACE WEAPONS DEFENSE MODE

		Space Defenses	TL	Mode	Skill
>	**B**	Slug Launcher	9	AM	Use: Weapon Mount skill, or may use Screens
>	**D**	DataCaster	10	AM	
>	**F**	Fusion Gun	12	AM	
>	**J**	Mining Laser	8	AM	
>	**K**	Pulse Laser	9	AM	
>	**L**	Beam Laser	10	AM	
>	**M**	Missile	8	AM	
>	**P**	Plasma Gun	10	AM	
>	**S**	SandCaster	9	AB	
>	**V**	Salvo Rack	10	AM	
>	**X**	Hybrid K-S-M	9	AB AM	
>	**Y**	Hybrid L-S-M	10	AB AM	

Weapons are installed under Weapons but may be used in Defense Modes.

STAGE EFFECTS

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	x3	+10
Pr	Prototype**	- 2	3 of 5	-3	x2	+3
Er	Early	- 1	1 of 5			+2
St	(Standard)	+0				
Im	Improved	+1	+1 of 5			
Ad	Advanced	+2	+3 of 5	+1		

Tons applies to Mount for non-Weapons.

GLOBES

A Globe absorbs cumulative Damage not to exceed:

Hull Tons x Jump Drive Potential

Overload. If Damage exceeds this value, the Black Globe Generator is destroyed and the Jump Drive is Destroyed.

Ejecting Accumulated Energy. A ship may eject accumulated energy by Jumping, or venting Energy = Hull Tons per Turn.

DEFENSE ABSOLUTE MODE

Attacker		Defender
T+C+S+M	**<**	**T+C+S+M**
G	<	G
Nuke.M-5N	<	N
E	<	Q
AM	<	RQ
-all-	<	T
all (but D)	<	U
HT G*M*	<	W

Attack fails if Attacker T+C+S+M is less than Defender T+C+S+M.

* G-Drive or M-Drive.

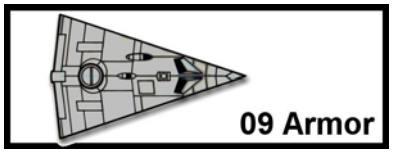
DEFENSE AB AM MODES

Attacker		Defender
1D	<	Mount
	<	1 = T1
	<	2 = T2 B1
	<	3 = T3
	<	4 = T4 B2
	<	5 = Bay
	<	6 = LBay
	<	7 = Main
AFJKLPW	<	S
MNQRV	<	BFGJKL

Defender is a Weapon Mount. Defender rolls equal or less on 1D to stop the attack.

Starship Armor

Starship hulls are constructed from the materials commonly available at the building Tech Level. Armor is installed in layers based on the information presented on this page.



ARMOR PROTECTS

Armor is applied to ships in layers. Any number of layers, may be allocated. Layer1 is automatic and its cost is included in the cost of the hull.

Additional layers of the same or different armor/material can be added at a cost in tonnage and KCr.

Hulls A-B-C-D-E-F-G-H-J add layers at a cost of 1 ton per 100 tons per additional layer.

Hulls K-L-M-N-P-Q-R-S-T add layers at a cost of 2 tons per 100 tons per additional layer.

Hulls U-V-W-X-Y-Z add layers at a cost of 3 tons per 100 tons per additional layer.

STANDARD STARSHIP ARMOR VALUE

Standard AV = TL minus 6

Armor cost is based on Tech Level, Tonnage, and Stage.

KCr = TL x Hull Tons/100 x Stage

Space AV x 10 equals each Personal AV:

Ar= Ca= Ra= So= In= Se=

(FlashProof= TL minus 6)

STAGE EFFECTS

	Stage	TL	QREBS	AV=	Layers	Cost
Ex	Experimental	- 3	Full	-3	3	X 10
Pr	Prototype	- 2	3 of 5	-4	2	x 3
Er	Early	- 1	1 of 5	-5	1	x 2
	(Standard)	+0		-6	1	x 1
Im	Improved	+1	+1 of 5	-5	1	/ 2
Ad	Advanced	+2	+3 of 5	-4	1	/ 2

AV= TL minus this value.

ARMOR TYPES

TL	Type	Characteristics
7	Armor-1	Basic Armor.
8	Ceram-2	
9	Organic-3	Self-Healing. Layer tonnage x2.
10	Dense-4	Layer tonnage /2.
11	Polymer-5	Self-Healing.
12	Charged-6	
13	SDense-7	Layer Tonnage /3
14	Kinetic-8	
15	LiteMetal-9	
16	VliteMetal-10	
17	Hullmetal-11	
18	Geneered-12	Self-Healing.
19	Hydrogen-13	
20	Strange-14	
7	Composite-1	Doubled against Pen.
10	Crystaliron-4	

Base Standard Armor types.

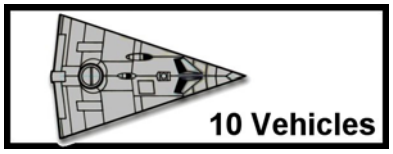
AVAILABLE ARMOR TYPES

TL	Experimental	Prototype	Early	Standard	Improved	Advanced	TL
4	Armor-1 (/3)						**4**
5	Ceram-1 (/3)	Armor-1 (/2)					**5**
6	Organic-1 (/3)	Ceram-1 (/2)	Armor-1				**6**
7	Dense-1 (/3)	Organic-2 (/2)	Ceram-2	Armor-1			**7**
8	Polymer-2 (/3)	Dense-2 (/2)	Organic-3	Ceram-2	Armor-3		**8**
9	Charged-2 (/3)	Polymer-3 (/2)	Dense-4	Organic-3	Ceram-4	Armor-5	**9**
10	SDense-2 (/3)	Charged-3 (/2)	Polymer-5	Dense-4	Organic-5	Ceram-6	**10**
11	Kinetic-3 (/3)	SDense-4 (/2)	Charged-6	Polymer-5	Dense-6	Organic-7	**11**
12	LiteMetal-3 (/3)	Kinetic-4 (/2)	SDense-7	Charged-6	Polymer-7	Dense-8	**12**
13	VliteMetal-3 (/3)	LiteMetal-5 (/2)	Kinetic-8	SDense-7	Charged-8	Polymer-9	**13**
14	Hullmetal-3 (/3)	VliteMetal-5 (/2)	LiteMetal-9	Kinetic-8	SDense-9	Charged-10	**14**
15	Geneered-4 (/3)	Hullmetal-6 (/2)	VliteMetal-10	LiteMetal-9	Kinetic-10	SDense-11	**15**
16	Hydrogen-4 (/3)	Geneered-6 (/2)	Hullmetal-11	VliteMetal-10	LiteMetal-11	Kinetic-12	**16**
17	Strange-5 (/3)	Hydrogen-7 (/2)	Geneered-12	Hullmetal-11	VliteMetal-12	LiteMetal-13	**17**
18		Strange-7 (/2)	Hydrogen-13	Geneered-12	Hullmetal-13	VliteMetal-14	**18**
19			Strange-14	Hydrogen-13	Geneered-14	Hullmetal-15	**19**
20				Strange-14	Hydrogen-15	Geneered-16	**20**
21					Strange-16	Hydrogen-17	**21**

(/2) =2 layers required (value shown = two layers). If Layer1 is penetrated, Layer2 is automatically penetrated.
(/3) =3 layers required (value shown = three layers). If Layer1 is penetrated, Layer2 and Layer3 are automatically penetrated.

Vehicles and Small Craft

Starships carry vehicles or small craft (or both) for local travel on or near world surfaces.



VEHICLES

Starships may carry vehicles for local travel where using the ship itself is impractical or too risky.

Any vehicle created using VehicleMaker may be assigned to a starship.

As Cargo

The vehicle is carried in the cargo hold of the ship. There are no special fittings or brackets.

Hull Niche

A compartment in the hull opens directly to the outside; the vehicle fits neatly in place and is covered by retractable doors.

Usually placed on the underside of the hull (for ground or watercraft). Placed on upper surface for flyers.

ATTACHED OBJECTS

A ship can attach objects (vehicles, small craft, other ships, cargo pods, fuel tanks) to its exterior provided the ship is equipped with a Jump Bubble.

Jump Potential Is Recalculated. The performance of the ship is recalculated based on the total tonnage including the attached object(s) rounded to the next larger hull size.

Drop Tanks. Fuel Tanks which are discarded after feeding their fuel to the drives, but before jump, are a risky system for increasing overall performance.

Drop Modules. Modular independent detachable ship components (usually for Cargo or Passenger Modules; less frequently Manufacturing or Research Modules) can be carried by a ship.

Drop Modules are ship hulls without drives. The performance of the ship can be recalculated when the Drop Module(s) are detached.

Requires Jump Bubble. Drop objects require Jump Bubble.

SMALL CRAFT

Starships may carry small craft or smaller ships.

Any small craft created using VehicleMaker may be assigned to a ship. A smaller ship designed using ACS may be assigned to a ship.

Hangars

A Hangar is an internal open space within a ship in which small craft and vehicles are stored.

Minimal. A Minimal Hangar can contain a specific small craft or vehicle. Minimal hangars are snug fitting.

Spacious. A Spacious Hangar can contain any reasonably configured small craft of the designated tonnage.

Attached

A Bracket is a mechanical fitting which securely holds a vehicle or small craft on the outside of a hull.

Standard Bracket. Holds a small craft securely, but without creating a streamlined configuration.

Streamlined Bracket. Holds a small craft securely in a depression within the hull. The hull configuration is unaltered (streamlined remains streamlined; lifting body remains lifting body).

Docking Ring. Holds the inserted nose of a small craft securely; the craft trails behind the docking ring.

For any Configuration, but atmospheric flight is not possible which a craft is docked.

A Docking Ring is a fitting into which the nose of a small craft can be inserted. The ring holds the small craft tightly, and the body of the craft trails.

Enclosed (For Ships)

The ship is carried inside a ship. Internal braces hold the ship firmly while in flight.

Grappled (For Ships)

The ship carries the ship (or ships) attached to the hull with heavy duty grapples.

CARRYING VEHICLES, SMALL CRAFT, AND SHIPS

	Type	Tonnage	Config	Cost	HLT	Requires
Vehicle	As Cargo	cargo hold		no	HL= Cargo	
	Hull Niche	Vehicle + 1	USAL	MCr 1	any Open Location	
Small Craft	Minimal Hangar	Small Craft +1		MCr 0.1	HL= Cargo	Folding Wings*
	Spacious Hangar	Small Craft x 2		MCr 0.1	HL= Cargo	Folding Wings*
	Standard Bracket	1 ton	CBU	MCr 1	any Open Location	
	Streamlined Bracket	1 ton	SAL	MCr 0.1	any Open Location	
	1.5 m Docking Ring	Small Craft minus 1 ton		MCr 0.1	any Open Location	Jump Bubble
	3.0 m Docking Ring	Small Craft minus 1 ton		MCr 0.1	any Open Location	Jump Bubble
	4.5 m Docking Ring	Small Craft minus 7 tons		MCr 0.5	any Open Location	Jump Bubble
Ship	Enclosed	Ship x 1.5		no	HL= Cargo	
	Grapple	1 ton per 100 tons carried		MCr 1	any Open Location	Jump Bubble
Drop Objects	Grapple	1 ton per 100 tons carried		MCr 1	any Open Location	Jump Bubble

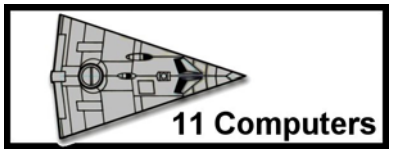
If a winged Small Craft (Config=A or Config=S with W) requires Folding Wings.

Exceeding original hull tonnage. If the addition of vehicles, small craft, ships, drop objects, or modules exceeds the original hull tonnage, recalculate hull tonnage (round up to the next higher 100-ton increment).

HLT= Hit Location Table. Object is carried in a designated Hit Location.

Computers

Computers fill a variety of roles in the control of equipment, vehicles, and the processes of industry and bureaucracy. Computers operate in a number of ways to complement, supplement, supplant, or replace active intelligent control or supervision.



THE SHIP'S COMPUTERS

Select a master Ship's Computer.
Install it on the Bridge.
Note the Local Computers for each of the Major Components.
Create the Local Network.

COMPUTER CONCEPTS

Cells hold Processes. The ship's computer network needs enough cells to hold all of its software processes.

Free Cells enhance efficiency. Empty cells help a computer process more rapidly.

THE SHIP'S COMPUTER

Every ship has a master Ship's Computer located on the Bridge. It networks with the many Local Computers throughout the ship.

Local Computers. Every major component has its own Local Computer managing its activities and operation.

The Standard **Local Computer** is a Model/2 loaded with a Console System Process and the appropriate Component Process.

Major Components

Each item in these categories is a Major Components and has a Local Computer.

Drives
Power Plants
Sensors
Weapons
Defenses

Computers are identified by Model, and distinguished by TL, Cells, and Cost.

Cells. Computer capacity is measured in Cells. One cell can contain one Process. A system operates most efficiently if free Cells equal installed Processes.

Computer Tonnage. Computers are not all that big: one Cell is a Lan, or about 100 Cells per ton. Model/5 and lower is dwarfed by its control console (which is about one Deck Square).

Brain Tonnage. Brains are installed in an existing Cell, so while the Brain itself is about 1 or 2 liters, it is part of a larger Cell.

COMPUTERS

M	Stage	Model	TL	=	Cells	KCr	Tonnage
0		Model/0	5	2^0	1	100	
1		Model/1	6	2^1	2	200	Console
1b		Model/1 bis	7	2^1+1	3	300	Console
2		Model/2	7	2^2	4	400	Console
2b		Model/2 bis	8	2^2+1	5	500	Console
3		Model/3	9	2^3	8	800	Console
3b		Model/3 bis	10	2^3+1	9	900	Console
4		Model/4	10	2^4	16	1600	Console
5		Model/5	11	2^5	32	3200	Console
6		Model/6	12	2^6	64	6400	1 ton
7		Model/7	13	2^7	128	12800	2 tons
8		Model/8	14	2^8	256	25600	3 tons
9		Model/9	15	2^9	512	51200	5 tons
Ex	Experimental (= Full QREBS)		-3			x 10	x 3
Pr	Prototype (= 3 of 5)		-2			x 3	x 2
Ea	Early (= 1 of 5)		-1			x 2	
Im	Improved (= +1 of 5)		+1			/ 2	
Adv	Advanced (= +3 of 5)		+2			/ 2	
	Fiber Optic	fib	+1			x 1.5	x 2
	Photonic	phot	+3			/ 2	
	Fluidic	flu	+4			x 2	x 2
	Neural Network	neu	+5			x 2	

M. The model number or variant suffix for the computer.
Stage. The technological development stage for the computer.
Model. The standard model name for the computer (bis = second or enhanced).
TL. The tech level of the computer.
=. Shows the formula for computing the number of cells based on Model.
Cells. The number of internal computer operating cells. Each cell holds a process.
KCr. Computer cost.
Tonnage. The ship tonnage requires for the computer.

NETWORK UPGRADES

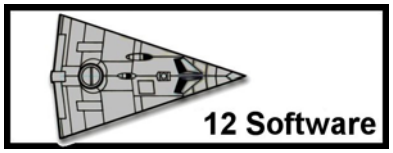
Upgrade	Status
Hardwire Connections	Standard
Specific Links Cut	Upgrade
Wireless Connections	Upgrade

Network Upgrades are available at no cost, but must be specified.

Default Network. All Local Computers and the Master Computer are default hardwire networked with each other. Upgrade the Network as desired.

Software

The heart of the computer is its software. Each major component and many housekeeping functions are managed by computers controlled by Processes dedicated software packages that relieve people of the burden of day-to-day activities.



COMPUTER PROCESSES

The software that drives a computer is the Process. Each Process addresses a specific function and manages it within the computer.

There are three types of Processes:

System. The Operating System for a Computer. Every Computer requires an Operating System Process.

Component. The governing Process for a Component.

Service. A Process providing support or information.

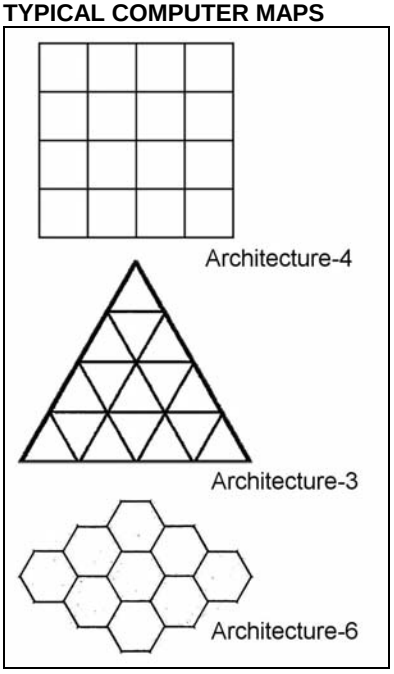
Redundant

Three identical Processes allow a Computer to automatically ignore a computing failure by one of the three.

Brain Tonnage. A Brain is installed in an existing Cell, so while the Brain itself is about 1 or 2 liters, it is part of a larger Cell.

Free Cells. A system operates most efficiently if it has free Cells equal to installed Processes. If the Computer has fewer than one empty cell per operating Process, output is delayed one Round.

TYPICAL COMPUTER MAPS



SYSTEM PROCESSES

M	Type	Process	TL	KCr	C	S
3.1	Console	Process	7	50		
XP	Console XP	Process	8	50		
	Conversational	Process	9	100		
XS	Expert System	Process	10	200		
SA	Self Aware	Process	14	300		
S0	Semi-Organic	Brain-0	10	100	1	1
S1	Semi-Organic	Brain-1	11	400	1D	1D
S2	Semi-Organic	Brain-2	12	800	2D	2D
S3	Semi-Organic	Brain-3	14	1200	3D	3D
P0	Positronic	Brain-0	11	400	1	1D
P1	Positronic	Brain-1	12	900	1D	1D
P2	Positronic	Brain-2	13	1500	2D	2D
P3	Positronic	Brain-3	15	2000	2D	3D
AI-16	Artificial Intelligence	Process	16	2000	1D	1D
AI-18	Artificial Intelligence	Process	18	3000	2D	2D
AI-20	Artificial Intelligence	Process	20	4000	2D	3D
AI-22	Artificial Intelligence	Process	22	5000	3D	3D

Each computer (Local or Master) requires a System Process. It must be installed in the computer is controls. It occupies one Cell.

COMPONENT AND SERVICE PROCESSES

Process	Type	TL	Cells	KCr	C	S
Drive	Component	=Jump	1	=TL		
Power Plant	Component	=PPlant	1	=TL		
Sensor	Component	=Sensor	1	=TL		
Weapon	Component	=Weapon	1	=TL		
Defense	Component	=Defense	1	=TL		
Guidance	Component		1	10		
Life Support	Service		1	10		
Data Base	Service		1	10		
Accounting	Service		1	10		
Astrogation	Service		1	10		
Medical	Service		1	10	2D	1D
Entertainment	Service		1	10		
Library Data	Service		1	10		
Security	Service		1	10		
Maintenance	Service		1	10		
Damage Control	Service		1	10	1D	1D

Component Processes must be installed in the Computer which controls the Component. The System Process is the controlling software for the computer.

Distributed Processing. Service Processes may be installed in any available Cell in any computer.

COMPUTER MAPS

The interior of a computer can be mapped. It shows the Computer's Cells on a grid based on the computer Architecture.

Architecture-N. Architecture is the number of connections between cells. Architecture-4 connects a cell to 4 adjacent cells; Architecture-9 indicates connections to 9 adjacent cells.

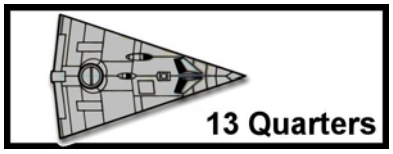
Architecture-3 is triangles; Architecture-4 is squares; Architecture-6 is hexagons.

Many possible architectures exist: for example, Architecture-9 wrapped to a cylinder; Architecture-5 mapped to a sphere.

Standard Imperial Computer Architecture is a compact bounded flat plane with a square grid (Architecture-4).

Quarters

Once the essential components of a ship have been specified, the crew can be determined and suitable accommodations for crew and passengers installed.



DETERMINING THE CREW FOR A SHIP

At the simplest possible level, there is no firm requirement for crewmembers for a ship: the ship simply requires individuals who can accomplish the tasks necessary for its operation. Over time, and with experience, naval architects and starship managers have developed basic crew requirements based in **positions** or on **skills**.

Title		Position-Based	Skill-Based
Pilot		Qualified Pilot.	Pilot = 1 level per G
Astrogator		Qualified Astrogation.	Astrogation = 1 level per J
Engineer		Qualified Engineer (1 per 35 tons of drives)	Engineer = 1 level per 35 tons
Medic		Qualified Medic (1 per 30 passengers and crew).	Medic = 1 level per 30
Steward		Qualified Steward (1 per 8 passengers)	Steward = 1 per 8 passengers
Freightmaster		Qualified Trader or Q Broker (1 per 1000 tons of hold)	Trader or Broker = any
Gunner		Qualified Gunner (1 per 2 weapons installations).	Gunner = 1 per 2 weapons installations
Counsellor	optional	Counsellor	Counsellor = any
Troops	optional	Fighting	Fighting = any

Qualified = He must show the ability to succeed at an Easy task at least 75% of the time. When a job or vocation states a skill-related job title, a character must generally be Qualified in order to be hired.

SUBSTITUTE CREW

Any component on a ship can be operated by its Computer based on that computer's C+S.

ACCOMMODATIONS ON A SHIP

In design and construction, a ship must allocate at least four tons per crew member and passenger, further divided between quarters and common areas.

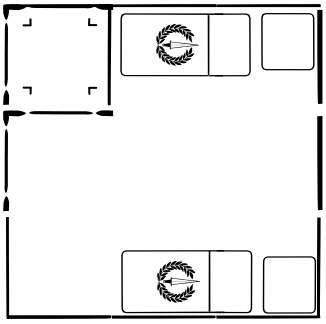
Crew Quarters. Living quarters must be installed for every serving crew member and passenger. The table shows specific requirements based on rank.

Passenger Staterooms. If a ship carries passengers, specific separate staterooms must be allocated.

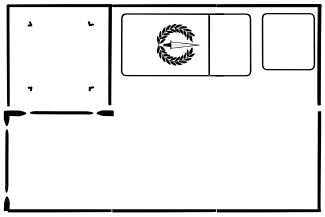
REQUIRED QUARTERS TONNAGE

Description	Tons	Comment	Occupants	MAQQ Quality
Crew				
Senior Officer	3	Officers O4-O6	1	75%
Junior Officers	3	Two Officers O1-O3	2	38%
Ratings Quarters	3	Four Ratings in Bunks	4	19%
Spacer Niche	1	One crew member	1	25%
Spacer Bunks	1	Two crew persons	2	13%
Spacer Hot Bunks	1	Two per watch (3 watches)	6	5%
Passengers				
Luxury Single	4	High Passengers	1	100%
Standard Double	4	Middle Passengers	2	50%

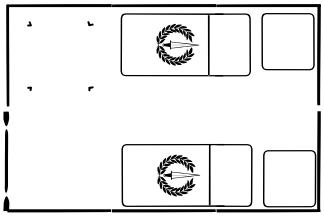
Luxury Single 4 tons
Standard Double 4 tons



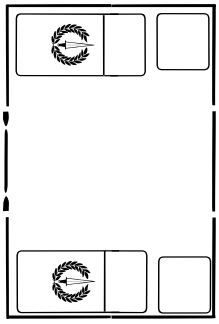
Senior Officer 3 tons



Junior Officer 3 tons
Ratings Quarters 3 tons



Junior Officer 3 tons
Ratings Quarters 3 tons



MAQQ

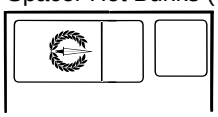
Minimum Average Quarters Quality MAQQ is a measure of the quarters space devoted to crew members. Most civilian (non-military) ships require an MAQQ of 50%.

MAQQ = .25 * Quarters Tons / Occupants

Common Areas. Non-quarters accommodation tons become common areas.

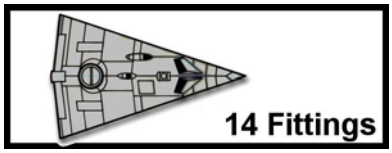
Standard Accommodations. Examples shown support sophonts approximately human size (Size = 100).

Spacer Niche (1) 1 ton
Spacer Bunks (2) 1 ton
Spacer Hot Bunks (6) 1 ton



Fittings

Ships have a variety of miscellaneous components filling a variety of functions.



LANDING GEAR		Standard on	Add
J	Landing Skids	Config-U	+ MCr1
K	Landing Legs	Config-S	+ MCr1 and +1 ton
L	Landing Wheels	Config-A, L	+ MCr1 and +1 ton
G	Grapples	No	+ MCr1 and +1 ton
Z	Lifters	Config-U, S	+ MCr1

Code Description

J **Landing Skids.** Retractable horizontal bars bear the ship's weight. Requires bedrock or tarmac landing site. Config-U Standard.

K **Landing Legs With Pads.** Retractable legs end in pads. Can tolerate uneven landing terrain. Config-S Standard.

L **Landing Wheels.** Retractable legs end in wheels. Allows glide landing / takeoff from airstrip. Config-A and L Standard.

G **Grapples.** Retractable grasping claws to interface with other ships. Allows mating with another ship also equipped with Grapples.

Z **Lifters.** Grav Plates provide limited hover capability.

FLOTATION HULL		Standard On	Add
D	Flotation Hull	Config-L	+ MCr1 and +1 ton
E	Submergence Hull	No	+ MCr2 and +1 ton

Code Description

D **Flotation Hull.** Sealed to protect against prolonged water or fluid exposure. Allows glide landing and takeoff from water.

E **Submergence Hull.** Hull is sealed to protect against prolonged water or fluid exposure. Includes ability to submerge and resurface. Allows glide landing and takeoff from water. Doubles the Pressure the hull (based on its Armor) can withstand.

FUEL ACCESSORIES		Standard on	Add
F	Fuel Scoops	No	+ MCr1
W	Purifier	No	+ MCr1 and + 1 ton

Code Description

F **Scoops.** Intake raw fuel from gas giant atmospheres. Intakes water from lake or ocean.

W **Purifier.** Transforms raw fuel into purified fuel at about 100 tons per day per ton of purifier.

FUEL TANKAGE

Allocate Fuel Tankage for the ship based on the drives carried.
Power Plant (per week) = P x H
Anti-Matter Plant (per year) = 1 ton console.
Collector = not required.
Jump Drive (per jump) = J x H /10

J= Jump Number.
P= Power Plant Drive Potential.
H= Hull Number (= tons /100).

WINGS AND FINS		Standard	
F	Fins		+ MCr1 and + 1 ton
W	Wings (and Fins)	Config-A	+ MCr1 and + 1 ton
K	Folding Wings	No	+ MCr1 and + 1 ton
L	Lifting Body	Config-L	cannot be added

* per 100 tons

Code Description

F **Fins.** Increase performance in atmosphere.

W **Wings (and Fins).** Increase performance of drives in atmosphere. Includes Fins.

K **Folding Wings.** Installed wings (and fins) can be folded for storage.

L **Lifting Body.** Assumes the advantages of Fins and Wings.

How Wings and Fins Work

The performance of ships operating **in atmosphere** (Atm= 2+, or P=1 or greater) is improved by Fins, Wings, and Wheeled Landing Gear.

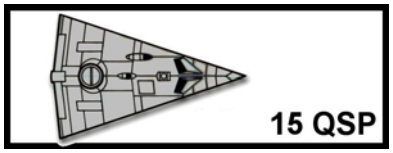
Fins on a ship operating **In Atmosphere** increase Agility +1.

Wings on a ship operating In Atmosphere increase Maneuver Drive performance +1 G.

Wheeled Landing Gear is required when Wings are used for Liftoff and Landing.

The Quick Ship Profile

The basic performance for a ship can be gleaned from the QSP; the Extensions provide information about vehicles and crew.



Adventure Class Ships are briefly identified using the QSP Quick Ship Profile and (if necessary) Extensions which provide additional information. For example, a 200-ton Jump-1 Maneuver-1 Free Trader is identified with QSP A-2211.

QUICK SHIP PROFILE

A2	-	2	2	1	1
Mission		**Hull**	**Config**	**Gs**	**Jump**

The **Quick Ship Profile** (QSP) shows the basic performance characteristics of a spacecraft.

Mission. Basic ship purpose.
Hull. Tonnage (volume) of the ship hull.
Config. Ship hull structure.
G's. Ship maximum maneuver capability in Gs.
Jump. Ship maximum jump capability.

The QSP Extensions allow additional information to be easily added to the QSP.Extensions are used only where needed.

Vx THE VEHICLE EXTENSION

Vx: Q1-1 (ATV-1)

The **Vehicle Extension** is preceded by the Code Vx:

Note the Vehicle Code and the Quantity (use a dash between the Code and the Quantity). Some short vehicle names may be used instead of Codes.

VEHICLE CODES

Code	Vehicle	Alt Code	
A	ATV		
B	Boat or Sub		
C	Cargo Module		
F	Flyer		
G	GroundCar		
L	Lander		
M	MTV		
R	Rotor flyer		
S	STV		
T	Tank		
V	Military Vehicle		
W	Winged flyer		
Q0	Pod. Gig. Lifepod.	QG	
Q1	Fighter.	QF	
Q2	Launch.	QL	
Q3	Ship's Boat.	QB	
Q4	Pinnace.	QP	
Q5	Cutter.	QC	
Q6	LR Fighter	QR	
Q7	Picket.	QK	
Q8	Tanker	QT	
Q9	Shuttle.	QS	

Vehicles which are carried within the Hull are Carried and are enclosed in Parens. Other vehicles are externally mated to the hull.

Small Craft carry the prefix Q (from the Missions Table).

For example, a Far Trade carries one

Cx THE CREW EXTENSION

Cx: A1 E1 G1 P1 R1

The **Crew Extension** is preceded by the Code Cx:

The Crew Extension provides the details of the Crew of a Starship.

CREW CODES

Code	Position			
A	Astrogator			
C	Counsellor			
E	Engineer			
F	Freightmaster			
G	Gunner			
M	Medic			
P	Pilot			
S	Steward			
T	Troops			
R	Sensor Tech			

The Crew Extension is created by noting the quantity of each Crew Position after each Crew Code.

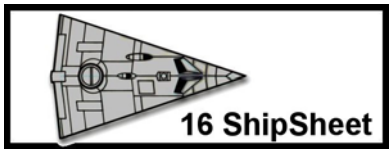
For example, a Free Trader requires one each of Pilot, Astrogator, Engineer, Gunner, Medic, and Steward.

Cx: A1 E1 G1 P1 S1.

Cx = Crew Extension. Not to be confused with Cx Cultural Extension associated with Worlds.

Creating The ShipSheet

The ShipSheet records damage to a ship and governed how damage is inflicted.



LAYERS

1	
2	
3	
4	
5	
6	

HIT LOCATION TABLE

-9	
-8	
-7	
-6	
-5	Comms
-4	Cargo
-3	Sensors
-2	Defenses
-1	Life Support
0	Hull
+1	Power
+2	Drives
+3	Weapons
+4	Bridge
+5	Computer
+6	
+7	
+8	
+9	

THE ELEMENTS OF THE SHIPSHEET

The ShipSheet is a unique record of the starship and how damage affects it.

The ShipSheet Tables are custom filled based on the ship designer's concepts and within the constraints of the Ship Design Rules.

Armor

Insert in the Layers Box the layer of armor on the hull. If there are more layers than spaces, use an additional sheet.

The Hit Location Table

The recommended or default Hit Locations are printed on the Hit Location Table.

Ship Design may place them in other locations, provided all 11 Locations are on the table and Hull is at Hit Location= 0.

Unless otherwise noted, the 11 entries must be in Hit Locations -5 to +5.

Drives. If the ship has a Jump Bubble, Drives must be in Hit location -1, 0, or +1.

If the ship has a Jump Grid, Drives may be in any Hit Location -5 to +5.

Cluster Hulls. A Cluster Hull Config-C may place the Locations in any Hit Locations -9 to +9. Gaps may be present between Locations.

Cluster may omit Hull as a Location.

Braced Cluster Hulls. A Braced Cluster Hull Config-B may place the 11 Elements in any Hit Locations -7 to +7. Gaps may be present between Elements.

Brace Cluster may omit Hull as a Location.

Carried Vehicles and Craft. Vehicles as Cargo or Small Craft in Hangars are part of Hit Location = Cargo.

Attached Objects. Grappled or Docked craft. and vehicles carried in Niches are noted in an otherwise unoccupied Hit Location adjacent to a filled Hit location.

Drives and Power

Note that Drives are distinct from the Power Plant.

Fuel Tankage is placed in Hit Location= Power.

Extended Objects

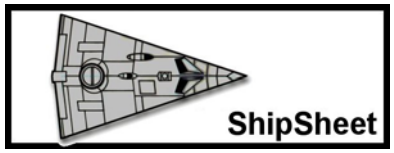
Some Sensors are Extendable. When retracted, they are in the Sensor Hit location. When Extended, they are in an otherwise unoccupied Hit Location.

Deployable Mounts

Some weapons and sensors are in Deployable mounts. When deployed, they are separate objects at Location=0 on a separate Hit location Table.

LARGE SHIPS

When entries require more spaces on the ShipSheet (for example, more Weapons than available entries), create additional available entries and number them to allow random selection of them



Ship Name	Out Of	Hull Number
Mission	QSP and Extensions	

LAYERS

1	
2	
3	
4	
5	
6	

HIT LOCATION TABLE

-9	
-8	
-7	
-6	
-5	Comms
-4	Cargo
-3	Sensors
-2	Defenses
-1	Life Support
0	Hull
+1	Power
+2	Drives
+3	Weapons
+4	Bridge
+5	Computer
+6	
+7	
+8	
+9	

COMMS X

1		
2		
3		
4		

CARGO/ PAYLOAD X

1		
2		
3		
4		
5		
6		

SENSORS X

1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

DEFENSES X

1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

LIFE SUPPORT X

1	Life Support	
2		
3		
4		
5		
6		

HULL X

1		
2		
3		
4		

POWER X

1		
2		
3		
4		

DRIVES X

1		
2		
3		
4		
5		

WEAPONS X

1		
2		
3		
4		
5		
6		
7		
8		
9		
0		

BRIDGE X

1	Main Controls	
2	Astrogator	
3		
4		
5		
6		

COMPUTER X

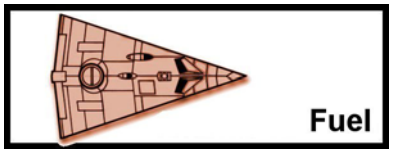
1	Ship's Computer	
2		
3		
4		
5		
6		

TARGETTING

Center Of Mass. Mod= Min plus Max entry on HLT.
Center of Heat. Mod= Drives.
Center of Emissions. Mod= Sensors or Comms.

Fuel for Starships

Power Plants process fuel (or use other processes) to provide the energy required by ships.



POWER PLANTS

Starships use Power Plants to process fuel to create energy to power their operations.

Component Power Sources. Most components on a starship are self-powered: each sensor, most weapons and defenses, and many components are self-powered with FusionPlus modules. Localized power makes the component power independent in the event of a central power failure, major damage, or malfunction.

Central Power Source. A ship also requires a central Power Source to support its Interplanetary and Interstellar drives.

The three basic Power Sources for starships are the Power Plant, the Anti-Matter Plant, and the Collector. Each has its own governing details.

POWER PLANTS

The Power Plant is a Fusion Power Supply adapted to use in starships. Power Plants are the most commonly available ship power sources.

The system uses Hydrogen as its fuel. Hydrogen is available at many starports.

Routine Fuel Use

A Power Plant requires Fuel = PPlant Drive Potential x Hull Number in tons, per week. Fuel is stored in fuel tanks throughout the ship.

ANTI-MATTER PLANTS

The Anti-Matter is an advanced Power Source; it produces energy from matter-anti-matter reactions.

The system uses anti-matter as its fuel. Anti-Matter slugs are available at TL 16 or greater Class A starports.

Routine Fuel Use

An Anti-Matter Plant is fuelled with a 1 ton console within the Plant; it contains containing slugs of anti-matter. Each slug (which is quite small) is magnetically isolated until used.

COLLECTORS

The Collector is an alternative Power Source. It extends a Canopy which gathers energy (a combination of photons and exotic particles) radiated from stars and gas giants.

Routine Energy Use

A Collector is unsuitable as a routine energy supply. The major components of the ship rely on their individual power supplies.

OVERCLOCK

Power Plants and Anti-Matter Plants can easily provide power for ordinary operations. When used to power Jump, the Plant shifts to Overclock Mode.

A fresh, newly overhauled P-Plant or AM-Plant has an Overclock OC rating = 42 plus Quality and each use in Overclock Mode reduces its rating by 1; a Plant is typically overhauled annually to refresh its Overclock rating.

	P-Plant or A-Plant
Failure Rate QFR=	37 + Quality
Per Use Reduction	-1
Jump Failure	Check FR (4D)
Malfunction	Check FR (4D) if Jump Failed

A standard Quality Power Plant newly overhauled has a Failure Rating= 37 + 5 = 42. There is no chance of drive failure (due to Overclock) on its first use. After 19 jumps, Failure Rate = 23, and there is a remote chance of failure (of rolling 24 on 4D). After 26 jumps, Failure rate = 16, and the chance of failure (of rolling 17 or greater on 4D) is about 24%. Most ships stop for an overhaul before this point.

Jump Failure. If the jump fails, the fuel involved is wasted; the ship may need to refuel before attempting another jump.

FUEL

Power Plant Fuel	= P x T	Per week	Cr500 for refined fuel at a Starport; no cost skimmed or gathered.
Jump Drive Fuel	= J x T / 10	Per Jump	
Hop Drive Fuel	= H x T / 100	Per Hop	
Skip Drive Fuel	= S x T / 100	Per Skip	
NAFAL Fuel	= G x T /100	Per Month	
Maneuver Drive Fuel			
Anti-Matter Plant	= 1 ton (console)	Per Year	MCr2 per console.
Collector	special	special	MCr3 per canopy

CANOPY DEGRADATION

The Canopy of the Collector degrades with use. A newly installed Canopy has a Canopy Failure Rate= 500 plus Quality.

	Collector
Failure Rate FR=	500 + Quality.
Per Use Reduction	- 1D
Jump Failure	Check FR (4D)
Malfunction	Check FR if Jump Failed

A standard-Quality Canopy newly installed has a Failure Rate = 505. Failure is not a problem for many months.

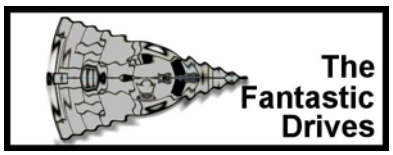
Time To Recharge

The time to charge a Canopy (in years) = (10/ Failure Rate) + Flux.

FR=	Time To Recharge
500	0.02 years = 7 days + Flux
200	0.05 years = 18 days + Flux
50	0.20 years = 72 days + Flux
23	0.43 years = 158 days + Flux

The Fantastic Drives

The Fantastic Drives are uncommonly encountered interstellar drives available only as artifacts or at extremely high Tech Levels.



DRIVE TONNAGE

Drive Letter	Rating EP	J J-Drive	H H-Drive	S S-Drive	N N-Drive
A	100	10	1	10	30
B	200	15	2	20	60
C	300	20	3	30	90
D	400	25	4	40	120
E	500	30	5	50	150
F	600	35	6	60	180
G	700	40	7	70	210
H	800	45	8	80	240
J	900	50	9	90	270
K	1000	55	10	100	300
L	1100	60	11	110	330
M	1200	65	12	120	360
N	1300	70	13	130	390
P	1400	75	14	140	420
Q	1500	80	15	150	450
R	1600	85	16	160	480
S	1700	90	17	170	510
T	1800	95	18	180	540
U	1900	100	19	190	570
V	2000	105	20	200	600
W	2100	110	21	210	630
X	2200	115	22	220	660
Y	2300	120	23	230	690
Z	2400	125	24	240	720
N2	2600	140	26	260	750
P2	2800	150	28	280	780
Q2	3000	160	30	300	810
R2	3200	170	32	320	840
S2	3400	180	34	340	870
T2	3600	190	36	360	900
U2	3800	200	38	380	930
V2	4000	210	40	400	960
W2	4200	220	42	420	990
X2	4400	230	44	440	1020
Y2	4600	240	46	460	1050
Z2	4800	250	48	480	1100

DRIVE TL

TL	J	H	S	N	TL	J	H	S	N
9	1	-	-	1	21	-	-	-	7
10	1	-	-	-	22	-	-	-	-
11	2	-	-	2	23	-	1	-	8
12	3	-	-	-	24	-	2	-	-
13	4	-	-	3	25	-	3	-	9
14	5	-	-	-	26	-	4	1	-
15	6	-	-	4	27	-	5	2	-
16	6	-	-	-	28	-	6	3	-
17	7	-	-	5	29	-	7	4	-
18	7	-	-	-	30	-	8	5	-
19	8	-	-	6	31	-	9	6	-
20	8	-	-	-	32	-	-	7	-

COSTS

Drive	MCr
Jump	1.0
Hop	5.0
Skip	5.0
NAFAL	1.0
Per Ton	

THE FANTASTIC DRIVES

Any of the Drives shown here must be supported by a Power Plant with Drive Potential at least equal to this Drive's Potential.

Jump Drive (shown for comparison). Jumps are measured in parsecs; one Jump (regardless of distance) requires one week.

The Mythical "Hop" Drive. Hops are measured in tens of parsecs; the ship Hops exactly that distance; one Hop takes about a day. Fuel usage is relatively small.

The Rumored "Skip" Drive. Skips are measured in hundreds of parsecs, but the final distance is inexact. One Skip (regardless of distance) requires several hours. Fuel usage is negligible. A Skip contaminates Jump Space in its originating system, and is subject to SkipScatter.

NAFAL. The **Not As Fast As Light** interstellar drive. The drive accelerates the ship perpendicular to a gravity source and decelerates the ship perpendicular to the destination gravity source. Acceleration is in Gs.

FUEL REQUIREMENTS

Drives require fuel to provide energy. Fuel is Hydrogen, stored under pressure and liquefied, fed from fuel tanks to the appropriate drive.

Hop Drive (per Hop). A Hop Drive requires 1% of Hull Tonnage per Hop number (subject to PPlant Overclock) per use. A Hop Drive can perform ONLY a Hop equal to its Potential.

Skip Drive (per Skip). A Skip Drive requires 1% of Hull Tonnage per Skip number (subject to PPlant Overclock) per use. A Skip Drive can perform ONLY a Skip equal to its Potential and is subject to Skip Scatter (1 parsec in a random direction from the destination hex).

NAFAL (per month). A NAFAL Drive requires 1% of Hull Tonnage per G number (subject to PPlant Overclock).

STAGE EFFECTS

	Stage	TL	QREBS	OC	Tons	Cost
Ex	Experimental*	- 3	Full	50	x3	x10
Pr	Prototype**	- 2	3 of 5	80	x2	x3
Er	Early	- 1	1 of 5	90		x2
	(Standard)	+0		100		
Im	Improved	+1	+1 of 5	110		
Ad	Advanced	+2	+3 of 5	120		

OC= Overclock (for Power Plants only; ignore Tons).

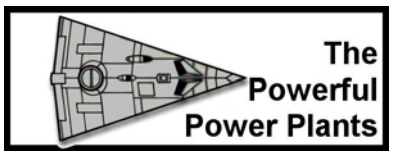
OVERCLOCK

Standard P-Plant tonnage is based on Overclock= 100.

True P-Plant tons = Power Plant Tons / (OC/100)
True **Hop** Fuel Required= Fuel / (OC/100)
True **Skip** Fuel Required= Fuel / (OC/100)

The Powerful Power Plants

The Powerful Power Plants are uncommonly encountered power sources suitable for installation on starships. The F Fusion Plant is shown for comparison.



DRIVE TONNAGE

Drive Letter	Rating EP	P P-Plant	A A-Plant	C Collector	F Fusion Plant
A	100	4	31	10	400
B	200	7	32	20	700
C	300	10	33	30	1000
D	400	13	34	40	1300
E	500	16	35	50	1600
F	600	19	36	60	1900
G	700	22	37	70	2200
H	800	25	38	80	2500
J	900	28	39	90	2800
K	1000	31	40	100	3100
L	1100	34	42	110	3400
M	1200	37	44	120	3700
N	1300	40	46	130	4000
P	1400	43	48	140	4300
Q	1500	46	50	150	4600
R	1600	49	52	160	4900
S	1700	52	54	170	5200
T	1800	55	56	180	5500
U	1900	58	58	190	5800
V	2000	61	60	200	6100
W	2100	64	62	210	6400
X	2200	67	64	220	6700
Y	2300	70	66	230	7000
Z	2400	73	68	240	7300
N2	2600	80	70	260	8000
P2	2800	86	72	280	8600
Q2	3000	92	74	300	9200
R2	3200	98	76	320	9800
S2	3400	104	78	340	10400
T2	3600	110	80	360	11000
U2	3800	116	82	380	11600
V2	4000	122	84	400	12200
W2	4200	128	86	420	12800
X2	4400	134	88	440	13400
Y2	4600	140	90	460	14000
Z2	4800	146	92	480	14600

POWER TL

TL	P	A	C	F	TL	P	A	C	F
8	1	-	-	-	21	-	6	-	-
9	2	-	-	1	22	-	7	-	-
10	3	-	-	2	23	-	8	-	-
11	4	-	-	3	24	-	9	-	-
12	5	-	-	4	25	-	-	-	-
13	6	-	-	5	26	-	-	-	-
14	7	-	-	6	27	-	-	-	-
15	8	-	-	7	28	-	-	-	-
16	9	1	-	8	29	-	-	-	-
17	-	2	-	9	30	-	-	-	-
18	-	3	5	-	31	-	-	-	-
19	-	4	9	-	32	-	-	-	-
20	-	5	-	-	33	-	-	-	-

COSTS

Drive	MCr
P-Plant	1.0
A-Plant	2.0
Collector	0.5
Fusion	1.0
Per Ton	

THE POWERFUL POWER PLANTS

A Power Plant must have Drive Potential (from the Drive Potential Table) equal or greater than the Drive(s) it supports.

Power Plant (shown for comparison). A Fusion Power Generator with OverClock Capabilities.

Anti-Matter Power Plant. A Power Generator based on Matter-AntiMatter interactions.

Collector. A Power Collector system which accumulates stellar energy over time.

A Collector is half internal mechanism and half external Canopy.

Fusion Installation (shown for comparison). An industrial or community Fusion-based power source.

FUEL REQUIREMENTS

Drives require fuel to provide energy.

Power Plants and FusionPlants require Hydrogen, stored under pressure and liquefied, fed from fuel tanks.

Power Plant. A Power Plant requires 1 ton of fuel times Drive Potential per Hull Number (= tons / 100) per week to support normal operations (that feeds about a liter of liquid hydrogen per minute to the power plant per Potential per 100 tons of Hull).

Anti-Matter Plant. An AM Plant is fuelled by Anti-Matter slugs contained by magnetic or gravitic fields. A one-ton Console contains enough slugs to provide power for a year.

Collector. A Collector gathers energy (It gathers energy (a combination of photons and exotic particles) radiated from stars and Gas Giants.

STAGE EFFECTS

	Stage	TL	QREBS	OC	Tons	Cost
Ex	Experimental*	- 3	Full	50	x3	x10
Pr	Prototype**	- 2	3 of 5	80	x2	x3
Er	Early	- 1	1 of 5	90		x2
	(Standard)	+0		100		
Im	Improved	+1	+1 of 5	110		
Ad	Advanced	+2	+3 of 5	120		

OC= Overclock (PPlants and AM Plants; ignore Tons).

OVERCLOCK

Standard P-Plant tonnage is based on Overclock= 100.

True Power Plant tonnage = Power Plant Tons / OC

Sensors

Sensors are the technological eyes and ears (and other senses) of starships (and of star system installations). Technology magnifies the capabilities of personal senses and translates the information that sensors gather into understandable formats.

Sensors are examples of technology; their use is an example of personal task resolution. Together, they give information to characters about their environments.

THE PURPOSE OF THE TRAVELLER SENSOR SYSTEM

The **Traveller** sensor system and its mix of devices allows the crew of a starship (or spacecraft, or vehicle, or installation) to acquire knowledge about objects and phenomena around them in a series of information-gathering steps. Rather than knowing everything about a star system or plant or region all at once, the information becomes available in a series of readings.

The Referee Has Perfect Knowledge

He knows if an enemy starship is lurking in the planetoid belt, or behind a gas giant. Or, he knows that the present star system is totally vacant, with no threats or dangers other than natural ones.

The Players Have No Knowledge.

They depend on the readings from their sensors to develop an understanding of the situation. Dare they risk moving directly to the barren mainworld, not knowing what ships might lie in ambush? Dare they move closer, risking being detected by possible enemies as they do?

The Process

The Sensor Process becomes part of the excitement as players investigate each new star system, planet, and even planetary location, moving ever closer as their use their sensors, and risking disaster if they guess wrong.

Used Only When Necessary. The Sensor Process is a sequence of steps dealing with the unknown. If the system is totally unknown to the characters, then using the Sensor Process is entirely appropriate. If the system is familiar, then Sensors come into play only when problems or unusual readings occur.

UNDERSTANDING SENSORS

Sensors are technological devices which provide information about the environment. Sensors are identified by a LongName (with enough detail to define its usage) which includes Stage, Range, Sensor Name, and Tech Level.

Each specific type of Sensor is also identified by a single Letter Code (for example, C = Communicator).

Types of Sensors. Sensors are available in a variety of generalized types. **Space Sensors** are used over the vast distances of space. **World Sensors** are used over smaller distances associated with a world. They are also more closely tailored to the information that examination of a world can provide.

USING SENSORS

Sensors reveal the details of the universe to the players. Their output is in three distinct stages:

Alert. When there is something of possible interest, the Referee conveys to the players an Alert:

"Your [sensor] sees something about here [location].

Detection. Using the Sensor Task, the characters try to resolve what gave the alert (or they can ignore it). Success in the Sensor Task provides information about the alert.

Tracking. Once a sensor detects an object, it can track that object until some event causes the signal to be lost (it moves out of range; it is hidden by a world; it deliberately jams or hides its signal).

THE SENSOR TASK

		TL	Char	Skill	Mod
nD	**<**	**T**	**+C**	**+S**	**+M**
n = Range			Use: C4 C5	Use: Sensor	
Uncertain (1D)					

A Sensor cannot operate beyond its stated Range.

The Sensor Task determines the success of the effort.

Because the possible readings are unknown, the Referee administers the task in increments based on the dice used:

The Uncertain Die. The referee rolls the Uncertain Die secretly and notes its result. Players can assume the result is 3 (although it may be between 1 and 6). If this assumed 3 is less than T+C+S+M, he reveals anything detected at S=1 (for Space Sensors) or R=1 for (World Sensors).

The Second Die. The referee rolls the second Die and if the total is less than T+C+S+M, he reveals anything detected at S=1 (for Space Sensors) or R=1 for (World Sensors).

Additional Dice. This process allows checking at each available range without revealing to the players which ranges are important.

DESCRIBING SENSORS

Sensors are identified by a LongName which provides enough detail to define its usage. A Sensor LongName includes Stage, Range, Sensor Name, and Tech Level.

Stage - Range - Type - Tech Level (C+S)

Elements of the LongName may be omitted if not applicable.

Stage is the sensor's position in the spectrum of sophistication in the developmental life cycle. It is possible for Stage to be blank. For example, Prototype, Basic, or Advanced.

Range is the sensor's distance factor in acquiring information. Space Sensors use Space Ranges. World Sensors use World Ranges. Range in either case uses a term which translates to a range band.

Sensor Name details the precise nature of the mechanism and provides insights into how it operates.

Tech Level identifies the Technological Level at which the Sensor is commonly manufactured. TL is required.

CREATING SENSORS

The abilities and effectiveness of Sensors is determined primarily by Type and Tech Level.

The Sensors available to a ship are determined by the Tech Level of the constructing shipyard (although character may upgrade their ship's sensors as better ones become available).

Similarly, the Sensors available to worlds or bases is determined by its governing tech level.

Space Sensors detect a variety of inputs and process them to provide specific details of location, environment, and friends and enemies.

The Sensor Creation Process

Sensors are selected from the Sensor List and then created in two parts: the Sensor (as modified by Range) and the Bridge Console (as modified by Stage).

1. Base Sensor. Select a Base Sensor Type from the World Sensor List or the Space Sensor List. Note its Model Letter and Tech Level.

The base tonnage for a Sensor is zero tons. The base cost for World Sensor is Cr100,000. The base cost for a Space Sensor is MCr1.

2. Mount. Select a Mount for the Sensor from the Sensor Mounts Table. Note any Mods to the Sensor based on Mount.

3. Range. The Standard Range for Space Sensors is S=7. The Standard Range for World Sensors is R=7. Increase or decrease the base Range using the Range Effects Table and note its consequences (applied to the Mount) for Tech Level, Tonnage, and Cost.

4. Bridge Console. Each Sensor requires a 1-ton Bridge Console. If the Bridge has insufficient consoles, increase Bridge size. The Console holds the Local Computer for the Sensor and its various operator displays.

5. Stage. The base Stage for Sensors is Standard (which need not be stated). Increase or decrease the base Stage using the Stage Effects Table and note its consequences for the Bridge Console Tech Level, Tonnage, and Cost.

Added tons may be located anywhere on the ship (not necessarily on the Bridge).

Note any Mods to the Sensor based on Stage.

SENSOR CREATION EXAMPLE

For example, several Neutrino Detectors are possible.

N-10 Neutrino Detector-10

The standard device at standard tech level; mounted in a hull Surface Mount.

S=7 (per Space Sensors).

Cost= Standard= MCr1 (per Space Sensors).

Console = 1 ton on the Bridge.

Mount = Surface Mount requires no additional tonnage.

The N-10 can detect anything equal to or larger than the benchmark shown on the Sensor Data Chart, but not farther than Maximum Range S=7.

Assuming the Sensor Operator has C4=7 and Sensor-3 and no Mods, the Sensor Task calls for him to roll 7D for (14 + 7 + 3 = 24) or less = about a 50% chance of detecting the target.

ExSRN-6 Experimental SR Bay Neutrino Detector-6

TL= 10 -3 -1 = 6.

S=5.

Cost= MCr1 x10 /2 plus Mount MCr5 = MCr10.

Mount= 50-ton Bay plus 3 tons adjacent to the Bay.

Console = 1-ton Console on the Bridge.

The ExSRN-10 can (attempt to) detect Fusion+ modules at S=5 = 50,000 km or closer. It has a Mod +5 to detect.

Assuming the Sensor Operator has C4=7 and Sensor-3 and Mod + 5, the Sensor Task calls for him to roll 5D for (10 + 7 + 3 +5 = 25) or less = about a 98% chance of detecting the target.

ACTIVE VERSUS PASSIVE

Most sensors are passive. They receive information in some way, but do not emit any information themselves. Passive sensors are difficult to detect.

Some sensors are active. They emit some form of information (they send out a radio pulse, or a laser spot in the course of operation). Active sensors give away their location and the fact that they are operating.

A sensor which can be Active or Passive is automatically Passive unless the operator makes the switch to Active (and receives a Mod +3) but also automatically alerts any operating sensors).

Active Mode can only be used to about S=7.

USING THE SENSOR CHARTS

The Sensor Charts show the various sensors and their capabilities at a wide selection of ranges.

Minimum Size Benchmarks. A sensor can attempt to detect the benchmark shown at the stated range or closer. An object smaller than the benchmark cannot be detected (or attempted to be detected). Mods change the chance of detection, but do not alter the size restrictions.

Maximum Range. Each Sensor has a stated Maximum Range. It cannot attempt detection of objects beyond Maximum Range.

Jammers

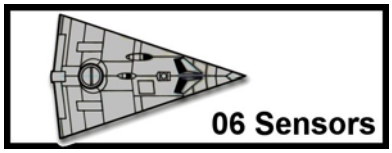
A Jammer produces a Mod against detection by Radar, EMS, or Scanner.

Stealth Mask

A Stealth Mask produces a Mod against detection by Active Radar, EMS, or Scanner.

Sensors

Sensors are the eyes and ears of the ship, or of explorers. They gather information and present it to users in an understandable form. Create sensors as needed from this page.



SENSOR DESCRIPTION

Model	LongName = Stage Range Mount Type -TL (C+S)

The basic information required to describe and use a sensor.

IDENTIFYING SPACE SENSORS

R= or S=
Stage Range Mount Type -TL (C+S)

Early DS Ant Radar -9 (10)

THE SENSOR TASK

		TL	Char	Skill	Mod
nD	**<**	**T**	**+C**	**+S**	**+M**
n = Range			Use: C4 C5	Use: Sensor	Passive Benchmark Mount

Uncertain (1D)

SPACE SENSORS

	Type	TL	Mount	S=	R=	MCr
A	Activity Sensor	11	Surf		7	0.1
B	Deep Radar	9	Surf		7	0.1
C	Communicator	8	Surf	7		1.0
D	Densitometer	10	Surf		7	0.1
E	EMS	12	Ant	7		1.0
F	Field Sensor	12	Surf		7	0.1
G	Grav Sensor	13	Surf	7		1.0
H	HoloVisor	18	Surf	7		1.0
J	Jammer	8	Surf	7		1.0
K	Analyzer / Sniffer	9	Surf		7	0.1
L	Life Detector	10	Surf		7	0.1
M	Mass Sensor	8	Surf		7	0.1
N	Neutrino Detector	10	Surf	7		1.0
P	Proximeter	10	Surf		7	0.1
Q	Stealth Mask	12	Surf	7		1.0
R	Radar	9	Ant	7		1.0
S	Scanner	19	Ant	7		1.0
T	Scope	9	Surf	7		1.0
V	Visor	14	Surf	7		1.0
U						
W	CommPlus	17	Surf	7		1.0
X						
Y	Sound Sensor	10	Surf		7	0.1
Z						

SENSOR MOUNTS

	Mount Type	Tons	Mod	Skill	MCr
T1	Turret	1	0	Sensor	0.2
B1	Barbette	3	+1	Sensor	3.0
De	Deployable	+2		Sensor	3.0
Bay	Bay	50	+5	Sensor	5.0
LBay	Large Bay	100	+8	Sensor	10.0
M	Main	200	+10	Sensor	20.0
Surf	Surface	0	0	Sensor	0.0
(blank)	Surface	0	0	Sensor	0.0
Ant	Antenna	1	+1	Sensor	0.5
Ext	Extendable	2	+3	Sensor	1.0

Sensors may be installed in weapon **Hardpoints** or in Sensor Mounts. Surface, Antenna, or Extendable.

Deployable. In addition to Turret or Barbette costs.

C+S CHARACTERISTIC PLUS SKILL

Characteristic Use C4 or C5.
Skill Use Skill= Sensors.

STAGE EFFECTS **(applies to Sensor)**

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	+3	x10
Pr	Prototype**	- 2	3 of 5	-3	+2	x3
Er	Early	- 1	1 of 5			x2
	(Standard)	+0				
Im	Improved	+1	+1 of 5			/ 2
Ad	Advanced	+2	+3 of 5	+1		/ 2

Tons in addition to 1-ton Bridge Console; may be anywhere.

SPACE SENSOR RANGE EFFECTS **(applies to Mount)**

S=		Range	TL	S=	Tons	Cost
2	**FR**	Fighter Range	- 2	7		/2
5	**SR**	Short Range	- 1	10		/2
7	**AR**	Attack Range	0	12		
9	**LR**	Long Range	+1	14	+1	x3
12	**DS**	Deep Space	+2	17	+2	x5

WORLD SENSOR RANGE EFFECTS **(applies to Mount)**

R=		Range	TL	R=	Tons	Cost
5	**L**	Long 1000 m	- 2	B		/2
6	**D**	Distant 5 km	- 1	1		/2
7	**Vd**	Vdistant 50 km	0	2		
8	**Or**	Orbit 500 km	+1	3	+2	x3
9	**Fo**	Far Orbit 5000 km	+2	4	+3	x5
10	**G**	Geo 50,000 km	+3	5	+4	x8

Each Sensor requires a 1-ton Console on the Bridge (which also holds its Local Computer) which is not part of the Sensor tonnage. Stage and Range Effects do not apply to Mounts.

Space Sensors

The basic details of available space weapons are shown here.

Space Sensors-1

SENSORS

	Type	TL	Mount
A	Activity Sensor	11	Surf
B	Deep Radar	9	Surf
C	Communicator	8	Surf
D	Densitometer	10	Surf
E	EMS	12	Ant
F	Field Sensor	12	Surf
G	Grav Sensor	13	Surf
H	HoloVisor	18	Surf
I	(not used)		
J	Jammer	8	Surf
K	Analyzer / Sniffer	9	Surf
L	Life Detector	10	Surf
M	Mass Sensor	8	Surf
N	Neutrino Detector	10	Surf
O	(not used)		Surf
P	Proximeter	10	Surf
Q	Stealth Mask	12	Surf
R	Radar	9	Ant
S	Scanner	19	Ant
T	Scope	9	Surf
U			
V	Visor	14	Surf
W	CommPlus	17	Surf
X			
Y	Sound Sensor	10	Surf
Z			

SENSOR MOUNTS

	Mount Type	Mod	Skill
T1	Turret	0	Sensor
B1	Barbette	+1	Sensor
De	Deployable		Sensor
Bay	Bay	+5	Sensor
LBay	Large Bay	+8	Sensor
M	Main	+12	Sensor
Surf	Surface	0	Sensor
(blank)	Surface	0	Sensor
Ant	Antenna	+1	Sensor
Ext	Extendable	+3	Sensor

Sensors may be installed in weapon **Hardpoints** or in Sensor Mounts. Surface, Antenna, or Extendable.

Deployable. In addition to Turret or Barbette costs.

A Activity Sensor

(Electronics. Passive). Activity Sensors detect thought activity (also based on the principles of Perception).

B Deep Radar

(Electronics. Active). Deep Radar is a world sensor. Deep Radar can map underground density structures. It is a lower tech equivalent of Densitometer.

C Communicator

(Electronics. Passive/Active). Communicators (radio) receive and transmit modulated energy to carry information. They carry voice (or any language of any type including tactile and pvoice) and may carry images.

Communicators are line-of-sight devices; they cannot transmit through objects (worlds, planets, stars). Receiving messages is Passive; transmitting messages is Active.

Communicators normally operate in Broadcast mode. The broadcast can be intercepted by any Communicator.

Communicators operating in BeamCast mode must first detect their intended receiver. Range is Maximum Range minus 2. The Beamcast cannot be intercepted (unless the interceptor is in the Beamcast beam.

Communicators operating in Burst Mode compress their message into a very short burst. Interception of a Burst requires resolution of the Sensor Task with double the required dice.

Communicator Operations. A Communicator or CommPlus can receive a Broadcast if it is within the transmitting Communicator's Range.

D Densitometer

(Gravitics. Passive). A Densitometer is a remote Mass Detectors capable of identifying masses and mapping their interior density structures.

Densitometers are subject to a Depth Limit (in World Range). The three-dimensional map created has a resolution expressed in pixels (Px); each pixel is expressed in Size.

E EMS ElectroMagnetic Sensors

(Electronics. Passive/ Active). EMS is a sophisticated form of Radar; its signals are aggressively computer analyzed for detailed information. Passive EMS senses existing EM radiation (including emissions by the target, reflected local energy, and occluded background energy). Active EMS projects radio pulses in sweeping scans of an area and interprets the returned signals (echoes) for information about an objects size, distance, and speed.

F Field Sensor

(Electronics or Magnetics. Passive). Field Sensors are multi-purpose detectors sensitive to electric and magnetic fields. They operate in much the way Awareness operates.

G Grav Sensor

(Gravitics. Passive). The Grav Sensor detects gravity sources (large masses) and the operation Gravitics-based technology (M-Drives and G-Drives).

H HoloVisor

(Photonics. Passive). HoloVisor is the ultimate vision screen system, using external light detectors and displaying them in 3D projection (computer enhancements fill in gaps, extrapolate unseen sides of objects, and maintain a complete image in memory).

J Jammer

(Electronics, Magnetics, Gravitics. Passive). Jammer is an anti-sensor. The device scrambles or distorts the transmissions and readings of other sensors.

The value or effectiveness of Jammer is the sum of (TL + Char + Skill + Mod – Space Range). Jammer is a negative Mod on the attempting Active or Passive **Radar, EMS, or Scanner** Sensor Task, or operation of DataCaster.

Space Sensors

The basic details of available space weapons are shown here.

K Analyzer / Sniffer

(Electronics, Biologics. Passive). The Analyzer detects volatiles in space and (more usually) in atmosphere.

L Life Detector

(Magnetics. Passive). A Life Detector senses the presence of organisms (based on the principles of Perception).

M Mass Sensor

(Gravitics. Passive). A Mass Sensor detects masses. It is a less sensitive version of the Grav Sensor.

N Neutrino Detector (Gravitics. Passive). Neutrino Detectors sense neutrinos, primarily as the byproduct of fusion reactions: positive readings reflect the presence of stars, starship or world fusion reactors, or nuclear activity.

Because neutrinos are almost impossible to shield, Neutrino Detectors are effective in sensing ships through their Power Plants (although not A-Plants or Collectors). The can also detect Fusion+ modules.

Ships frustrate Neutrino Detectors by turning the Power Plant off, or by approaching with the local star directly behind them.

P Proximeter

(Electronics. Passive). A Proximeter senses objects close to the hull of a starship. It serves as an accurate close-up altimeter, and as an alert device when objects (people) approach.

Q Stealth Mask

(Polymers. Passive). Stealth Mask is a signal absorber. The device (actually an external hull coating) absorbs or diverts Active sensor signals. Stealth Mask can be switched On and Off.

The value or effectiveness of Stealth mask is TL the sum of (TL + Mod – Space Range). Stealth Mask is a negative Mod on the attempting **Active** Sensor Task.

R Radar

(Electronics. Passive/Active). Radar projects radio pulses in sweeping scans of an area and interprets the returned signals (echoes) for information about an objects size, distance, and speed.

S Scanner

(Electronics. Passive/Active). Scanner is an advanced form of Electromagnetic Sensor.

T Scope

(Photonics. Passive). Scope is vision screen with distance and enhancement capabilities. It acquires images and magnifies them for interaction, navigation, and analysis.

V Visor

(Photonics. Passive). Visor is the basic visual sensor. It uses external cameras with telescopic enhancements to view images.

W CommPlus

(Gravitics. Passive/Active). CommPlus is an advanced version of Communicator which uses particles (primarily neutrinos) to carry information. CommPlus can transmit through objects (worlds, planets, stars).

CommPlus is incompatible with Communicators. Neither can receive and transmit to the other system.

CommPlus operate otherwise in the same manner as Communications (Broadcast, Beamcast, Burst).

Y Sound Sensor

(Electronics. Passive). Sound Sensor is an external audio pickup capable of sensing a wide variety of sounds. It operates only in atmosphere (or under water).

MULTIPLE SENSORS

A ship may install any number of sensors, subject only to tonnage restrictions. More than one of a specific sensor (multiples of the same model, or several different models) may be installed for redundancy.

EXTENDABLE SENSORS

Sensors may be mounted on Extendable Stalks.

DEPLOYABLE SENSORS

Sensors may be installed in Deployable Hardpoints; they may be moved and operated at a distance from the ship. Deployable Sensors are installed in the Weapons section.

STANDARD SENSOR PACKAGES

Package	TL	MCr	Components			Consoles	Tons
Standard-9	9	5.5	Surf LR Comm-9	Surf AR Scope-9	Ant AR Radar-9	3	+2
Standard-10	10	5.5	Imp Surf LR Comm-10	Imp Surf AR Scope-10	Ant LR Radar-10	3	+3
Standard-11	11	4.0	Adv Surf LR Comm-11	Adv Surf AR Scope-11	Imp Ant LR Radar-11	3	+3
Standard-12	12	3.5	Adv Surf LR Comm-11	Adv Surf AR Scope-11	Ant AR Scanner-12	3	+2
Standard-13	13	3.0	Adv Surf LR Comm-11	Adv Surf AR Scope-11	Imp Ant AR Scanner-13	3	+2
Standard-14	14	4.5	Adv Surf LR Comm-11	Surf AR Visor-14	Imp Ant LR Scanner-14	3	+3
Standard-15	15	4.0	Adv Surf LR Comm-11	Imp Surf AR Visor-15	Adv Ant LR Scanner-15	3	+3

Each Sensor requires a 1-ton console on the Bridge (which includes its associated Local Computer) and a Mount places somewhere on the hull or on a weapons mount.

Sensor Data-1

Sensors
Near Worlds

				Boarding	Fighter Range		Short Range		
		Space Ranges>		**B**	**1**	**2**	**3**	**4**	**5**
	TL	**Sensor**	Contact	1000 m	5 km	50 km	500 km	5,000 km	50,000 km
A	**11**	**Activity Sensor**		5 Thoughts	**6** Agonies	**7** Deaths	**8** ManyDeaths	|||||||||||||||	|||||||||||||||
B	**9**	**Deep Radar**	Depth= 5 Px=Size-5	Depth=4 Px=Size-6	Depth= 3 Px=Size-7	Depth= 2 Px=Size-7	Depth= 1 Px=Size-7	|||||||||||||||	|||||||||||||||
C	**8**	**Communicator**							
D	**10**	**Densitometer**	Depth= 6 Px=Size-2	Depth=6 Px=Size-3	Depth= 6 Px=Size-4	Depth= 6 Px=Size-5	Depth= 6 Px=Size-6	Depth= 5 Px=Size-7	|||||||||||||||
E	**12**	**EMS**	>>>	>>>	>>>	>>>	>>>	>>>	5 Missile
F	**12**	**Field Sensor**	>>>	>>>	2 Electronics			5 Generators	6 Power Lines
G	**13**	**Grav Sensor**	>>>	>>>	>>>	>>>	>>>	>>>	5 Missile
H	**18**	**HoloVisor**	|||||||||||||||					
I		**(not used)**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
J	**8**	**Jammer**	Effect Against Active or Passive Radar, EMS, or Scanner = (Negative Mod = T+C+S+M – S)						
K	**9**	**Analyzer / Sniffer**	Operates on Samples			|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
L	**10**	**Life Detector**	>>>	>>>	5 People	6 Crowds	7 Herds	8 Forest	Vague
M	**8**	**Mass Detector**	|||||||||||||||	6 Small Craft	7 ACS Ship	8 BCS Ship	9 Rock	10 Large Rock	11 Asteroid
N	**10**	**Neutrino Detector**	|||||||||||||||	-	-	-	-	-	-
O		**(not used)**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
P	**10**	**Proximeter**	|||||||||||||||	5 Missile	6 Small Craft	7 ACS Ship	8 BCS Ship	9 Rock	10 Large Rock
Q	**12**	**Stealth Mask**	Effect Against Active Radar, EMS, or Scanner = (Negative Mod = T +M – S)						
R	**9**	**Radar**	|||||||||||||||				5 Missile	6 Small Craft
S	**19**	**Scanner**	|||||||||||||||				3 Book	4 Fusion+
T	**9**	**Scope**	>>>	3 Book	4 Fusion+	5 Missile	6 Small Craft	7 ACS Ship	8 BCS Ship
U			-	-	-	-	-	-	-
V	**14**	**Visor**	>>>	>>>	3 Book	4 Fusion+	5 Missile	6 Small Craft	7 ACS Ship
W	**17**	**CommPlus**	-	-	-	-	-	-	-
X			-	-	-	-	-	-	-
Y	**10**	**Sound Sensors**	>>>	3 Distress	4 Distress !!	5 Gunshots	6 Thunder	7 Explosion	
		World Ranges>	0	5	6	7	8	9	10

Sensor Data-2

As sensor can attempt to detect a benchmark (or any larger object) at the stated range.

Sensors
In Space

	TL		Attack Range		Long Range		Deep Space		
		Space Ranges>	**6**	**7**	**8**	**9**	**10**	**11**	**12**
		Sensor	1 ls	2 ls	8 ls	16 ls	3 lm	8 lm. 1 AU	30 lm
A	**11**	**Activity Sensor**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
B	**9**	**Deep Radar**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
C	**8**	**Communicator**							
D	**10**	**Densitometer**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
E	**12**	**EMS**	6 Small Craft	7 ACS Ship	8 BCS Ship	9 Local Hex	10 Terrain Hex	11 Asteroid	12 World Hex
F	**12**	**Field Sensor**	**7** Lightning	8 EMP	9 EMP +	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
G	**13**	**Grav Sensor**	6 Small Craft	7 ACS Ship	8 BCS Ship	9 Rock	10 Large Rock	11 Asteroid	12 Moon
H	**18**	**HoloVisor**	5 Person	6 Truck	7 Small Craft	8 BCS Ship	9 Local Hex	10 Terrain Hex	11 Asteroid
I		**(not used)**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
J	**8**	**Jammer**	Effect Against Sensor = (Negative Mod = T+C+S+M – S)						
K	**9**	**Analyzer / Sniffer**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
L	**10**	**Life Detector**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
M	**8**	**Mass Detector**	Vague	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
N	**10**	**Neutrino Detector**				6 Fusion+			9 Power Plant
O		**(not used)**	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
P	**10**	**Proximeter**	11 Asteroid	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||	|||||||||||||||
Q	**12**	**Stealth Mask**	Effect Against Sensor = (Negative Mod = T+C+S+M – S)						
R	**9**	**Radar**	7 ACS Ship	8 BCS Ship	9 Rock	10 Large Rock	11 Asteroid		
S	**19**	**Scanner**	5 Missile	6 Small Craft	7 ACS Ship	8 BCS Ship	9 Rock	10 Large Rock	11 Asteroid
T	**9**	**Scope**	9 Local Hex	10 Terrain Hex	11 Asteroid	12 World Hex			
U			-	-	-	-	-	-	-
V	**14**	**Visor**	8 BCS Ship	9 Local Hex	10 Terrain Hex	11 Asteroid	12 World Hex		
W	**17**	**CommPlus**	-	-	-	-	-	-	-
X			**-**	**-**	**-**	**-**	**-**	**-**	**-**
Y	**10**	**Sound Sensors**	-	-	-	-	-	-	-
		World Ranges>	11	12	13	14	15	16	17

Space Weapons

Space weapons are produced in many different forms and at many different tech levels, but all have the same goal: to defeat other ships in battles, and to attack targets on worlds.

The broad array of space weapons reflects the many different ways weapon technology can operate. The interplay between weapons and defenses allows for many different weapon use strategies.

UNDERSTANDING SPACE WEAPONS

Space weapons have a focused purpose: to damage or destroy enemy spacecraft, or to damage targets on worlds. Space Weapons fall into four distinct categories or operating principles.

Missiles launch a physical object at the target. Missile Launchers. Slug Throwers, Kinetic Kill Missiles, Ortillery, and Rail Guns. Small Craft as rams fall into this category.

Beams project concentrated energy at the target. Particle Accelerators, Plasma and Fusion Guns, Meson Guns, Lasers, Tractors and Pressors, and Disruptors.

Fields project an area of effect on the target. Stasis, Inducers and Dampers.

Data broadcasts or beamcasts data at the target. CommCaster and DataCasters.

WEAPON TYPES
- **Missiles**
- **Beams**
- **Fields**
- **Data**

IDENTIFYING SPACE WEAPONS

	R= or S=				
Stage	Range	Mount	Type	-TL	(C+S)

Adv LR T1 Msl -11 (10)

Advanced Long Range Single Turret Missile-11 (10)

Space Weapons are identified by a LongName with enough detail to define its usage. The LongName includes:

Stage - Range - Mount - Type - Tech Level (+C+S)

Elements of the LongName may be omitted if not applicable.

Stage is the weapon's position in the spectrum of sophistication in the developmental life cycle. It is possible for Stage to be blank. For example, Prototype, Basic, or Advanced.

Range is the weapon's distance factor in attacking targets. Weapons may use Space Ranges or World Ranges. Range in either case uses a term which translates to a range band.

Mount states the type of weapon mount used with the weapon.

Weapon Name details the precise nature of the mechanism and provides insights into how it operates.

Tech Level identifies the Technological Level at which the Weapon is commonly manufactured. TL is required.

C+S. A weapon identifier may have an additional element indicating the Controlling Characteristic and Skill level of the operator. If the weapon is controlled by a Gunner, Brain or Computer, the applicable C+S is used. C+S is shown as a plus and a number inside parentheses. For example, the operator assigned to a specific weapons installation is C4=7 and Bay Weapons-3; the weapon LongName includes (+10) for the C+S value.

Until an operator for a weapon is assigned, (+C+S) is omitted).

IDENTIFYING MISSILES

Stage	Missile	-Size	Type	Guidance

Missile-5X HW

Missile-5 Explosive Warhead Hard-Wired Guidance

Missiles are a special case and are identified separate from their Launcher. A Missile LongName consists of

Missile - Size - Warhead - Guidance.

When a missile is used, it takes its TL and (C+S) from its Launcher.

Missile is the weapon identifier: it is always the word: Missile.

Size is the Missile's Object Size from 1 to 7. For example, Missile-1 is a Bullet.

Type describes the warhead or attack capability. For example, N is Nuclear.

Guidance is the system which controls the missile and directs it to its target. For example, OG is Operator Guided: the Gunner in the Launcher guides the missile to it target. Such a system may include radar guidance, direct joystick control, or some other means.

The Concept of Missile Includes

Traditional missiles, Bullets, various projectiles, Bombs, Deadfall Ordnance, Metal Slabs launched from Rail Guns, and other systems.

THE MOUNTS

The effectiveness of Space Weapons depends in large part on the size of the Weapon Mount. Space Weapon Mounts are the physical structures in which weapons are installed.

Mounts determine the skill required to operate the weapon, the Mod on the Space Weapon Task, and (in most cases) the Hits the weapon inflicts.

Allocating Mounts

Each Type of Weapon requires a minimum size for its Mount (Minimum Mount as noted in the Space Weapon Types Table).

Mounts may be upgraded. Turrets may be upgraded to larger Turrets or to Barbettes. Bays may be upgraded to Large Bays.

But, Particle Accelerators may be upgraded through all larger Mounts.

Limits On The Number of Mounts. Every hull has one Hardpoint per 100 tons. One Mount may be installed at each Hardpoint. In some cases (Main), the Mount will occupy more than the 100 tons associated with that Hard Point. In some cases (Bay or Large Bay), the Mount will occupy much of the 100 tons associated with the Hard Point.

Mount Power. Mounts are self-contained for battle survivability purposes. They carry their own life support (1 week) and their own power modules. They carry their own operating computer (which is networked to the ship's main computer).

Deployable Mounts

A Deployable Mount is a Mount capable of being launched from (and recovered by) a ship.

Only Turret and Barbette can be made Deployable.

Uses. Deployables have a variety of uses. If a deployed turret is targeted enemy fire, damage is restricted to the Deployable. Deployables detected by Sensors do not betray the location of the ship itself. Deployables can serve as Life Pods.

Operations. It can maneuver under its own power (it has G-Drive= 1-G which restricts it to about 5 km from its ship, or within10 D of a nearby planet S=5 R=10). may be launched from the ship and may maneuver under its own power.

Endurance. Deployables carry life support and power for about two weeks.

Armor. A Deployable Mount is armored the same as the hull.

THE SPACE WEAPON TASK

		TL	Char	Skill	Mod
nD	**<**	**T**	**+C**	**+S**	**+M**
n = Range **(S= or R=)**			Use: C4 C5	Use: Wpn	TSM Mount

A Weapon cannot operate beyond its stated Range.

USING SPACE WEAPONS

Weapons may attack targets which their ship has detected. In some cases, weapons (usually missiles) may be launched without a specific target detected or identified.

Space Weapons attack using the Space Weapon Task.

Range determines the number of Dice rolled to hit.

Technology, Characteristic and Skill, and applicable Mods determines the Target Number. The size of the Space Weapon (based on its weapons mount and applied as a Mod) is a major element of the Space Weapons Task.

The Type of weapon determines which defenses and armors it can ignore and which it must overcome.

If the Hits the target and successfully overcomes any armor and protections, it inflicts damage based the Weapon Mount Size.

The Weapon Type determines the type of damage inflicted.

Typical Mods are Weapons Mount and Target Size Modifier (=Target Size minus Range).

CREATING WEAPONS

The abilities and effectiveness of Weapons is determined primarily by Type and Tech Level.

The Weapons available to a ship are determined by the Tech Level of the constructing shipyard (although characters may upgrade their ship's weapons as better ones become available).

Similarly, the Space Weapons available to worlds or bases is determined by its governing tech level.

The Space Weapon Creation Process

Space Weapons are selected from the Space Weapons List and modified by Stage and Range. Tonnage is rounded to the nearest Ton with minimum of 1 ton for Ships and actual tonnage for Small Craft. Costs are not rounded.

1. Base Weapon. Select a Base Weapon Type from the Space Weapon List. Note its Model Letter and Tech Level.

Note its base cost and base range.

Note the weapons Minimum Mount.

2. Mount. Select a Mount for the Weapon. The original minimum Mount may be used, or it may be upgraded. Mounts below Bay cannot be upgraded above Dual Barbette.

Note the Mount tons, Mod, Hits, and Cost.

3. Range. Increase or decrease the base Range using the Space Weapon Range Effects Table and note its consequences for Tech Level, Tonnage, and Cost.

A Weapon cannot be improved beyond its maximum range (R=10 for World Ranges; S=12 for Space Ranges).

3. Stage. The base Stage for Weapons is Standard. Increase or decrease the base Stage using the Stage Effects Table and note its consequences for Tech Level, Tonnage, and Cost.

4. C+S. If the operator is known, add Characteristic and Skill.

WEAPONS AND WEAPONS EFFECTS

The array of available Space Weapons ranges from the simple to the complex. The following descriptions provide a basic understanding of the principles and realities of the weapons.

The Weapon Charts. Weapons Attacks-1 and -2 show the ranges at which various weapons operate (including maximum range).

Particle Accelerators

Particle Accelerators project subatomic particles in focused beams. Interaction with the target produces physical and radiation damage.

Particle Accelerators operate in two distinct modes: in space and in atmosphere.

In Space. PAs in space use Space Ranges S=. They have an effective range limit of about S=7, beyond which the particle beam is too dissipated to do damage.

In Atmosphere. PAs operating in atmosphere (that is, attacking a target which is in atmosphere) use World Ranges R=, and shed 1D of damage for each layer of atmosphere the beam penetrates.

Theoretically, a Particle Accelerator at S=7 (its maximum possible range) could attack a target on a world surface). It would use R= 12 because the target is in atmosphere, and its particle beam would shed 1D for Range Band of atmosphere it penetrates, typically Bands 1 to 7. A PA Barbette would lose effectiveness before the beam hit the target; a Main Mount could potentially hit and damage the target.

Slug Throwers

Slug Throwers are heavy duty Guns or Gatlings firing Missile-2 Slugs (either solid or explosive).

Although Size-2 Slugs are technically Missiles, Slug Throwers (Code = B) do not appear on the Defenses: AB AM Mode Table under Attacker; they are not subject to Anti-Missile Defenses.

CommCasters

CommCasters are dedicated information and communications links between the ships.

Sensor Data. Two ships, each with CommCasters can share Sensor Data, and each may attack targets sensed by the other.

Virtual Battery Fire. Ships (each equipped with CommCaster) can attack the same target with weapons of the same Type (but not necessarily the same TL or Mount). The hits inflicted by the weapons are summed.

DataCasters

DataCasters spew vast amounts of data at targets attempting to confuse, distract, or overload enemy sensors. Its transmitters are constantly searching across many communications and sensor bands for opportunities to introduce spurious data.

Sensor Overload. Successful DataCaster Attacks on Sensors or Comms inflict Damage on a specific Sensor or Comm.

Successful DataCaster attacks on non-Sensor, non-Comm locations insert a Virus or an Applet (or multiples).

Applet. An Applet produces annoying spoof messages on the control console associated with the Hit Location. The component in that Location receives Mod -1 for operation.

Virus. A Virus successfully introduced onto a ship disables the Component at the Hit Location.

In each successive Combat Round, the Virus may attack an adjacent Hit Location and succeeds if 1D < Computer + Virus.

For example, a Virus is assigned a value = 1D = 3. It attacks an adjacent Hit Location Power Plant controlled by Computer/2. It must roll 1D for 2+3 or less = 5. If successful, that location is disabled.

A Virus is isolated if all computer connections are cut between the Virus disabled locations and all other hit locations. The computers can operate independently; but this step prevents use of batteries and commcasters, and restricts the use of weapons to R=7 or less.

Stasis Projector

A Stasis Projector imposes a series of Stasis Fields (varying in size from 1 cm to 1.5 m) along a line extending from its projector. The fields tend to form around objects; all molecular activity within the field is suspended; time stands still within an active field. The field remains in effect until released. When the field is released, its contents continue unaffected.

However, their connections with the rest of the ship have been severed. The result is a crippling effect on the component Hit Location.

The litter of stasis project or attacks lingers long after the battle. Stasis bubbles filled with battlefield debris can be destabilized with a hand-held Mag Scrambler to reveal their contents: personnel, artifact, ruined equipment, even captured explosions.

Jump Inducer

The Jump Inducer channels the energies of a ship's Jump Drive into disastrous jump-like effect on a target.

The name Jump Inducer is misleading: the weapon induces a misjump of components of a ship. The misjump essentially disintegrates the components.

A Jump Inducer requires an operating on its ship.

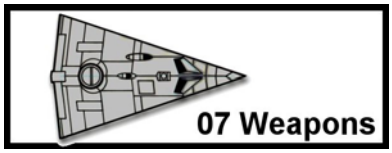
Disruptor

The Disruptor suppresses the charge on the electron. Chemical bonds break; compounds disintegrate. With the electron charge suppressed, atomic nuclei exhibit a positive charge and repel their neighbors, creating an expanding cloud of particles.

The Disruptor is a relatively slow weapon. Focused on a target, it boils away armor layers over the course of minuted. Once out of the Disruptor beam's influence, the electrons' negative charge reasserts itself,

Space Weapons

Space weapons are the offensive tools of starships and spacecraft. They are produced in a variety of types and tech levels. Create weapons as needed from this page.



SPACE WEAPON DESCRIPTION

Model	LongName = Stage Range Mount Type-TL (C+S)

The basic information required to describe and use a space weapon.

IDENTIFYING SPACE WEAPONS

R= or S=

Stage Range Mount Type -TL (C+S)

Adv LR T1 Msl -11 (10)

SPACE WEAPON TYPES

	Space Weapon	TL	Minimum	R=	S=	MCr
A	Particle Accelerator	11	Barbette	7*	7*	2.5
B	Slug Thrower	9	Turret	7		
C	CommCaster	8	Turret		7	
D	DataCaster	10	Turret	7		
E	Stasis	19	Turret	7		
F	Fusion Gun	12	Barbette	7		1.5
G	Meson Gun	13	Main		7	5.0
H	Inducer	18	Turret	7		
I	--- not used ---					
J	Mining Laser	8	Turret	7		0.5
K	Pulse Laser	9	Turret	7		1.0
L	Beam Laser	10	Turret	7		0.5
M	Missile	8	Turret		7	0.2
N	KK Missile	10	Bay		7	3.0
O	--- not used ---					
P	Plasma Gun	10	Barbette	7		1.0
Q	Ortillery	12	Bay	7		
R	Rail Gun	12	Bay		5	
S	SandCaster	9	Turret	7		0.1
T	Jump Damper	14	Barbette	7		
U	Tractor/Pressor	15	Barbette	7		
V	Salvo Rack	10	Bay		7	
W	Disruptor	17	Barbette	7		
X	Hybrid K-S-M	9	Triple Turret*	7		1.5
Y	Hybrid L-S-M	10	Triple Turret*	7		1.0
Z						

Minimum= minimum required mount for this weapon.
* Particle Accelerator uses S= in Space Attacks.
* Only available in this Mount.

C+S CHARACTERISTIC PLUS SKILL

Char	Use C4 or C5.
Skill	Use Skill= Gunner plus Knowledge= Turrets, Bays, Ortillery, or Spines (includes Main). Nuclear Missiles requires Heavy Weapons + WMD in place of any other Skills/Knowledges.

SPACE WEAPON MOUNTS

	Mount Type	Tons	Mod	Hits	Skill	MCr
T1	Single Turret	1	- 3	1	Turret	0.2
T2	Dual Turret	1	- 2	2	Turret	0.5
T3	Triple Turret	1	- 1	3	Turret	1.0
T4	Quad Turret	1		4	Turret	1.5
B1	Barbette	3	0	3	Turret	3.0
B2	Dual Barbette	3	+2	5	Turret	4.0
De	Deployable	+2			Turret	3.0
Bay	Bay	50	+5	10	Bay*	5.0
LBay	Large Bay	100	+8	20	Bay*	10.0
M	Main	200	+10	30	Spine	20.0
S	Spine	Not available for ACS ships.				

*Ortillery and Rail Gun governed by Skill= Ortillery.
Hardpoints. One mount per 100 tons of ship.
Deployable. In addition to Turret or Barbette costs.

STAGE EFFECTS **(applies to Weapon)**

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	+3	+10
Pr	Prototype**	- 2	3 of 5	-3	+2	+3
Er	Early	- 1	1 of 5			+2
	(Standard)	+0				
Im	Improved	+1	+1 of 5			
Ad	Advanced	+2	+3 of 5	+1		

Install added tons adjacent to the Mount.

WEAPON RANGE EFFECTS S= **(applies to Mount)**

S=		Range	TL	Tons	Cost
2	**FR**	Fighter Range	- 2		/2
5	**SR**	Short Range	- 1		/2
7	**AR**	Attack Range	0		(standard)
9	**LR**	Long Range	+1	+2	x3
12	**DS**	Deep Space	+2	+3	x5

Applies to Bays, Large Bays, and Mains

WEAPON RANGE EFFECTS R= **(applies to Mount)**

R=		Range	TL	Tons	Cost
5	**Vl**	Vlong 1000 m	- 2		/2
6	**D**	Distant 5 km	- 1		/2
7	**Vd**	Vdistant 50 km	+0		(standard)
8	**Or**	Orbit 500 km	+1	+2	x3
9	**Fo**	Far Orbit 5000 km	+2	+3	x5
10	**G**	Geo 50,000 km	+3	+4	x8

Applies to Turrets and Barbettes

Space Missiles

The missiles launched from starships and spacecraft is available in a variety types to suit user needs.

Missiles

MISSILE DESCRIPTION

Model	LongName (Mount) Missile-Size Type Guidance

The basic information required to describe and use a space weapon.

IDENTIFYING MISSILES

Stage Missile -Size Type Guidance

Missile-5X HW

A Missile is identified separately from the launching Mount, it takes its TL and Mod from its Launching Mount and its C+S from its Guidance System.

Missiles include: projectiles, bombs, deadfall ordnance.

SPACE WEAPON TYPES- MISSILE

		Size	Types	Guidance
B	MachineGun	1	S	UG
B	Slug Launcher	2	SX	UG
V	Salvo Rack	3	XE	HW OG
Q	Ortillery	4 5 6	D	UG HW
M	Missile	5	XENYZ	OG HW SA DL
N	KK Missile	6	K	OG HW SA DL
R	Rail Gun	6	X	UG HW

MISSILE TYPES

Missiles are produced in Types SDXENKYZ.

S Slug. Solid metal projectile.

D Deadfall. Solid projectile crafted to survive passage through atmosphere to target.

X Explosive. High explosive charge. Explodes on impact or when very near the target.

E EMP. ElectroMagnetic Pulse to disable electronics.

N Nuke. A nuclear weapon or device.

K Kinetic. Inflicts damage through high velocity impact.

Y Decoy. Appears as SDXENZ (but not KY).

Z Sensor Package. Single-use sensor package.

MISSILE SIZES

Missiles are produced in Sizes 1-2-3-4-5 to Object Size.

MISSILE GUIDANCE

Missiles guidance systems may be:

UG. UnGuided. No guidance system.

HW. Hardwired (5). Circuits direct missile to the target.

OG. Operator Guided (C+S). Gunner directs missile to the target (must be launched from S=2 or less).

SA. Self-Aware (C+S). Missile is controlled by an on-board self-aware Brain.

DL. Down Loaded (C+S). Missile is controlled by the downloaded personality of the Gunner.

MISSILE TYPES AND EFFECTS

				Effects (in D)					
				S	**D**	**X**	**E**	**N**	**K**
Sz	**Missile**	**Type**		Slug	Deadfall	Explosive	EMP	Nuke	Kinetic
1	Missile-1	Bullet	S	Pen= 0					
2	Missile-2	Slug	SX	Pen= 1		Pen= 2			
3	Missile-3	Vsmall Missile	SXE	Pen= 2		Pen= 3	EMP= 3		
4	Missile-4	Small Missile	DXE		ME	Pen= 4	EMP= 4		
5	Missile-5	Missile	DXEN		ME	Pen= 5	EMP= 5	ME	
6	Missile-6	Small Craft	XK		ME	Pen= 6			Pen= 6xSp^2
7	Missile-7	Ship	K		ME				Pen= 7xSp^2

Hits inflicted are in D. For example, Pen-1 inflicts 1D Hits Kinetic = Sp = Speed = Space Range of Attack.

ME= Massive Explosion. Missile-6K is a G-Drive powered Small Craft. Missile-7K is an M-Drive powered Ship.

Massive Explosion **Missile Warhead**

R=	Proximity	Sz-1D	Blast	BFE*	Rad	Burn
0	Direct Hit	5		Vaporized= 100D		
1	Hit	6	90 D	20 D	10 D	30 D
2	Hit	7	40 D	15 D	10 D	20 D
3	Vnear Miss	8	30 D	10 D	10 D	10 D
4	Near Miss	9	10 D	5 D	5 D	5 D
5	Far Miss	10	5 D	1D	1D	1D
6	Miss	11				

* BFE= Bang, Flash, EMP (EMP only with Nukes).

MASSIVE EXPLOSION ADJUSTMENTS

Missiles-4-5-6-7 can inflict Massive Explosion.
Missile-5 is the Benchmark for effects.
Missile-4 inflicts one-tenth damage,
Missile-6 inflicts double damage.
Missile-7 inflicts triple damage
Bang=0 if in space.
Non-Nuke ignore EMP and Rad.
Explosive (not Nuke) inflicts one-tenth damage.
AM Anti-Matter inflicts additional triple damage.

Space Weapons

The brief, basic details and descriptions of available space weapons are shown here.

SPACE WEAPONS

	Type	TL	Mount
A	PAW	11	B1
B	Slug Thrower	9	T1
C	CommCaster	8	T1
D	DataCaster	10	T1
E	Stasis	19	T1
F	Fusion Gun	12	B1
G	Meson Gun	13	Main
H	Inducer	18	T1
I	--- not used ---		
J	Mining Laser	8	T1
K	Pulse Laser	9	T1
L	Beam Laser	10	T2
M	Missile	8	T1
N	KK Missile	10	Bay
O	--- not used ---		
P	Plasma Gun	10	B1
Q	Ortillery	12	Bay
R	Rail Gun	12	Bay
S	SandCaster	9	T1
T	Jump Damper	14	B1
U	Tractor/Pressor	15	B1
V	Salvo Rack	10	Bay
W	Disruptor	17	B1
X	Hybrid K-S-M	9	T3
Y	Hybrid L-S-M	10	T3
Z			

SPACE WEAPON MOUNTS

	Mount Type	Skill
T1	Single Turret	Turret
T2	Dual Turret	Turret
T3	Triple Turret	Turret
T4	Quad Turret	Turret
B1	Barbette	Turret
B2	Dual Barbette	Turret
De	Deployable	Turret
Bay	Bay	Bay*
LBay	Large Bay	Bay*
M	Main	Spine

*Ortillery and Rail Gun governed by Skill= Ortillery.

Deployable. In addition to Turret or Barbette costs.

A PARTICLE ACCELERATOR

Particle Accelerators project subatomic particles in focused beams. Interaction with the target produces physical and radiation damage.

Charged particles travel well in atmosphere but poorly in space. Neutral particles travel well in space but poorly in atmosphere. Particle Accelerators are able to switch their output depending on the target. A PA attacking in space uses S= Space Ranges; attacking targets in atmosphere use R= World Ranges.

A Particle Accelerator. Base TL=11. Minimum Mount= Barbette.

B SLUG THROWER

Slug Throwers are heavy duty Guns or Gatlings firing Missile-2 slugs.

B Slug Thrower. Base TL= 9. Minimum Mount= Single Turret.

May be used in Anti-Missile Mode.

C COMMCASTER

CommCasters are dedicated information and communications links between the ships. Any ship with a CommCaster can share all of its sensor data with any other ship also equipped with a CommCaster (subject to lightspeed delay).

Ships with CommCaster can participate in Battery Fire.

C CommCaster. Base TL= 8. Minimum Mount = Single Turret.

D DATACASTER

DataCasters are offensive weapons broadcasting or beamcasting petabytes of information at or against enemy sensors and communicators. DataCasters pursue three strategies: they attempt to spook or overload sensors, they attempt to introduce viruses into onboard systems through flaws in sensor inputs, and they transmit tailored psychological messages and propaganda.

D DataCaster. Base TL= 10. Minimum Mount = Single Turret.

May be used in Anti-Missile Mode.

E STASIS PROJECTOR

A Stasis Projector imposes a series of Stasis Fields (varying in size from 1 cm to 1.5 m) along a line from its projector. The fields tend to form around objects; all molecular activity within the field is suspended; time stands still within an active field. The field remains in effect until released. When the field is released, its contents continue unaffected.

However, their connections with the rest of the ship have been severed. The result is a crippling effect on the component.

E Stasis Projector. Base TL= 19. Minimum Mount= Single Turret.

May be used in Anti-Missile Mode.

F FUSION GUN

Fusion Guns fire beams of super-heated plasma at their targets and cause damage by their intense heat and kinetic energy. Fusion Guns operate at higher temperatures than Plasma Guns (in which the plasma actually undergoes fusion).

F Fusion Gun. Base TL = 12. Minimum Mount= Barbette.

May be used in Anti-Missile Mode.

G MESON GUN

Meson Guns create Muons and charged Pions and project them in focused beams at near lightspeed toward a target. The speed is calculated to promote particle decay inside the target. The ultimate decay products (electrons and photons) inflict internal damage, having bypassed most defenses.

G Meson Gun. Base TL= 13. Minimum Mount= Main Weapon.

H JUMP INDUCER

A Jump Inducer projects a field which initiates Jump on a target component. The raw nature of the attack almost always creates a Misjump: transporting the target to a random location, usually in pieces.

A Jump Inducer requires a Jump Drive installed on its ship.

H Jump Inducer. Base TL= 18. Minimum Mount= Single Turret.

Space Weapons

The brief, basic details and descriptions of available space weapons are shown here.

J MINING LASER

The Mining Laser is an industrial strength Laser system created for asteroid mining. It primary use is slicing nickel iron asteroids at relatively close ranges.

J Mining Laser. Base TL= 8. Minimum Mount= Single Turret.

May be used in Anti-Missile Mode.

K PULSE LASER

Laser weapons fire concentrated beams of energy at their targets and cause damage through intense heat.

The Pulse Laser is a weaponized Mining Laser with improved power and range. It fires in intermittent pulses rather than continuous beams.

K Pulse Laser. Base TL= 9. Minimum Mount= Single Turret.

May be used in Anti-Missile Mode.

L BEAM LASER

The Beam Laser is the standard starship Laser weapon. It fires in continuous beams to inflict greater damage.

L Beam Laser. Base TL= 10. Minimum Mount= Single Turret.

May be used in Anti-Missile Mode.

M MISSILE

Missile systems launch Size-5 (roughly person size) Missiles at targets. The Missile itself (independently described) travels to the target and inflicts damage.

M Missile Launcher (or just Missile). Base TL= 8. Minimum Mount = Single Turret.

May be used in Anti-Missile Mode.

N KINETIC KILL MISSILE

The KK Missile Launcher is a dedicated Launcher for Size-6 (roughly vehicle size) missiles. The Missile itself (independently described) travels to the target and inflicts damage.

N KK Missile Launcher (or just KK Missile). Base TL= 10. Minimum Mount = Bay.

May be used in Anti-Missile Mode.

P PLASMA GUN

Plasma Guns fire beams of super-heated plasma at their targets and cause damage by their intense heat and kinetic energy (but the temperatures do not reach fusion levels).

P Plasma Gun. Base TL = 10. Minimum Mount= Barbette.

May be used in Anti-Missile Mode.

Q ORTILLERY

Ortillery (Orbital Artillery) systems launch a variety of Deadfall Ordnance (unpowered Size 4-5-6 Missiles) from near planet locations for attacks against world surface targets.

Q Ortillery. Base TL = 12. Minimum Mount= Bay.

R RAIL GUN

Rail Guns launch a variety of Size-6 Missiles at strategic world surface and orbital targets.

Rail Guns operate in remote regions of a system (usually planetoid belts or small moons) where they fabricate the bodies of their Missiles on-site (hardly more than slabs or billets of nickel-iron) and add guidance systems.

R Rail Gun. Base TL = 12. Minimum Mount= Bay.

S SANDCASTER

Sandcasters project clouds of sand (small crystalline particles) which obstruct incoming beam weapons.

Sandcaster is not technically a weapon; it is a defense.

S Sandcaster. Base TL= 9. Minimum Mount= Single Turret.

May be used in Anti-Laser Mode.

T JUMP DAMPER

A Jump Damper inflates the Diameter effect of a ship; ships within this enlarged field are prevented from initiating jump.

Although the system is mounted in a Barbette, its effect is spherical centered on the ship.

T Jump Damper. Base TL= 14. Minimum Mount= Barbette.

U TRACTOR/PRESSOR

Tractors and Pressors (they are reversed polarity versions of the same thing) are grav based remote manipulators. Each is capable of applying pressure (tractors pull an object toward it; pressors push an object away from it; each is capable of applying some lateral pressure).

U Tractor/Pressor. Base TL= 15. Minimum Mount= Barbette.

V SALVO RACK

A salvo Rack launches groups (salvos) of Size-3 missiles at a target.

V Salvo Rack. Base TL= 10. Minimum Mount = Bay.

W DISRUPTOR

The Disruptor suppresses the charge on the electron, breaking the chemical bonds which create molecules. The process creates a positively charged cloud of atomic nuclei which rapidly expands.

The (suppressed charge) neutral electrons regain their charge once out of the Disruptor beam and reattach to the positively charged nuclei.

Disruptors boil off armor in layers.

W Disruptor. Base TL= 16. Minimum Mount= Barbette.

X HYBRID K-S-M

Hybrid-X is a triple turret equipped with a Pulse Laser, a SandCaster, and a Missile Launcher.

In any turn, the turret may use any one of its weapons; the other two are not available

X Hybrid K-S-M. Base TL = 9. Required Mount= Triple Turret.

Y HYBRID L-S-M

Hybrid-Y is a triple turret equipped with a Beam Laser, a SandCaster, and a Missile Launcher.

In any turn, the turret may use any one of its weapons; the other two are not available.

X Hybrid K-S-M. Base TL = 10. Required Mount= Triple Turret.

Weapon Attacks-1

Space Weapons may attack previously detected targets which are at ranges allowed by this chart.

Weapons
Near Worlds

NEAR WORLD BIG WEAPONS			1000 m	5 km	50 km	500 km	5000km	50,000 km
		Contact	Vlong	Distant	Vdistant	Orbit	Far Orbit	Geo
S=	**Space Ranges**		**B**	**1**	**2**	**3**	**4**	**5**
			Boarding	Fighter Range		Short Range		
A	**11** PA (see Note)	|||||||						
C	**8** CommCaster	|||||||						
G	**13** Meson Gun	|||||||	|||||||	|||||||	|||||||	|||||||	|||||||
M	**8** Missile	|||||||	|||||||	[- - - - AM Mode - - - -]		Resolved In Next Turn	
N	**10** KKM	|||||||	|||||||	|||||||	|||||||	Resolved In Next Turn	
R	**12** Rail Gun	|||||||	|||||||			Resolved In Next Turn	
V	**10** Salvo Rack	|||||||	|||||||	[- - - - AM Mode - - - -]		Resolved In Next Turn	

NEAR WORLD SMALL WEAPONS		Contact	1000 m Vlong	5 km Distant	50 km Vdistant	500 km Orbit	5000km Far Orbit	50,000 km Geo
R=	**World Ranges>**		**5**	**6**	**7**	**8**	**9**	**10**
TL	Weapon		Boarding	Fighter Range		Short Range		
B	**8** Slug Launcher	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
D	**10** DataCaster	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
E	**19** Stasis	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]				|||||||||||||||||||	|||||||||||||||||||	|||||||||||||||
F	**10** Fusion Gun	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
H	**18** Jump Inducer							
J	**8** Mining Laser	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]					|||||||||||||||||||	|||||||||||||||
K	**9** Pulse Laser	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
L	**10** Beam Laser	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
P	**10** Plasma Gun	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
Q	**12** Ortillery	|||||||||||||||||||						
S	**9** SandCaster	[- - - - - - - - - - - - - - AL Mode - - - - - - - - - - - -]						
T	**14** Jump Damper	Creates 100D Field					|||||||||||||||||||	|||||||||||||||
U	**15** Tractor/Pressor							
W	**16** Disruptor	[- - - - - - - - - - - - - - AM Mode - - - - - - - - - - - -]						
X	**9** Hybrid K-S-M	[- - - - - - - - - - - - - - AB AM Mode - - - - - - - - - - - -]						
Y	**9** Hybrid L-S-M	[- - - - - - - - - - - - - - AB AM Mode - - - - - - - - - - - -]						

Weapons On this Chart Do Not Reach Beyond R=10

||||||||||= Attack Not Possible.

Particle Accelerators: Use S= for Space Targets; use R= for targets in Atmosphere.

Weapon Attacks-2

Space Weapons may attack previously detected targets which are at ranges allowed by this chart.

Weapons
In Space

		LONG RANGE	1 ls	2 ls	8 ls	16 ls	3 lm	8 lm	30 lm
		BIG WEAPONS	250,000km	500,000km	2.5 million	5 million	50 million	150 million	500 million
S=		**Space Ranges**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
TL		**Weapon**	Attack Range		Long Range		Deep Space		
A	**11**	PA (see Note)				|||||||||	|||||||||	|||||||||	|||||||||
C	**8**	CommCaster						|||||||||	|||||||||
G	**13**	Meson Gun						RINT	|||||||||
M	**8**	Missile	Launched at start of Battle. Attack occurs in Turn = Space Range.						
N	**10**	KKM	Launched at start of Battle. Attack occurs in Turn = Space Range.						
R	**12**	Rail Gun	Cannot participate in a Battle at this Range.						
V	**10**	Salvo Rack	Attack occurs in Turn = Space Range.			|||||||||	|||||||||	|||||||||	|||||||||
		World Ranges>	**11**	**12**	**13**	**14**	**15**	**16**	**17**
			Satellite						

Launched at start of Battle. Assumes the combatant has preplanned attacks. Resolved in Turn number equal to S.
RINT. Resolved In Next Turn. ||||||||| = Attack Not Possible.
Particle Accelerators: Use S= for Space Targets; use R= for targets in Atmosphere.

		OPERATING RANGES	Contact	1000 m	5 km	50 km	500 km	5000km	50,000 km
		FOR DEFENSES		Vlong	Distant	Vdistant	Orbit	Far Orbit	Geo
R=		**World Ranges>**		**5**	**6**	**7**	**8**	**9**	**10**
TL		Defense		Boarding	Fighter Range		Short Range		
G	**11**	Meson Screen		Exp and Pro	Early	Standard	Improved	Advanced	|||||||||
N	**12**	Nuclear Damper	Exp and Pro	Early	Standard	Improved	Advanced	|||||||||	|||||||||
Q	**14**	Mag Scrambler	Exp and Pro	Ear and Std	Imp and Adv	|||||||||	|||||||||	|||||||||	|||||||||
R	**19**	Proton Screen	Exp and Pro	Early	Standard	Imp and Adv	|||||||||	|||||||||	|||||||||
T	**16**	Black Globe	Standard and Earlier	Improved and Advanced	|||||||||	|||||||||	|||||||||	|||||||||	|||||||||
U	**20**	White Globe			|||||||||	|||||||||	|||||||||	|||||||||	|||||||||
W	**17**	Grav Scrambler	Exp and Pro	Ear and Std	Imp and Adv	|||||||||	|||||||||	|||||||||	|||||||||

This table shows the size of the protective field created by the defense. The attacking weapon resolves the Absolute Mode Defense Task when it enters the range band at the edge of the protective field.

TL		Defense	Affects
G	**11**	Meson Screen	Meson Gun
N	**12**	Nuclear Damper	Nukes
Q	**14**	Mag Scrambler	Stasis Projector. Magnetics. Anti-Matter
R	**19**	Proton Screen	Anti-Matter
T	**16**	Black Globe	All
U	**20**	White Globe	All
W	**17**	Grav Scrambler	Jump Damper, Jump Inducer, J-Drive, M-Drive, G-Drive

Space Defenses and Armor

A starship defends itself with a variety of systems each designed to reduce or eliminate an attack before it can inflict damage.

Space defenses include active systems (which attack incoming weapons) and passive systems (which reduce or block the force of attacks). Each has its place, and a well-designed starship has a variety of defenses.

UNDERSTANDING SPACE DEFENSES

Space defenses are designed to reduce or eliminate attacks.

Active Systems. Some space weapons have defensive abilities; for example, a laser turret may attack and destroy incoming missiles. Active systems are space weapons previously created which are assigned defensive roles.

Passive Systems. Passive defense systems block attacks, usually by interposing sum effect which interferes with the attacking system. For example, a Meson Screen blocks the effects of a Meson Gun.

Armor. The oldest form of defense is Armor. Ships may be equipped with layers of defensive armor to block attacks (and to block natural effects such as temperature or pressure).

IDENTIFYING SPACE DEFENSES

Space Defenses can be identified by Name, LongName, Letter, or Model.

By Name. Defenses carry simple names that generally identify the principle or purpose.

By Letter. Each Defense is assigned a single letter identifier. This letter suffices as an abbreviation when additional information is not required. For example, Nuclear Damper is N.

By LongName. Specifically created Defenses are given a LongName which includes its stage, type and other information. For example, an Advanced Nuclear Damper-14.

By Model. Abbreviations for the elements of the LongName are used to create the Model of a specific Defense. For example, ImpN-14.

USING SPACE DEFENSES

Defenses function in reaction to an attack.

Active Defenses which have been assigned an AB Anti-Beam Mode or AM Anti-Missile Mode respond to such attacks.

Absolute Defenses are interposed between the attacker and the target (the ship). Each related attack must pass through its Absolute Defenses before it may attack the ship.

For example, a G Meson Screen is an Absolute Defense against a meson Gun attack. Every Meson Gun shot must successfully pass through the Meson Screen before reach the target.

Armor is the last line of defense: any attack which has passed through Active and Passive Defenses finally attacks the ship's Armor. If that Armor is penetrated, damage is inflicted on the Target.

THE MOUNTS

Mounts are the physical structures in which defenses are installed.

Weapons As Defenses. Some weapons may be used as in the defensive Anti-Beam mode or the defensive Anti-Missile mode. They operate from their standard weapons mounts.

Defense Mounts

Absolute Mode Defenses may be installed in two different types of Mount: Internal or Bolt-In.

An **Internal Mount** is a location within the hull for the defensive mechanism. It is created during ship design specifically for the Defense.

A **Bolt-In Mount** is a retrofit location for the installation of a Defense at some point after construction.

Consoles

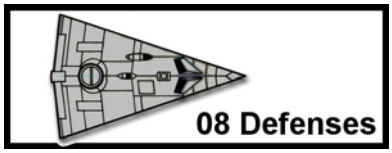
The operating position for a Defense is its Console.

The operating position for weapons used in defense is the weapon crew position (the turret or weapons mount).

Each Absolute Mode Defense requires a 1-ton Console on the Bridge. The console contains the Local Computer for the Defense and a display for the operator.

Space Defenses

Space defenses are creates to reduce or stop the effects of space weapons. Like space weapons, they are produced in a variety of types and tech levels. Create defenses as needed from this page.



SPACE DEFENSE DESCRIPTION

Model	LongName = Stage- Defense -TL (C+S)

The basic information required to describe and use a space defense.

IDENTIFYING SPACE DEFENSES

Stage	Defense	-TL	(C+S)
Imp	**Nuclear Damper**	**-11**	**(10)**

SPACE DEFENSES

	Space Defenses	TL	Absolute Mode vs	MCr
G	Meson Screen	11	G	1.0
N	Nuclear Damper*	12	Nukes	1.0
Q	Mag Scrambler	14	E Magnetics	1.0
R	Proton Screen	19	AM	1.0
T	Black Globe	16	-all-	4.0
U	White Globe	20	-all (except D)	10.0
W	Grav Scrambler	17	H T Gravitics	2.0
Z				

* Nuclear Damper requires TWO separate Mounts.
** Vs Weapon (but not its fire).

SPACE DEFENSE MOUNTS

	Mount Type	Tons	Mod	Skill	MCr
In	Internal	1	+1	Screens	0.5
Bo	Bolt-In	2	-1	Screens	0.5
	Console	1		Screens	0.0

Each Absolute Mode Defense requires an Internal or Bolt-In Mount (anywhere in the ship) and a Console (on the Bridge).

SPACE WEAPONS DEFENSE MODE

		Space Defenses	TL	Mode	Skill
>	**B**	Slug Launcher	9	AM	Use: Weapon Mount skill, or may use Screens
>	**D**	DataCaster	10	AM	
>	**F**	Fusion Gun	12	AM	
>	**J**	Mining Laser	8	AM	
>	**K**	Pulse Laser	9	AM	
>	**L**	Beam Laser	10	AM	
>	**M**	Missile	8	AM	
>	**P**	Plasma Gun	10	AM	
>	**S**	SandCaster	9	AB	
>	**V**	Salvo Rack	10	AM	
>	**X**	Hybrid K-S-M	9	AB AM	
>	**Y**	Hybrid L-S-M	10	AB AM	

Weapons are installed under Weapons but may be used in Defense Modes.

STAGE EFFECTS

	Stage	TL	QREBS	Mod	Tons	Cost
Ex	Experimental*	- 3	Full	-4	x3	+10
Pr	Prototype**	- 2	3 of 5	-3	x2	+3
Er	Early	- 1	1 of 5			+2
St	(Standard)	+0				
Im	Improved	+1	+1 of 5			
Ad	Advanced	+2	+3 of 5	+1		

Tons applies to Mount for non-Weapons.

GLOBES

A Globe absorbs cumulative Damage not to exceed:

Hull Tons x Jump Drive Potential

Overload. If Damage exceeds this value, the Black Globe Generator is destroyed and the Jump Drive is Destroyed.

Ejecting Accumulated Energy. A ship may eject accumulated energy by Jumping, or venting Energy = Hulls Tons per Turn.

DEFENSE ABSOLUTE MODE

Attacker		Defender
T+C+S+M	**<**	**T+C+S+M**
G	<	G
Nuke.M-5N	<	N
E	<	Q
AM	<	RQ
-all-	<	T
all (but D)	<	U
HT G*M*	<	W

Attack fails if Attacker T+C+S+M is less than Defender T+C+S+M.

* G-Drive or M-Drive.

DEFENSE AB AM MODES

Attacker		Defender
1D	<	Mount
	<	1 = T1
	<	2 = T2 B1
	<	3 = T3
	<	4 = T4 B2
	<	5 = Bay
	<	6 = LBay
	<	7 = Main
AFJKLPW	<	S
MNQRV	<	BFGJKL

Defender is a Weapon Mount. Defender rolls equal or less on 1D to stop the attack.

Space Defenses

The basic details of available space defenses are shown here.

SPACE DEFENSES

	Space Defenses	TL
G	Meson Screen	11
J	Jammer *	11
N	Nuclear Damper	12
Q	Mag Scrambler	14
R	Proton Screen	19
T	Black Globe	16
U	White Globe	20
W	Grav Scrambler	17
Z		

SPACE DEFENSE MOUNTS

	Mount Type	Skill
In	Internal	
Bo	Bolt-In	
	Console	Screens

Each Absolute Mode Defense requires an Internal or Bolt-In Mount (anywhere in the ship) and a Console (on the Bridge).

G MESON SCREEN

The Meson Screen interacts with all incoming high energy particles and disrupts their rate of decay: some decay instantly and harmlessly expend their energy; others do not decay and pass harmlessly through the ship.

G Meson Screen. Base TL = 11.

N NUCLEAR DAMPER

The Nuclear Damper creates an interference field which manipulates the Strong nuclear force causing nuclei to shed neutrons. The effect prevents nuclear explosions.

The Nuclear Damper requires dwo separate Mounts installed at different locations on the ship.

N Nuclear Damper. TL=12.

Q MAG SCRAMBLER

The Mag Scrambler interrupts magnetic effects in mechanisms.

It specifically counters the operation of the E Stasis Projector (A Stasis Field cannot be established around an operating Mag Scrambler).

The Mag Scrambler's interference with magnetic fields disrupts the protective encapsulating magnetic field around Anti-Matter. The Defense is used against Anti-Matter missile warheads.

Q Mag Scrambler. TL= 14.

R PROTON SCREEN

The Proton Screen is a defense field which interacts with anti-matter warheads.

R Proton Screen. TL = 19.

T BLACK GLOBE

The Black Globe generator produces an impenetrable black enveloping globe around its mechanism. Matter cannot penetrate the globe, and energy (including impact energy) is absorbed (the lack of reflection provides the characteristic black appearance).

The disadvantage of the Black Globe is that a ship is unable to use any sensors while the Black Globe is operational.

A Black Globe can absorb cumulative Damage equal to:

Hull Tons x Jump Drive Potential.

T Black Globe. TL= 16.

U WHITE GLOBE

The White Globe generator is an advanced version of the Black Globe generator.

The White Globe adds an ability to **flicker** the field so that sensors can be used, and the field reradiates absorbed energy immediately (creating the characteristics glowing white appearance).

A White Globe can absorb cumulative Damage equal to:

Hull Tons x Jump Drive Potential.

U White Globe. TL 20.

W GRAV SCRAMBLER

The Grav Scrambler interferes with the operating principles of Jump, Maneuver, and Gravitic drives.

It is a defense against Jump Projector and Jump Damper, and it prevents the operation of Maneuver and Gravitic drives within its operational field.

W Grav Scrambler. TL 17.

Starship Armor

Starship hulls are constructed from the materials commonly available at the building Tech Level.

Starship Armor

IDENTIFYING SPACE ARMOR

Layers Stage Armor AV (TL)

Triple Std LiteMetal-9 (TL-15)

ARMOR PROTECTS

Starship hulls have a protective armor value. A hull may be made of any armor available at the TL of the building starport.

Armor is applied in layers. The first layer (at hull TL) is automatic and cost is included in the cost of the hull.

Additional Armor Layers

Hulls A-B-C-D-E-F-G-H-J = 1 ton
Hulls K-L-M-N-P-Q-R-S-T = 2 tons
Hulls U-V-W-X-Y-Z = 3 tons
per layer, per 100 tons of Hull.

ARMOR TYPES

TL	Type		Pen	Rad	Blast	Heat
7	Armor-1					
8	Ceram-2			**/2**		
9	Organic-3	**SH**				
10	Dense-4	**LT/2**		**x2**		
11	Polymer-5	**SH**				**/2**
12	Charged-6					
13	SDense-7	**LT/3**		**x3**		
14	Kinetic-8				**x2**	
15	LiteMetal-9					
16	VliteMetal-10					
17	Hullmetal-11					
18	Geneered-12	**SH**		**/2**		
19	Hydrogen-13			**x2**		
20	Strange-14		**x3**			
7	Composite-1		**x2**			
10	Crystaliron-4					

SH= Self Healing. **LT**= Layer Tonnage.

AVAILABLE ARMOR TYPES

TL	Experimental	Prototype	Early	Standard	Improved	Advanced	HullSteel
4	Armor-1 (/3)						
5	Ceram-1 (/3)	Armor-1 (/2)					
6	Organic-1 (/3)	Ceram-1 (/2)	Armor-1				
7	Dense-1 (/3)	Organic-2 (/2)	Ceram-2	Armor-1			
8	Polymer-2 (/3)	Dense-2 (/2)	Organic-3	Ceram-2	Armor-3		HullSteel-1
9	Charged-2 (/3)	Polymer-3 (/2)	Dense-4	Organic-3	Ceram-4	Armor-5	HullSteel-2
10	SDense-2 (/3)	Charged-3 (/2)	Polymer-5	Dense-4	Organic-5	Ceram-6	HullSteel-3
11	Kinetic-3 (/3)	SDense-4 (/2)	Charged-6	Polymer-5	Dense-6	Organic-7	HullSteel-4
12	LiteMetal-3 (/3)	Kinetic-4 (/2)	SDense-7	Charged-6	Polymer-7	Dense-8	HullSteel-5
13	VliteMetal-3 (/3)	LiteMetal-5 (/2)	Kinetic-8	SDense-7	Charged-8	Polymer-9	HullSteel-6
14	Hullmetal-3 (/3)	VliteMetal-5 (/2)	LiteMetal-9	Kinetic-8	SDense-9	Charged-10	HullSteel-7
15	Geneered-4 (/3)	Hullmetal-6 (/2)	VliteMetal-10	LiteMetal-9	Kinetic-10	SDense-11	HullSteel-8
16	Hydrogen-4 (/3)	Geneered-6 (/2)	Hullmetal-11	VliteMetal-10	LiteMetal-11	Kinetic-12	HullSteel-9
17	Strange-5 (/3)	Hydrogen-7 (/2)	Geneered-12	Hullmetal-11	VliteMetal-12	LiteMetal-13	HullSteel-10
18		Strange-7 (/2)	Hydrogen-13	Geneered-12	Hullmetal-13	VliteMetal-14	HullSteel-11
19			Strange-14	Hydrogen-13	Geneered-14	Hullmetal-15	HullSteel-12
20				Strange-14	Hydrogen-15	Geneered-16	HullSteel-13
21					Strange-16	Hydrogen-17	HullSteel-14
AV	AV=TL-6-			TL-6			=TL-7
KCr	TL x 10	TL x 3	TL x2	TL	TL /2	TL /2	TL /2
	Full QREBS	3 of 5 QREBS	1 of 5 QREBS		+1 of 5 QREBS	+3 of 5 QREBS	QREBS=0

* Per 100 hull tons. For layers after the first. (/3) = Three layers required. (/2) = Two layers required.