THE QUICK SHIP DESIGN SYSTEM

Version 1.5

Certain situations in Traveller call for a different ship design than those provided. The Quick Ship Design System (QSD System) is a simple way of customizing and designing starships for Traveller. Ships designed with the QSD System are modular starships, assembled at the shipyard from standardized components.

The use of standardized components, and thus the economies of scale production, make starships constructed using this system cheaper than custom designed ships. Starships designed using the QSD System receive a 25% discount over the equivalent custom-built ship. The design tables below show the undiscounted list price of the components. When the ship design is completed, multiply all the final cost by 75% to reflect the discount for standardized, modular construction.

THE DESIGN SEQUENCE

The goal of the design sequence is to fill in the Universal Ship Description of the new ship. This will provide all of the necessary details of the ship, from its cargo capacity to its fighting weaponry and defenses.

Ship or Class Name and Type (Design System)

Tons: ### Std (Configuration)	Volume: ###### m^3	Cost: #### MCr
Crew: ####	High/Mid Pass: ####	Low: ##
Cargo: #### Std	Controls: Type (Bridge)	TL: ##

## Size	## Jump Drive (## Std/Pc Fuel)
	## Maneuver (Type, ## Mw)
##x BatteryName (##) #/##-##-##-##	## Power Plant (#x ##Mw)
##x BatteryName (##) ##/##	## Fuel (Scoop ##, Refine ##)
w/ ## MissileName #/# #G##	## Meson Screen (## Mw)
	## Sandcasters (#### Cans)
##x LaunchFacility (Craft)	## Nuclear Damper (## Mw)
##x HangarFacility (Craft)	A# P# J# Sensors (# Stealth/Cloak)
	## Armor, ## Structure

Crew Detail: ## Engineers, ## Electronics, ## Maneuver, ## Gunners, ## Screens, ## AuxCraft Crew, ## Troops/Marines, ## Command, ## Stewards, ## Medical

Notes:

THE DESIGN SEQUENCE

The design of the starship is a simple process of following the sequence below. When the Universal Ship Descriptor is completed, then the ship has been completely designed. Once the hull has been chosen, the total volume (in displacement tons) of the vessel will be known. All systems must fit in the volume of the ship hull chosen. The surface area of the ship is also critical to determine the type and number of external fittings on the ship. The surface area of added equipment and fixtures cannot exceed the total available surface area of the ship.

Select Mission
Select Hull
Calculate Volume Available
Select Jump Drive
Select Maneuver Drive
Select Avionics
Select Communications
Select Offensive Weapons
Select Defensive Weapons
Select Miscellaneous Equipment
Select Power Plant
Calculate Crew Requirements
Add Workstations
Add Bridge
Add Quarters
Calculate Cargo Space
Calculate Cost
Complete the USD

MISSION SELECTION

Select the Tech Level and mission for the ship. This will determine what sort of equipment will be needed. For example, a long range military ship will require a bigger hull and greater jump drives, not to mention weapons, whereas an intrasystem cargo vessel may only require a short jump drive, lots of cargo space, and no weapons. The requirements for weapons, defenses, passengers and cargo will be dictated by the ship's mission.

HULL

All vessels must have a hull; select one from the table below. Hull size is measured in Standard Displacement Tons (Std or simply tons), equal to 14 cubic meters, the volume of one metric ton (1000kg) of liquid hydrogen. All hulls include a life-support system, controls, airlocks (one per hundred tons displacement), cargo hatches (one per two hundred tons displacement), artificial gravity, inertial compensation systems and contra-gravity lifters in addition to the basic shell of the ship. Streamlined hulls also include fuel scoops capable of scooping 40% of the hull volume per hour. All of these hulls are available at any building yard, TL-10 or above.

Standard Hull Configurations

Configuration	Tons	MaxG	Armor	Structure	Volume	Power	Cost	Area	Length	USD Size
Wedge S	100	2	10	6	94.1	27.3	4.4	708.0	35	8
Needle S	100	4	20	9	92.8	27.2	4.5	612.0	42	8
Wedge A	100	6	20	10	89.2	26.9	5.4	924.0	35	8
Disk S	200	2	10	9	189.6	54.6	8.8	832.0	26	8
Box S	200	1	0	6	190.6	54.7	8.5	832.0	21	8
Cylinder S	200	4	20	11	187.8	54.5	8.8	760.0	34	8
Needle S	200	6	40	12	178.7	53.8	9.6	904.0	51	8
Disk S	300	4	20	12	281.9	81.7	13.7	1120.0	30	8
Cylinder A	400	1	0	9	381.3	109.4	17.3	1684.0	44	8
Needle A	400	3	10	12	376.2	109.0	17.9	1996.0	66	8
Wedge U	400	6	40	16	358.5	107.7	17.8	1993.0	55	8
Slab S	500	4	20	16	469.3	136.2	21.9	1996.0	66	8
Cylinder S	600	2	10	12	570.8	164.0	25.7	1708.0	50	8
Open Frame U	700	1	0	10	666.6	191.4	28.9	1916.0	95	8
Disk A	800	1	0	11	763.1	218.8	34.2	2931.2	42	8
Sphere U	800	2	60	14	724.2	215.9	36.7	2096.0	28	8
Sphere S	800	4	30	18	749.0	217.7	35.8	1856.0	28	8
Cylinder U	900	2	10	15	857.0	246.0	37.4	2498.0	58	8
Needle S	1000	3	10	18	947.8	273.0	43.1	2828.0	90	9
Needle A	1000	6	20	23	931.5	271.8	45.9	3701.6	90	9
Open Frame U	2000	1	0	16	1908.4	547.0	82.5	3710.0	126	9
Slab A	2000	4	30	25	1855.6	543.1	95.1	6548.0	99	9
Close Structure U	3000	2	10	23	2859.6	820.3	123.9	6938.0	74	9
Box U	4000	1	0	20	3825.2	1094.6	164.9	7240.0	59	9
Wedge U	5000	4	20	28	4745.3	1365.6	208.2	10396.0	128	9

Explanation of columns:
Config - The code for the ship's overall shape and degree of streamlining.
Tons - The exterior volume of the hull, in Standard Displacement Tons (tons = 14 cubic meters each).
MaxG - The maximum Gs of maneuver acceleration the hull is rated for.
Armor - The USD armor factor of the hull.
Structure - The USD structure factor of the hull.
Volume - The remaining, usable interior volume of the hull, in tons.
Power - The power required to run the hull's systems (life support and gravitics).
Cost - The cost of the hull and all it's systems, in millions of credits (MCr).
Area - The remaining, usable surface area in Square Meters.
Length - The approximate length of the hull, in meters.
USD Size - The USD Size Rating of the hull.

The degree of streamlining is indicated by a letter appended to the shape code number. Unstreamlined hulls, coded U, have no attention paid to the aerodynamic qualities of the hull. Such ships cannot enter an atmosphere without risk, and cannot skim gas giants for fuel. Streamlined ships, indicated by the letter S, have hulls that are faired into a sleek shape capable of high-speed travel through an atmosphere. Such ships may land on any world, and may skim for fuel. Airframe hulls, coded A, have lifting surfaces added so that they can fly (or at least glide) and maneuver aerodynamically within an atmosphere. Airframe ships may land on any world, and may skim for fuel.

DRIVES

Jump Drive

The Jump Drive provides a starship with the ability to move interstellar distances. Vessels that have a jump drive installed are starships. Vessels that do not are non-starships, used for in-system use. Starships and non-starships may also have a maneuver drive, to enable them to travel within a star system.

Determine the maximum possible jump range for the ship's tech level from the Jump Drive Technology table. Any jump capacity up to and including this maximum may be constructed.

Jump Drive Technology

TL	9	11	12	13	14	15
Jump	1	2	3	4	5	6

Cross-index the desired jump performance of the ship with the size of the hull on the Jump Drive Potential chart. The chart will indicate the size (in displacement tons) of the drive required. To find the other characteristics of the drive, locate the size of the drive on the Standard Jump Drives table below. Also note the fuel requirement (along the bottom of the Jump Drive Potential table): jump drives require fuel equal to 10% of the total displacement of the hull, per parsec jumped.

Jump Drive Potential

Jump	1	2	3	4	5	6
100	2	3	4	5	6	7
200	4	6	8	10	12	14
300	6	9	12	15	18	21
400	8	12	16	20	24	28
500	10	15	20	25	30	35
600	12	18	24	30	36	42
700	14	21	28	35	42	49
800	16	24	32	40	48	56
900	18	27	36	45	54	63
1000	20	30	40	50	60	70
2000	40	60	80	100	120	140
3000	60	90	120	150	180	210
4000	80	120	160	200	240	280
5000	100	150	200	250	300	350
Fuel	10%	20%	30%	40%	50%	60%

Standard Jump Drives

Volume	Cost	Area	Crew
2	8.4	9.3	0.1
3	12.6	14.0	0.1
4	16.8	18.7	0.1
5	21.0	23.3	0.2
6	25.2	28.0	0.2
7	29.4	32.7	0.2
8	33.6	37.3	0.3
9	37.8	42.0	0.3
10	42.0	46.7	0.3
12	50.4	56.0	0.4
14	58.8	65.3	0.5
15	63.0	70.0	0.5
16	67.2	74.7	0.5
18	75.6	84.0	0.6
20	84.0	93.3	0.7
21	88.2	98.0	0.7
24	100.8	112.0	0.8
25	105.0	116.7	0.8
27	113.4	126.0	0.9
28	117.6	130.7	0.9
30	126.0	140.0	1.0
35	147.0	163.3	1.2
36	151.2	168.0	1.2
40	168.0	186.7	1.3
42	176.4	196.0	1.4
45	189.0	210.0	1.5
48	201.6	224.0	1.6
49	205.8	228.7	1.6
50	210.0	233.3	1.5
54	226.8	252.0	1.5
56	235.2	261.3	1.6
60	252.0	280.0	1.6
63	264.6	294.0	1.6
70	294.0	326.7	1.7
80	336.0	373.3	1.8
90	378.0	420.0	1.9
100	420.0	466.7	2.0
120	504.0	560.0	2.2
140	588.0	653.3	2.4
150	630.0	700.0	2.5
160	672.0	746.7	2.6
180	756.0	840.0	2.8
200	840.0	933.3	3.0
210	882.0	980.0	3.1
240	1008.0	1120.0	3.4
250	1050.0	1166.7	3.5
280	1176.0	1306.7	3.8
300	1260.0	1400.0	4.0
350	1470.0	1633.3	4.5

Explanation of columns:
Volume - The size of the drive, in tons.
Cost - The cost of the drive, in MCr.
Area - The surface area required for the drive's jump grid, in square meters.
Crew - The number of crew required to operate the drive.

Maneuver Drives

There are several technologies available, depending on Tech Level, for maneuver drives. Most vessels will require a maneuver drive, although some specialized designs (such as a small space station or orbital gun platform) may not require one.

HEPlaR Drive

At TL-10, the standard maneuver drive is a type of fusion rocket using High-Energy Plasma Recombination (HEPlaR). These drives require both electrical power and fuel for reaction mass.

To install a HEPlaR maneuver drive, cross-index the size of the hull with the maneuver Gs desired on the HEPlaR Drive Potential table to determine the volume of the drive in displacement tons. To find the other characteristics of the drive, including the fuel required for 20 hours of operation, find the indicated size drive on the Standard HEPlaR Drive table.

HEPlaR Drive Potential

Maneuver	1	2	3	4	5	6
100	1	1	2	2	2	3
200	1	2	3	3	4	5
300	2	3	4	5	6	7
400	2	3	5	6	8	9
500	2	4	6	8	9	11
600	3	5	7	9	11	13
700	3	5	8	10	13	15
800	3	6	9	12	15	18
900	4	7	10	13	17	20
1000	4	8	11	15	18	22
2000	8	15	22	29	36	43
3000	11	22	33	43	54	65
4000	15	29	43	58	72	86
5000	18	36	54	72	90	108

Standard HEPlaR Drives

Volume	Power	Cost	Area	Fuel	Crew
1	140	0.1	14	2.5	0.0
2	280	0.3	28	5.0	0.1
3	420	0.4	42	7.5	0.1
4	560	0.6	56	10.0	0.1
5	700	0.7	70	12.5	0.2
6	840	0.8	84	15.0	0.2
7	980	1.0	98	17.5	0.2
8	1120	1.1	112	20.0	0.3
9	1260	1.3	126	22.5	0.3
10	1400	1.4	140	25.0	0.3
11	1540	1.5	154	27.5	0.4
12	1680	1.7	168	30.0	0.4
13	1820	1.8	182	32.5	0.4
15	2100	2.1	210	37.5	0.5
17	2380	2.4	238	42.5	0.6
18	2520	2.5	252	45.0	0.6
20	2800	2.8	280	50.0	0.7
22	3080	3.1	308	55.0	0.7
29	4060	4.1	406	72.5	1.0
33	4620	4.6	462	82.5	1.1
36	5040	5.0	504	90.0	1.2
43	6020	6.0	602	107.5	1.4
54	7560	7.6	756	135.0	1.5
58	8120	8.1	812	145.0	1.6
65	9100	9.1	910	162.5	1.7
72	10080	10.1	1008	180.0	1.7
86	12040	12.0	1204	215.0	1.9
90	12600	12.6	1260	225.0	1.9
108	15120	15.1	1512	270.0	2.1

Explanation of columns:
Volume - The size of the drive, in tons.
Power - The power required to operate the drive, in Mw.
Cost - The cost of the drive, in MCr.
Area - The surface area required for the drive's exhaust nozzles, in square meters.
Fuel - The amount of fuel (liquid hydrogen) in tons required to operate the drive for 20 hours.
Crew - The number of crew required to operate the drive.

Thrust-Plate Drive

The thrust-plate drive is developed at TL-12, and is the standard spacecraft drive from that point onward. It uses gravitic principles, and requires only electrical power to operate. Thrust-plate drives are unsuitable for deep-space operations, more than 1000 diameters from the nearest large body. Most starships operate well within this distance, and thrust-plate drives are installed on practically all starships once they are available.

To install a thrust-plate drive, cross-index the maneuver Gs required with the size of the hull on the Thrust-Plate Drive Potential table to determine the volume (in displacement tons) of the drive. Use the Standard Thrust-Plate Drives table to determine the other characteristics of the drive.

Thrust-Plate Drive Potential

Gs	1	2	3	4	5	6
100	2	4	6	8	9	11
200	4	8	11	15	18	22
300	6	11	17	22	27	33
400	8	15	22	29	36	43
500	9	18	27	36	45	54
600	11	22	33	43	54	65
700	13	25	38	50	63	75
800	15	29	43	58	72	86
900	17	33	49	65	81	97
1000	18	36	54	72	90	108
2000	36	72	108	143	179	215
3000	54	108	161	215	268	322
4000	72	143	215	286	358	429
5000	90	179	268	358	447	536

Standard Thrust-Plate Drives

Volume	Power	Cost	Area	Crew
2	28	7.0	6	0.1
4	56	14.0	12	0.1
6	84	21.0	17	0.2
8	112	28.0	23	0.3
9	126	31.5	26	0.3
11	154	38.5	31	0.4
13	182	45.5	37	0.4
15	210	52.5	42	0.5
17	238	59.5	48	0.6
18	252	63.0	51	0.6
22	308	77.0	62	0.7
25	350	87.5	70	0.8
27	378	94.5	76	0.9
29	406	101.5	82	1.0
33	462	115.5	93	1.1
36	504	126.0	101	1.2
38	532	133.0	107	1.3
43	602	150.5	121	1.4
45	630	157.5	126	1.5
49	686	171.5	138	1.6
50	700	175.0	140	1.5
54	756	189.0	152	1.5
58	812	203.0	163	1.6
63	882	220.5	177	1.6
65	910	227.5	182	1.7
72	1008	252.0	202	1.7
75	1050	262.5	210	1.8
81	1134	283.5	227	1.8
86	1204	301.0	241	1.9
90	1260	315.0	252	1.9
97	1358	339.5	272	2.0
108	1512	378.0	303	2.1
143	2002	500.5	401	2.4
161	2254	563.5	451	2.6
179	2506	626.5	502	2.8
215	3010	752.5	602	3.2
268	3752	938.0	751	3.7
286	4004	1001.0	801	3.9
322	4508	1127.0	902	4.2
358	5012	1253.0	1003	4.6
429	6006	1501.5	1202	5.3
447	6258	1564.5	1252	5.5
536	7504	1876.0	1501	6.4

Explanation of columns:
Volume - The size of the drive, in tons.
Power - The power required to operate the drive, in Mw.
Cost - The cost of the drive, in MCr.
Area - The surface area required for the drive’s emitter plates, in square meters.
Crew - The number of crew required to operate the drive.

AVIONICS

All spacecraft require electronic systems to enable them to navigate, detect other vehicles and navigational hazards, and to communicate. Select at least one package from each category (controls, sensors, and communicators) and install the packages in the hull. Some systems are described as military; but the purchase such equipment is not restricted to the military. Rather, it is of the type typically used on military vessels. Civilian ship owners may freely purchase military-specification avionics.

All control systems include the appropriate computer systems, flight avionics, and terrain-following equipment to allow flight over planetary surfaces for those ships capable of doing so. Military controls include radiation-hardened computer systems to better withstand battle damage.

Standard Civilian Controls

TL	Volume	Power	Cost	Area
9	1.1	0.9	2.0	0.4
10	1.3	1.0	3.2	0.4
11	1.5	1.2	6.2	0.3
12	1.7	1.3	9.2	0.3
13	1.9	1.5	12.2	0.2
14	1.7	1.6	15.2	0.2
15	1.5	1.8	18.2	0.2

Explanation of columns:
TL - The Technology Level (TL) of the equipment.
Volume - The volume required of the installation, in displacement tons.
Power - The power required to run the controls, in Mw.
Cost - The price, in MCr.
Area - The surface area required for antennas.

Standard Military Controls

TL	Volume	Power	Cost	Area
9	2.2	1.6	3.8	0.4
10	2.6	1.9	6.2	0.4
11	3.0	2.2	12.2	0.3
12	3.4	2.5	18.2	0.3
13	3.9	2.8	24.2	0.2
14	3.4	3.1	30.2	0.2
15	3.0	3.4	36.2	0.2

SENSORS

There are four types of standard sensor package available. All of the sensor packages contain an active sensor (radar, or active EMS when available) and a passive sensor (high-resolution thermal, or passive EMS when available). In the Basic package, the active sensor is too short-ranged for combat use, but is sufficient for collision-avoidance. The Improved package increases the range of the basic sensors. Both military packages add a LADAR system for accurate range-finding and target designation, as well as improved antenna sizes for the active and passive sensors. The antenna diameter determines the minimum size ship these sensors may be mounted on. The medium military package provides an identical back-up active sensor to better withstand battle damage, and also adds neutrino sensors and densitometers when they become available.

Standard Sensor Systems

TL	Sensor Description	Min Length	Volume	Power	Cost	Area	Crew	USD
9	Basic	5	1.1	2.2	13.5	45.0	1.3	A0 P2 J0
9	Improved	5	1.4	3.2	18.5	47.5	1.3	A0 P2 J0
9	Small Military	10	4.5	15.3	90.0	167.0	2.6	A2 P3 J1
9	Medium Military	20	7.2	23.1	171.0	621.3	3.3	A4 P4 J2
10	Basic	5	0.3	15.2	9.4	14.0	0.9	A0 P2 J0
10	Improved	5	0.6	35.2	17.4	22.0	0.9	A0 P2 J0
10	Small Military	20	1.9	82.7	67.0	154.4	1.4	A4 P4 J0
10	Medium Military	40	14.0	545.1	254.0	574.4	2.7	A16 P5 J8
11	Basic	5	0.3	15.1	8.2	10.0	0.6	A0 P2 J0
11	Improved	5	0.5	25.1	12.2	14.0	0.6	A1 P2 J0
11	Small Military	20	2.1	142.7	88.0	88.1	1.2	A10 P4 J4
11	Medium Military	40	14.1	465.3	186.8	561.5	2.1	A16 P5 J16
12	Basic	10	0.3	11.1	6.8	12.4	0.4	A1 P3 J0
12	Improved	10	0.3	12.6	7.4	13.0	0.4	A2 P3 J0
12	Small Military	20	1.2	85.2	62.5	44.6	0.8	A10 P4 J10
12	Medium Military	40	4.5	201.2	92.9	262.0	1.2	A16 P5 J16

Explanation of columns:
TL - The TL of the sensor system.
Sensor Description - A short description of the most commonly purpose of the sensor.
Min Length - The length of the shortest hull that can mount the sensor, in meters. This detail can be safely ignored for almost any hull listed in this version of the QSDS system.
Volume - The volume of the system, in displacement tons.
Power - The power required, in Mw.
Cost - The price, in MCr.
Area - The surface area required for the system's antennas.
Crew - The number of crewmembers required to operate the system.
USD - The combat statistics of the sensor system.

COMMUNICATIONS

In the QSD System, three types of communicator packages are available. The Basic package contains only the systems absolutely required for navigation: a 3000km-range radio communicator and a 1000AU-range laser communicator. The Improved package extends the radio's range to 30,000km, and replaces the laser with a tight beam maser-based system that offers superior reliability. The Advanced system uses a 1000AU-range radio communicator, two maser communicators, and adds a laser communicator as an inexpensive back-up system.

Standard Communicator Systems

TL	Type	Volume	Power	Cost	Area	Crew
9	Basic	0.0	1.3	0.2	11.0	1.3
9	Improved	0.0	10.6	0.3	101.0	1.3
9	Advanced	0.1	21.5	2.0	203.0	2.6
10	Basic	0.0	1.3	0.2	11.0	0.9
10	Improved	0.0	10.6	0.3	101.0	0.9
10	Advanced	0.0	21.5	2.0	203.0	1.8
11	Basic	0.0	1.3	0.2	11.0	0.6
11	Improved	0.0	10.6	0.3	101.0	0.6
11	Advanced	0.0	21.5	2.0	203.0	1.2
12	Basic	0.0	1.3	0.2	11.0	0.4
12	Improved	0.0	10.6	0.3	101.0	0.4
12	Advanced	0.0	21.5	2.0	203.0	0.8

Explanation of columns:
TL - The TL of the system.
Type - A short description of the most commonly purpose of the communicator.
Volume - The volume of the system, in displacement tons.
Power - The power required, in Mw.
Cost - The price, in MCr.
Area - The surface area required for the system’s antennas.
Crew - The number of crewmembers required to operate the system.

WEAPONS

Civilian Weapons

Civilian weapons systems are low-cost, low-power models intended for widespread use as after-market add-ons to existing starships. For this reason, they don't include the dedicated, sophisticated fire-control equipment that military-specification weapons have. A ship that mounts civilian weapons has a USD fire-control rating of 0, no matter what TL avionics system is installed.

Most worlds allow non-military shipowners to install military-specification turret and barbette weapon systems. Missile batteries, bay and spinal weapons are usually only available to authorized purchasers.

Standard Civilian Laser Batteries

TL	Weapons	Volume	Power	Area	Cost	USD
11	1	3.0	11.0	10.0	2.1	(+0) 1/1-0-0-0
11	1	3.0	22.0	10.0	2.1	(+0) 1/2-0-0-0
12	1	3.0	13.3	10.0	1.4	(+0) 1/1-0-0-0
12	1	3.0	26.7	10.0	1.4	(+0) 1/2-0-0-0
13	1	3.0	14.5	10.0	1.5	(+0) 1/1-1-0-0
13	1	3.0	29.0	10.0	1.5	(+0) 1/2-2-0-0
14	1	3.0	21.0	10.0	0.7	(+0) 1/1-0-0-0
14	1	3.0	42.0	10.0	0.7	(+0) 1/2-0-0-0
15	1	3.0	21.0	10.0	0.9	(+0) 1/1-1-1-1
15	1	3.0	42.0	10.0	0.9	(+0) 1/2-2-2-2

Explanation of columns:
TL - The TL of the laser battery.
Weapons - The number of weapons mounts in the battery.
Volume - The total volume in displacement tons, of the battery and all it’s control equipment.
Power - The total power required for the battery, in Mw.

Cost - The cost of the battery, in MCr.
Area - The total surface area required for the battery, in square meters.
USD - The USD bonus, hits and penetration factors of the battery when it is used in combat.

Military Missile Systems

Missile launchers are available in two sizes: turret, and the larger barbette. Both systems can launch their entire supply of ready missiles in a single turn. Missile launchers do not have to be crewed when operating as part of a missile battery under the control of a Master Fire Director, but if assigned, a crewmember may launch missiles under local control from the weapon mount.

Military Missile Launchers

TL	Missiles	Volume	Power	Cost	Area	Mount
8	2	3	0.2	0.1	10	Turret
8	5	6	0.2	0.1	20	Barbette

Explanation of columns:
TL - The TL the launcher system is introduced.
Missiles - The number of missiles in ready storage.
Volume - The volume of the system, in displacement tons.
Power - The power required, in Mw.
Cost - The price, in MCr.
Area - The surface area required for the system's antennas.

The number of missiles a ship may control in flight simultaneously depends on the capacity of it's missile Master Fire Directors (MFDs). Any number of MFDs may be installed; each requires a crewmember to operate it. No ship may have a MFD or military weapon battery of a TL higher than that of it's avionics system.

Master Fire Directors

TL	Control	Volume	Power	Cost	Area	USD Bonus
9	2	3.1	15.2	36.1	7.0	(+2)
10	3	3.9	13.4	48.1	6.2	(+3)
11	3	2.9	6.4	34.1	3.4	(+3)
12	4	2.3	3.1	25.6	2.1	(+4)
13	4	2.3	3.1	25.6	2.1	(+4)
14	5	1.6	1.8	15.1	1.6	(+5)
15	6	1.1	1.7	9.1	1.6	(+6)

Explanation of columns:
TL - The TL of the Master Fire Director
Control - The control rating of the MFD; the number of missiles in can control in-flight at once.
Volume - The volume of the MFD and it's sensors and communicators, in tons.
Power - The power required, in Mw.
Cost - The cost of the MFD, in millions of credits (MCr).
Area - The surface area required for the MFD's antennas.
USD Bonus - The USD bonus for missile batteries using this equipment.

Standard Military Laser Batteries

TL	Weapons	Volume	Power	Cost	Area	USD
11	1	5.9	28.4	36.1	13.4	(+3) 1/2-0-0-0
11	2	8.9	50.4	38.2	23.4	(+3) 1/3-0-0-0
11	4	14.9	94.4	42.4	43.4	(+3) 1/4-0-0-0
11	6	20.9	138.4	46.5	63.4	(+3) 1/5-0-0-0
11	8	26.9	182.4	50.7	83.4	(+3) 1/6-0-0-0
11	10	32.9	226.4	54.9	103.4	(+3) 1/7-0-0-0
11	1	12.9	74.4	45.5	23.4	(+3) 1/2-2-0-0
11	2	22.9	142.5	57.0	43.4	(+3) 1/3-3-2-0
11	3	32.9	210.6	68.4	63.4	(+3) 1/4-3-2-2
11	4	42.9	278.6	79.9	83.4	(+3) 1/5-4-3-2
11	5	52.9	346.7	91.4	103.4	(+3) 1/6-5-3-2
11	6	62.9	414.7	102.8	123.4	(+3) 1/7-6-3-2
11	7	72.9	482.8	114.3	143.4	(+3) 1/8-6-4-2
11	8	82.9	550.9	125.7	163.4	(+3) 1/9-7-4-3
11	10	102.9	687.0	148.7	203.4	(+3) 1/9-8-5-3
12	1	5.3	29.8	27.0	12.1	(+4) 1/2-0-0-0
12	2	8.3	56.4	28.4	22.1	(+4) 1/3-2-0-0
12	4	14.3	109.8	31.3	42.1	(+4) 1/4-3-2-0
12	6	20.3	163.1	34.2	62.1	(+4) 1/5-3-3-0
12	8	26.3	216.4	37.1	82.1	(+4) 1/6-4-3-2
12	10	32.3	269.8	40.0	102.1	(+4) 1/7-5-3-2
12	1	8.3	69.8	28.6	22.1	(+4) 1/2-2-0-0
12	2	14.3	136.4	31.6	42.1	(+4) 1/3-3-2-0
12	3	20.3	203.1	34.6	62.1	(+4) 1/4-4-3-2
12	4	26.3	269.8	37.6	82.1	(+4) 1/5-5-3-2
12	5	32.3	336.4	40.6	102.1	(+4) 1/6-5-3-2
12	6	38.3	403.1	43.6	122.1	(+4) 1/7-6-4-3
12	7	44.3	469.8	46.6	142.1	(+4) 1/8-7-4-3
12	8	50.3	536.4	49.6	162.1	(+4) 1/9-7-5-3
12	9	56.3	603.1	52.6	182.1	(+4) 1/9-8-5-3
12	10	62.3	669.8	55.6	202.1	(+4) 1/9-9-5-3
13	1	5.3	32.1	27.0	12.1	(+4) 1/2-2-0-0
13	2	8.3	61.1	28.5	22.1	(+4) 1/3-3-2-0
13	4	14.3	119.1	31.4	42.1	(+4) 1/4-4-3-0
13	6	20.3	177.1	34.3	62.1	(+4) 1/5-5-3-0
13	8	26.3	235.1	37.2	82.1	(+4) 1/7-6-4-0
13	10	32.3	293.1	40.1	102.1	(+4) 1/8-7-4-2
14	1	4.6	43.8	15.8	11.6	(+5) 1/2-0-0-0
15	1	4.1	43.7	9.9	11.6	(+6) 1/2-2-2-2
15	10	31.1	421.7	17.7	101.6	(+6) 1/9-9-9-9

Explanation of columns:

TL - The TL of the laser battery.

Weapons - The number of weapons mounts in the battery.

Volume - The total volume in displacement tons, of the battery and all it's control equipment.

Power - The total power required for the battery, in Mw.

Cost - The cost of the battery, in MCr.

Area - The total surface area required for the battery, in square meters.

USD - The USD bonus, hits and penetration factors of the battery when it is used in combat.

Military Bay Weapons

TL	Type	Volume	Power	Cost	Area	Crew	USD
9	PA-Gun	200	1125.0	156.3	24.9	2.9	(+2) 2/5-4-2-0
11	PA-Gun	100	2281.9	126.2	16.0	2.7	(+3) 1/7-6-5-0
10	Laser	50	125.0	104.0	91.6	1.0	(+3) 1/2-0-0-0
12	Laser	50	1336.4	98.1	91.6	1.0	(+4) 1/6-6-6-5
12	PA-Gun	100	2278.7	118.6	14.7	1.8	(+4) 2/9-7-6-5
12	Meson Gun	125	27.8	147.0	10.2	5.0	(+4) 2/3-2-0-0

Explanation of columns:
TL - The TL of the bay weapon.
Type - The number of the weapon in the bay: neutral particle accelerator (PA-Gun), bay laser system (Laser), or meson accelerator (Meson Gun).
Volume - The total volume in displacement tons, of the battery and all it's control equipment.
Power - The total power required for the battery, in Mw.
Cost - The cost of the battery, in MCr.
Area - The total surface area required for the battery, in square meters.
USD - The USD bonus, hits and penetration factors of the battery when it is used in combat.

Spinal Mount Weapons

Custom-built starships may have a large weapon forming the keel or spine of the ship. The long tunnel length and large size of these weapons make them the most formidable that cruise the stars. Since the QSD System relies on standardized hulls and modular components, spinal mounts are not available for QSD System designed ships.

DEFENSES

Sandcasters

The basic defensive weapon of starship combat, sandcasters are also installed in turrets. Each sandcaster requires a gunner to operate it.

Sandcasters

TL	Volume	Power	Cost	Area	Cans
9	3	1	0.7	10	18
10	3	1	0.7	10	20
11	3	1	0.8	10	24
12	3	1	0.8	10	30
13	3	1	0.9	10	35
14	3	1	0.9	10	40
15	3	1	1.0	10	50

Explanation of columns:
TL - The TL of the sandcaster.
Volume - The volume in tons of the sandcaster.
Power - The power required per sandcaster, in Mw.
Cost - The price of the sandcaster, in MCr.
Area - The hull surface area required per sandcaster, in square meters.
Cans - The number of volleys (cannisters) in the sandcaster's ready storage.

Meson Screen

The meson screen is developed at TL-12 to defend against meson guns.

Standard Meson Screens

Volume	Power	Cost	Area	Crew	PV 100+	PV 1000+
1.4	1	2	10	0.0	2	1
4.3	3	6	30	0.1	3	2
8.6	6	12	60	0.3	4	3
17.1	12	24	120	0.5	5	4
30.0	21	42	210	1.0	6	5
45.7	32	64	320	1.5	7	6
71.4	50	100	500	2.3	8	7
102.9	72	144	720	3.3	9	8
182.9	128	256	1280	5.8	10	9
321.4	225	450	2250	10.3	11	10
642.9	450	900	4500	20.5	12	11
1142.9	800	1600	8000	36.5	13	12

Explanation of columns:
Volume - The volume of the screen generator, in displacement tons.
Power - The power required for the screen, in Mw.
Cost - The cost of the screen, in MCr.
Area - The area of the screen's emitters, in square meters.
Crew - The number of crewmembers required to operate the screen
PV100+ - The screen's USD protection value for 100-999 ton ships.
PV1000+ - The screen's USD protection value for 1000-9999 ton ships.

Nuclear Dampers

Like sandcasters, nuclear dampers are installed in turrets. They target incoming nuclear missiles, using the damper to deactivate them. Each damper requires a gunner to operate it.

Standard Nuclear Dampers

TL	Volume	Power	Cost	Area	Mount	USD
12	6	15	2.0	20	Barbette	Number of Barbettes
13	6	9	2.7	20	Barbette	Number of Barbettes
14	6	6	4.0	20	Barbette	Number of Barbettes
15	3	3	4.5	10	Turret	Number of Turrets

Explanation of columns:
TL - The TL of the damper installation.
Volume - The volume required per damper in displacement tons.
Power - The power required per damper in Mw.
Cost - The cost per damper in MCr.
Area - The hull surface area required per damper, in square meters.
Mount - The type of weapon mount, turret or barbette.
USD - The nuclear damper USD factor is equal to the number of dampers installed.

MISCELLANEOUS EQUIPMENT

Different equipment can be purchased for use on starships. Their costs, requirements for use and any notes are described below.

Shops and Labs

Type	Volume	Power	Cost	Notes
Engineering Shop	6	0.6	1	1 per 20 engineering crew
Vehicle Shop	10	1	2	1 per 20 vehicle or small craft crew
Laboratory	8	0.8	5	1 per 2 scientists
Sickbay	8	0.8	5	1 per 2 beds

Explanation of columns:
Type - The type of facility.
Volume - The volume in displacement tons, of the facility.
Power - The power requirement to run the shop or lab, in Mw.
Cost - The cost of the fully-equipped shop or lab, in MCr.
Notes - The recommended (but not required) installation guidelines.

Small Craft External Grapples

If external grapples are used, the ship may carry externally mounted craft without compromising its streamlining configuration, so long as the externally mounted craft also meets that configuration. If the grapple or craft's configuration is lower than that of the overall hull, the ship is limited to the lower configuration if it is carrying the craft. If the craft is detached, the hull's configuration may be used.

Craft	Unstreamlined hulls		Streamlined hulls		Airframe hulls		Surface
Hull	Volume	Cost	Volume	Cost	Volume	Cost	Area
10	1	0.0	3	0.1	5	0.2	441
20	2	0.0	6	0.2	10	0.4	576
30	3	0.1	9	0.3	15	0.6	762
40	4	0.1	12	0.3	20	0.8	974
50	5	0.1	15	0.4	25	1.1	1129
60	6	0.1	18	0.5	30	1.3	1212
70	7	0.1	21	0.6	35	1.5	1407
80	8	0.1	24	0.7	40	1.7	1569
90	9	0.1	27	0.8	45	1.9	1665

Explanation of columns:
Craft Hull - The hull size in displacement tons, of the small craft carried.
Volume - The volume, in displacement tons, of the grapple equipment.
Cost - The cost of the grapple, in MCr.
Surface Area - The surface area required for the grapple and craft.

Small Craft Hangars and Launch Port

Craft	for Minimal Hangar		for Spacious Hangar		Launch Port
Hull Size	Volume	Cost	Volume	Cost	Area
10	20	0.1	40	0.2	49
20	40	0.2	80	0.3	64
30	60	0.3	120	0.4	85
40	80	0.3	160	0.6	109
50	100	0.4	200	0.7	126
60	120	0.5	240	0.8	135
70	140	0.6	280	0.9	157
80	160	0.6	320	1.1	175
90	180	0.7	360	1.2	185

Explanation of columns:
Craft Hull Size - The hull size, in displacement tons, of the carried small craft.
Minimal Hangar - A hangar that provides no room to perform maintenance and repairs.
Spacious Hangar - A large hangar, with enough room for service crews to work.
Volume - The volume, in displacement tons, occupied by the hangar.
Cost - The cost of the hangar, in MCr.
Launch Port Area - The surface area, in square meters, required for the launch port.

Standard Fuel Purification Plants

TL	Capacity	Volume	Power	Cost
9	3	11	2.3	0.1
9	5	18	3.8	0.1
9	10	36	7.6	0.2
9	20	72	15.1	0.3
9	50	180	37.8	0.8
10	3	10	2.0	0.1
10	5	17	3.4	0.1
10	10	33	6.7	0.2
10	20	66	13.4	0.3
10	50	165	33.6	0.8
11	3	8	1.7	0.0
11	5	14	3.0	0.1
11	10	27	5.9	0.1
11	20	54	11.8	0.3
11	50	135	29.4	0.7
12	3	7	1.5	0.0
12	5	12	2.5	0.1
12	10	24	5.0	0.1
12	20	48	10.1	0.3
12	50	120	25.2	0.7
13	3	6	1.3	0.0
13	5	11	2.1	0.1
13	10	21	4.2	0.1
13	20	42	8.4	0.3
13	50	105	21.0	0.6

Explanation of columns:
TL - The TL of the plant.
Capacity - The amount of fuel processed by the plant, in tons per hour.
Volume - The volume of the plant, in displacement tons.
Power - The power required to operate the plant, in Mw.
Cost - The cost of the plant, in Mcr.

Extra Fuel Tanks

Any volume of space within the hull may be designated as fuel tankage. There is no additional cost, surface area or power requirement for fuel tanks. Starship fuel is liquid hydrogen. Entering a fuel tank, even partially-filled, is fatal to personnel (even in the best of vacc suits). Empty fuel tanks still contain hydrogen gas, and may be entered, but should be treated as Insidious type atmospheres.

Normally, the designer will provide enough fuel tankage for the ship's primary purpose. Additional fuel may be added with collapsible tanks, or dismountable tanks.

Collapsible Tanks: Insulated fuel bladders may be carried in the cargo hold to provide additional fuel. This fuel may not be used directly, but must be pumped into the ship's normal fuel tanks before use. Collapsible tanks cost Cr 1400 per ton of fuel carried. When empty, they can be stored at 5% of their full volume.

Dismountable Tanks: Dismountable fuel tanks may be carried in the ship's cargo hold to provide additional fuel. Fuel from these rigid tanks may be used directly by the ship's drives. Dismountable tanks cost Cr 2800 per ton of fuel carried, but must be stored at their full volume. A version is also available that can be disassembled to store in 25% of its full volume, at a cost of Cr 7000 per ton.

POWER

All vessels require a power plant to provide electrical power to run the ship's systems. Total the power required for all systems. Select power plants from the table below until the power requirement has been met. You can add the power output of more than one plant to meet the total power requirement. All power plants on this table have the listed characteristics from the TL of their introduction through TL 12.

Standard Power Plants

TL	Volume	Power	Cost	Fuel	Crew
9	107.1	3000	300.0	32.1	2.1
9	71.4	2000	200.0	21.4	1.7
10	71.4	2000	200.0	21.4	1.7
10	35.7	1000	100.0	10.7	1.2
11	26.8	750	75.0	8.0	0.9
11	17.9	500	50.0	5.4	0.6
12	7.1	200	20.0	2.1	0.2
12	3.6	100	10.0	1.1	0.1
12	2.7	75	7.5	0.8	0.1
12	1.8	50	5.0	0.5	0.1
12	0.7	20	2.0	0.2	0.0
12	0.4	10	1.0	0.1	0.0

Explanation of columns:
TL - The earliest TL at which the plant can be produced.
Volume - The volume, in displacement tons, of the plant.
Power - The power in Mw output by the plant.
Cost - The price of the plant, in MCr.
Fuel - The fuel (liquid hydrogen) volume in tons required to run the plant for 1 year.
Crew - The engineering crew required to run the plant.

CREW

Crew Size

Engineering Crew: Total the crew requirements for power plants, maneuver drives, and jump drives. Drop fractions less than 0.2; round others up to the next whole crewmember. This is the number of engineering crewmembers needed. Each engineering crewmember requires a workstation.

Electronics Crew: Total the crew requirements for sensors and communications equipment. Drop fractions less than 0.2; round others up to the next whole crewmember. This is the number of electronics crewmembers needed. Each electronics crewmember requires a workstation.

Maneuver Crew: All starships require an astrogator, and any spacecraft with a maneuver drive requires a pilot as well. The pilot and astrogator each require a workstation.

Gunnery Crew: One gunner is required for each battery installed. One gunner is also required for each sandcaster and damper turret installed. Each gunner requires a workstation.

Screens Crew: Crew are required to operate the ship's meson screen, as indicated in the meson screen table. These crew do not require workstations.

Small Craft Crew: The crew of the small craft, as well as any maintenance personnel (at least one per craft carried, unless otherwise specified), must have quarters aboard the mothership, but do not need workstations.

Troops: Any number of troops (marines) may be carried. They will require quarters (but not workstations).

Command Crew: Total the above crew, and divide by six (round fractions to the nearest whole number). This is the number of command crew. They will require workstations.

Stewards: Ships that carry high passengers, or have a total crew larger than 25, must have at least one steward. One steward is required per 8 high passengers (or command crew), plus one steward is also required per 50 middle passengers (or non-command crew). Round all fractions up. Stewards do not require workstations.

Medical: Ships that carry passengers of any type must have at least one medic onboard. One medic is required per 120 people carried, plus one per 20 low berths installed. Medical crew does not require workstations, but ships with a total complement of 120 or more should have a sickbay.

WORKSTATIONS

Multiply the number of crewmembers that need workstations by the workstation characteristics below. The results will be the volume and cost of the workstations. Note: if there are fewer than 25 crew, the cost of the workstations may be ignored.

Workstations

TL	Volume	Cost
9	0.5	0.0010
10	0.5	0.0015
12	0.5	0.0020

Explanation of columns:
TL - The TL of introduction of the workstation.
Volume - The volume of each workstation.
Cost - The cost of each workstation.

Small Ships and combined jobs:
Any fractional crew requirement less than one (before rounding), can be combined into one position, as long as the total of the combined requirement is still less than or equal to one. Small ships can also be operated under routine conditions (not combat) by fewer than the normal crew. A ship of 100 tons or less can be operated by a single person, and a ship of 200 tons or less can be operated by a crew of two.

BRIDGE

If a ship requires two or more command crew, a bridge must be installed, and the electronics, maneuver, gunnery, and command workstations must be located on the bridge. A bridge requires 0.5 displacement tons per workstation installed, in addition to the workstations themselves.

QUARTERS

Living quarters must be installed for the crew and passengers. High passengers require a large stateroom, and middle passengers require at least a small stateroom. Crewmembers may have any type of living quarters, but command crew should have quarters larger than enlisted crew; commercial ships typically allocate a large stateroom for the captain (and possibly the executive officer), and small staterooms for all other crewmembers. Low berths are used for low passengers. Emergency low berths hold 4 persons, and are installed on some vessels as a safety measure, or for transporting large animals safely in cold sleep.

Multiply the number of occupants by the characteristics of the selected type of quarters to determine the volume, power, and cost of quarters. The power requirement can be ignored for ships with a total complement of less than 50.

Type	Volume	Power	Cost
Bunk	1	0.0000	0.005
Small Stateroom	2	0.0005	0.040
Large Stateroom	4	0.0010	0.100
Low Berth	1	0.0010	0.050
Emergency Low Berth	2	0.0020	0.100

Explanation of columns:
Type - The type of the quarters.
Volume - The amount of space, in displacement tons, required by quarters for one person.
Power - The power required, per person, in Mw.
Cost - The cost of quarters for one person, in MCr.

CALCULATE CARGO SPACE

Any volume of space within the hull may be designated as cargo holds. There is no additional cost, surface area, or power requirement for cargo holds. The required cargo hatches are already included in the price of the hull. Cargo holds are assumed to be maintained at the ship's standard environment (gravity, temperature, and air pressure and composition) unless changed by the ship's crew. This ship's environmental controls allow each cargo hold to be set for a wide range of conditions, so that a hold could be configured to carry refrigerated cargo, or animals requiring a simulated desert environment.

CALCULATE COST

Add all of the costs of all of the systems installed in the ship together, from hull to quarters. This is the full cost of the ship. Multiply the cost by 75% to calculate the cost of actually building the ship at a shipyard. The savings is generated because of the use of standardized modules.

COMPLETE THE UNIVERSAL SHIP DESCRIPTOR

All of the information to create the Universal Ship Descriptor is now available. Fill in the necessary information. The ship design process is complete.

Tons: Enter the tonnage of the vessel, in standard displacement tons.
Volume: Enter the volume of the vessel in cubic meters. Volume equals tonnage multiplied by 14.
Cost: Total the cost of the ship in MCr, rounded to the nearest tenth, and enter it here.
Crew: Enter the total number of the crew (including stewards and medics).
High/Mid Passengers: Enter the total number of high and middle passengers (combined) carried.
Low Passengers: Enter the number of low berths.

Cargo: Enter the total volume of the ship's cargo holds, in displacement tons.
Controls: Enter a short description of the ship's controls. "Std" indicates standard control systems, "Fib" indicates military-specification fiber-optic systems. If the ship has a bridge, place "/Bridge" after the control system type.
Tech Level: Enter the controlling TL of the design (usually the TL of the ship's avionics).
Size: Enter the USD Size rating of the ship from the hull table.:
Jump: Enter the jump drive capacity of the ship, in parsecs.
Maneuver: Enter the maximum acceleration of the maneuver drive, in Gs, as well as the type of drive (HEPlaR or Thrust-Plate).
Power Plant: Multiply the total power output by the ship's power plants (in Mw) by 2, and divide by the ship's volume rating in displacement tons. This is the power plant rating. Starships must have a Power Plant rating of at least half their Jump Rating to be able to charge the jump drive prior to making a Jump.
Fuel: Enter the total volume of fuel carried, in standard displacement tons. If the ship is equipped with fuel scoops (all streamlined and airframe hulls designed with the QSD System are), enter an S and the scooping rate (in tons per hour) after the amount of fuel. If the ship is equipped with a fuel purification plant, also enter an R (for refining capability), and the plant's capacity in tons per hour.
Meson Screen: Enter the USD number from the meson screen table.
Sand Caster: Enter the number of sandcasters, and in parentheses, the total number of canisters carried in ready storage.
Nuclear Damper: Enter the number of nuclear damper turrets or barbettes installed.
Sensors: Enter the sensor rating from the avionics section.
Armor: Enter the armor factor given on the hull table.
Structure: Enter the structure factor given on the hull table.
Batteries: For each distinct type of battery carried by the ship, make a battery entry. This entry consists of the number of batteries of this type, a battery identifier (such as "Long-Range Laser" or "Missile Bay"), and the USD combat statistics from the battery table (bonus, hits, and penetration).
Missiles: If the ship is equipped with missiles, note the number of missile batteries, the battery identifier (such as "Missile Barbette"), and the number of launchers as well as the number of missiles that can be guided at once. On separate lines, list the number of missiles carried and their characteristics.
Launch Facilities: List the number of facilities, their type, and the type of craft that use them.
Hangar Facilities: List the number of hangars, their type, and the craft that are stored there.
Crew Detail: List the breakdown of the crew required to operate the ship.
Notes: Note additional information about the ship here, including the hull shape, streamlining, and details of any carried craft.