THE STANDARD SHIP DESIGN SYSTEM

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

The use of standardized components make starships constructed using this system cheaper than custom designed ships. Starships designed using the SSD System receive a 10% 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 90% to reflect the discount for the mostly 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.

SAMPLE UNIVERSAL SHIP DESCRIPTION

Type and Name of Ship

Tons	Volume	Cost in Mcr
Crew	Passengers High/Medium	Passengers Low
Cargo	Controls	Tech Level

## Size Rating	## Jump Rating
## Fire Control Rating	## G Rating / Maneuver Drive
## Battery 1 - ##, ##, ##, ##	## Power Plant Rating
## Battery 2 - ##, ##, ##, ##	## Fuel Rating / Scoop / Refine
## Battery 3 - ##, ##, ##, ##	## Meson Screen Rating
## Battery 4 - ##, ##, ##, ##	## Sand Caster Rating
## Battery 5 - ##, ##, ##, ##	## Damper Rating
## Battery 6 - ##, ##, ##, ##	## A ## P ## J (Mask) Sensor Rating
## Battery 7 - ##, ##, ##, ##	
## Battery 8 - ##, ##, ##, ##	## Armor ## Structure

THE DESIGN SEQUENCE

The design of the starship is a process of following the sequence below. Use the starships worksheet to complete the design. When the Universal Ship Descriptor is completed, 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 and Surface Area Available
Select Jump Drive
Select Maneuver Drive
Select Offensive Weapons
Select Defensive Weapons
Select Controls and Electronics
Select Life Support
Select Miscellaneous Equipment
Select Power Plant
Calculate Passenger Capacity and Crew Requirements
Add Workstations

Add Bridge
Add Quarters
Calculate Cost
Complete the USD

SELECT MISSION

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. The Tech Level of the ship determines the maximum tech level of any components of the ship. The ship may have inferior technology aboard if the designer so chooses.

SELECT HULL

The hull size determines the amount of equipment, weapons, passenger and cargo space available. The mission will determine the size of the ship's hull. There are nine different types of hull configuration available for starships. Each provides a different amount of surface area and internal displacement available for use, and have different associated costs. Some are better at entering atmosphere while others are superior at maximizing volume. The different hull types are:

Open Frame Hull
Needle Hull
Wedge Hull
Cylinder Hull
Box Hull
Sphere Hull
Dome/Disk Hull
Close Structure Hull
Slab Hull

Select a hull tech level.

Select the size in displacement tons (1 ton is equivalent to 14 cubic meters), the configuration, and any streamlining. Not all types of streamlining are available for all configurations. The “Price Mods” entry on the hull size tables will indicate which are available. Those not available are as “n/a.” Also choose the maximum acceleration (in Gs of acceleration) the ship is capable of and the armor level required. Find the hull displacement on the appropriate configuration chart.

Under Volume Factor, find the column for the tech level, and find the row for the displacement. Multiply the number there by the maximum Gs to determine the amount of hull volume (in m^3) that is dedicated to the internal structure of the ship.

Multiply that same Volume Factor by the armor level desired, to determine the volume taken up by the armor. If an “Airframe” hull is desired, multiply the result by 1.3.

The “Material Type” table shows the material of the hull at each tech level. Find the row for the tech level. Multiply the structure volume just calculated by the density number in the Material Type table to determine how much the structure masses. Likewise, multiply the structure volume by the cost number in the Material Type table to find out how much it costs. Do the same with the armor volume to find the armor mass and price. The amount of streamlining affects the price of the armor. At the top of the Hull Size table are price modifiers for different streamlining. Multiply the armor price just calculated by the price modifier for streamlining.

The ship requires a certain number of airlocks. The Airlocks portion of the table shows how many are needed, and the total mass, volume, power and price they take up. For hulls less than 50 displacement tons, airlocks are optional.

Record the mass, volume, and price for the structure and the armor. Also note the total volume and area available. Note that Airframe (AF) streamlining also increases the surface area available – multiply the listed

number by 1.3.

Material Type and Tech Level

Material Type	Cost (MCr/m³)	Density (t/m³)
TL 8-9: Composite Laminate	0.008	8.0
TL 10-11: CrystalIron	0.009	10.0
TL 12-13: Superdense	0.014	15.0
TL14-16: Bonded Superdense	0.028	15.0

Open Frame Hull

Price Modifiers: No SL 0.3; SL n/a; AF n/a

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	28.0	140	190	0.63	0.48	0.27	0.14	1	0.2	3	2	0.001	0.005
20	7	32.0	280	230	0.77	0.58	0.33	0.16	1	0.2	3	2	0.001	0.005
30	7	36.8	420	270	0.90	0.68	0.39	0.19	1	0.2	3	2	0.001	0.005
40	7	41.6	560	310	1.03	0.78	0.44	0.22	1	0.2	3	2	0.001	0.005
50	7	44.8	700	380	1.27	0.95	0.54	0.27	1	0.2	3	2	0.001	0.005
60	7	46.4	840	420	1.40	1.05	0.60	0.30	1	0.2	3	2	0.001	0.005
70	7	50.0	980	460	1.53	1.15	0.66	0.33	1	0.2	3	2	0.001	0.005
80	7	52.8	1,120	510	1.70	1.28	0.73	0.36	1	0.2	3	2	0.001	0.005
90	7	54.4	1,260	550	1.83	1.38	0.79	0.39	1	0.2	3	2	0.001	0.005
100	8	56.0	1,400	600	2.00	1.50	0.86	0.43	1	0.2	3	2	0.001	0.005
200	8	68.0	2,800	900	3.00	2.25	1.29	0.64	2	0.4	6	4	0.002	0.010
300	8	80.0	4,200	1,200	4.00	3.00	1.71	0.86	3	0.6	9	6	0.003	0.015
400	8	88.0	5,600	1,500	5.00	3.75	2.14	1.07	4	0.8	12	8	0.004	0.020
500	8	96.0	7,000	1,700	5.67	4.25	2.43	1.21	5	1.0	15	10	0.005	0.025
600	8	100.0	8,400	2,000	6.67	5.00	2.86	1.43	6	1.2	18	12	0.006	0.030
700	8	108.0	9,800	2,200	7.33	5.50	3.14	1.57	7	1.4	21	14	0.007	0.035
800	8	112.0	11,200	2,400	8.00	6.00	3.43	1.71	8	1.6	24	16	0.008	0.040
900	8	116.0	12,600	2,600	8.67	6.50	3.71	1.86	9	1.8	27	18	0.009	0.045
1,000	9	120.0	14,000	2,800	9.33	7.00	4.00	2.00	10	2.0	30	20	0.010	0.050
2,000	9	144.0	28,000	4,300	14.33	10.75	6.14	3.07	20	4.0	60	40	0.020	0.100
3,000	9	168.0	42,000	5,700	19.00	14.25	8.14	4.07	30	6.0	90	60	0.030	0.150
4,000	9	188.0	56,000	7,000	23.33	17.50	10.00	5.00	40	8.0	120	80	0.040	0.200
5,000	9	204.0	70,000	8,000	26.67	20.00	11.43	5.71	50	10.0	150	100	0.050	0.250

Needle Hull

Price Modifiers: No SL 0.7; SL 0.8; AF 1.2

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	21.0	140	247	0.41	0.31	0.18	0.09	1	0.2	3	2	0.001	0.005
20	7	24.0	280	299	0.50	0.37	0.21	0.11	1	0.2	3	2	0.001	0.005
30	7	27.6	420	351	0.59	0.44	0.25	0.13	1	0.2	3	2	0.001	0.005
40	7	31.2	560	403	0.67	0.50	0.29	0.14	1	0.2	3	2	0.001	0.005
50	7	33.6	700	494	0.82	0.62	0.35	0.18	1	0.2	3	2	0.001	0.005
60	7	34.8	840	546	0.91	0.68	0.39	0.20	1	0.2	3	2	0.001	0.005
70	7	37.5	980	598	1.00	0.75	0.43	0.21	1	0.2	3	2	0.001	0.005
80	7	39.6	1,120	663	1.11	0.83	0.47	0.24	1	0.2	3	2	0.001	0.005
90	7	40.8	1,260	715	1.19	0.89	0.51	0.26	1	0.2	3	2	0.001	0.005
100	8	42.0	1,400	780	1.30	0.98	0.56	0.28	1	0.2	3	2	0.001	0.005
200	8	51.0	2,800	1,170	1.95	1.46	0.84	0.42	2	0.4	6	4	0.002	0.010
300	8	60.0	4,200	1,560	2.60	1.95	1.11	0.56	3	0.6	9	6	0.003	0.015
400	8	66.0	5,600	1,950	3.25	2.44	1.39	0.70	4	0.8	12	8	0.004	0.020
500	8	72.0	7,000	2,210	3.68	2.76	1.58	0.79	5	1.0	15	10	0.005	0.025
600	8	75.0	8,400	2,600	4.33	3.25	1.86	0.93	6	1.2	18	12	0.006	0.030
700	8	81.0	9,800	2,860	4.77	3.58	2.04	1.02	7	1.4	21	14	0.007	0.035
800	8	84.0	11,200	3,120	5.20	3.90	2.23	1.11	8	1.6	24	16	0.008	0.040
900	8	87.0	12,600	3,380	5.63	4.23	2.41	1.21	9	1.8	27	18	0.009	0.045
1,000	9	90.0	14,000	3,640	6.07	4.55	2.60	1.30	10	2.0	30	20	0.010	0.050
2,000	9	108.0	28,000	5,590	9.32	6.99	3.99	2.00	20	4.0	60	40	0.020	0.100
3,000	9	126.0	42,000	7,410	12.35	9.26	5.29	2.65	30	6.0	90	60	0.030	0.150
4,000	9	141.0	56,000	9,100	15.17	11.38	6.50	3.25	40	8.0	120	80	0.040	0.200
5,000	9	153.0	70,000	10,400	17.33	13.00	7.43	3.71	50	10.0	150	100	0.050	0.250

Wedge Hull

Price Modifiers: No SL 0.5; SL 0.7; AF 1.5

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	17.5	140	285	0.48	0.36	0.20	0.10	1	0.2	3	2	0.001	0.005
20	7	20.0	280	345	0.58	0.43	0.25	0.12	1	0.2	3	2	0.001	0.005
30	7	23.0	420	405	0.68	0.51	0.29	0.14	1	0.2	3	2	0.001	0.005
40	7	26.0	560	465	0.78	0.58	0.33	0.17	1	0.2	3	2	0.001	0.005
50	7	28.0	700	570	0.95	0.71	0.41	0.20	1	0.2	3	2	0.001	0.005
60	7	29.0	840	630	1.05	0.79	0.45	0.23	1	0.2	3	2	0.001	0.005
70	7	31.3	980	690	1.15	0.86	0.49	0.25	1	0.2	3	2	0.001	0.005
80	7	33.0	1,120	765	1.28	0.96	0.55	0.27	1	0.2	3	2	0.001	0.005

90	7	34.0	1,260	825	1.38	1.03	0.59	0.29	1	0.2	3	2	0.001	0.005
100	8	35.0	1,400	900	1.50	1.13	0.64	0.32	1	0.2	3	2	0.001	0.005
200	8	42.5	2,800	1,350	2.25	1.69	0.96	0.48	2	0.4	6	4	0.002	0.010
300	8	50.0	4,200	1,800	3.00	2.25	1.29	0.64	3	0.6	9	6	0.003	0.015
400	8	55.0	5,600	2,250	3.75	2.81	1.61	0.80	4	0.8	12	8	0.004	0.020
500	8	60.0	7,000	2,550	4.25	3.19	1.82	0.91	5	1.0	15	10	0.005	0.025
600	8	62.5	8,400	3,000	5.00	3.75	2.14	1.07	6	1.2	18	12	0.006	0.030
700	8	67.5	9,800	3,300	5.50	4.13	2.36	1.18	7	1.4	21	14	0.007	0.035
800	8	70.0	11,200	3,600	6.00	4.50	2.57	1.29	8	1.6	24	16	0.008	0.040
900	8	72.5	12,600	3,900	6.50	4.88	2.79	1.39	9	1.8	27	18	0.009	0.045
1,000	9	75.0	14,000	4,200	7.00	5.25	3.00	1.50	10	2.0	30	20	0.010	0.050
2,000	9	90.0	28,000	6,450	10.75	8.06	4.61	2.30	20	4.0	60	40	0.020	0.100
3,000	9	105.0	42,000	8,550	14.25	10.69	6.11	3.05	30	6.0	90	60	0.030	0.150
4,000	9	117.5	56,000	10,500	17.50	13.13	7.50	3.75	40	8.0	120	80	0.040	0.200
5,000	9	127.5	70,000	12,000	20.00	15.00	8.57	4.29	50	10.0	150	100	0.050	0.250

Cylinder Hull

Price Modifiers: No SL 0.6; SL 0.8; AF 2.0

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	14.0	140	209	0.35	0.26	0.15	0.07	1	0.2	3	2	0.001	0.005
20	7	16.0	280	253	0.42	0.32	0.18	0.09	1	0.2	3	2	0.001	0.005
30	7	18.4	420	297	0.50	0.37	0.21	0.11	1	0.2	3	2	0.001	0.005
40	7	20.8	560	341	0.57	0.43	0.24	0.12	1	0.2	3	2	0.001	0.005
50	7	22.4	700	418	0.70	0.52	0.30	0.15	1	0.2	3	2	0.001	0.005
60	7	23.2	840	462	0.77	0.58	0.33	0.17	1	0.2	3	2	0.001	0.005
70	7	25.0	980	506	0.84	0.63	0.36	0.18	1	0.2	3	2	0.001	0.005
80	7	26.4	1,120	561	0.94	0.70	0.40	0.20	1	0.2	3	2	0.001	0.005
90	7	27.2	1,260	605	1.01	0.76	0.43	0.22	1	0.2	3	2	0.001	0.005
100	8	28.0	1,400	660	1.10	0.83	0.47	0.24	1	0.2	3	2	0.001	0.005
200	8	34.0	2,800	990	1.65	1.24	0.71	0.35	2	0.4	6	4	0.002	0.010
300	8	40.0	4,200	1,320	2.20	1.65	0.94	0.47	3	0.6	9	6	0.003	0.015
400	8	44.0	5,600	1,650	2.75	2.06	1.18	0.59	4	0.8	12	8	0.004	0.020
500	8	48.0	7,000	1,870	3.12	2.34	1.34	0.67	5	1.0	15	10	0.005	0.025
600	8	50.0	8,400	2,200	3.67	2.75	1.57	0.79	6	1.2	18	12	0.006	0.030
700	8	54.0	9,800	2,420	4.03	3.03	1.73	0.86	7	1.4	21	14	0.007	0.035
800	8	56.0	11,200	2,640	4.40	3.30	1.89	0.94	8	1.6	24	16	0.008	0.040
900	8	58.0	12,600	2,860	4.77	3.58	2.04	1.02	9	1.8	27	18	0.009	0.045
1,000	9	60.0	14,000	3,080	5.13	3.85	2.20	1.10	10	2.0	30	20	0.010	0.050
2,000	9	72.0	28,000	4,730	7.88	5.91	3.38	1.69	20	4.0	60	40	0.020	0.100
3,000	9	84.0	42,000	6,270	10.45	7.84	4.48	2.24	30	6.0	90	60	0.030	0.150
4,000	9	94.0	56,000	7,700	12.83	9.63	5.50	2.75	40	8.0	120	80	0.040	0.200
5,000	9	102.0	70,000	8,800	14.67	11.00	6.29	3.14	50	10.0	150	100	0.050	0.250

Box Hull

Price Modifiers: No SL 0.4; SL 0.6; AF n/a

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	8.8	140	228	0.38	0.29	0.16	0.08	1	0.2	3	2	0.001	0.005
20	7	10.0	280	276	0.46	0.35	0.20	0.10	1	0.2	3	2	0.001	0.005
30	7	11.5	420	324	0.54	0.41	0.23	0.12	1	0.2	3	2	0.001	0.005
40	7	13.0	560	372	0.62	0.47	0.27	0.13	1	0.2	3	2	0.001	0.005
50	7	14.0	700	456	0.76	0.57	0.33	0.16	1	0.2	3	2	0.001	0.005
60	7	14.5	840	504	0.84	0.63	0.36	0.18	1	0.2	3	2	0.001	0.005
70	7	15.6	980	552	0.92	0.69	0.39	0.20	1	0.2	3	2	0.001	0.005
80	7	16.5	1,120	612	1.02	0.77	0.44	0.22	1	0.2	3	2	0.001	0.005
90	7	17.0	1,260	660	1.10	0.83	0.47	0.24	1	0.2	3	2	0.001	0.005
100	8	17.5	1,400	720	1.20	0.90	0.51	0.26	1	0.2	3	2	0.001	0.005
200	8	21.3	2,800	1,080	1.80	1.35	0.77	0.39	2	0.4	6	4	0.002	0.010
300	8	25.0	4,200	1,440	2.40	1.80	1.03	0.51	3	0.6	9	6	0.003	0.015
400	8	27.5	5,600	1,800	3.00	2.25	1.29	0.64	4	0.8	12	8	0.004	0.020
500	8	30.0	7,000	2,040	3.40	2.55	1.46	0.73	5	1.0	15	10	0.005	0.025
600	8	31.3	8,400	2,400	4.00	3.00	1.71	0.86	6	1.2	18	12	0.006	0.030
700	8	33.8	9,800	2,640	4.40	3.30	1.89	0.94	7	1.4	21	14	0.007	0.035
800	8	35.0	11,200	2,880	4.80	3.60	2.06	1.03	8	1.6	24	16	0.008	0.040
900	8	36.3	12,600	3,120	5.20	3.90	2.23	1.11	9	1.8	27	18	0.009	0.045
1,000	9	37.5	14,000	3,360	5.60	4.20	2.40	1.20	10	2.0	30	20	0.010	0.050
2,000	9	45.0	28,000	5,160	8.60	6.45	3.69	1.84	20	4.0	60	40	0.020	0.100
3,000	9	52.5	42,000	6,840	11.40	8.55	4.89	2.44	30	6.0	90	60	0.030	0.150
4,000	9	58.8	56,000	8,400	14.00	10.50	6.00	3.00	40	8.0	120	80	0.040	0.200
5,000	9	63.8	70,000	9,600	16.00	12.00	6.86	3.43	50	10.0	150	100	0.050	0.250

Sphere Hull

Price Modifiers: No SL 0.8; SL 1.0; AF n/a

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	7.0	140	190	0.32	0.24	0.14	0.07	1	0.2	3	2	0.001	0.005
20	7	8.0	280	230	0.38	0.29	0.16	0.08	1	0.2	3	2	0.001	0.005
30	7	9.2	420	270	0.45	0.34	0.19	0.10	1	0.2	3	2	0.001	0.005

40	7	10.4	560	310	0.52	0.39	0.22	0.11	1	0.2	3	2	0.001	0.005
50	7	11.2	700	380	0.63	0.48	0.27	0.14	1	0.2	3	2	0.001	0.005
60	7	11.6	840	420	0.70	0.53	0.30	0.15	1	0.2	3	2	0.001	0.005
70	7	12.5	980	460	0.77	0.58	0.33	0.16	1	0.2	3	2	0.001	0.005
80	7	13.2	1,120	510	0.85	0.64	0.36	0.18	1	0.2	3	2	0.001	0.005
90	7	13.6	1,260	550	0.92	0.69	0.39	0.20	1	0.2	3	2	0.001	0.005
100	8	14.0	1,400	600	1.00	0.75	0.43	0.21	1	0.2	3	2	0.001	0.005
200	8	17.0	2,800	900	1.50	1.13	0.64	0.32	2	0.4	6	4	0.002	0.010
300	8	20.0	4,200	1,200	2.00	1.50	0.86	0.43	3	0.6	9	6	0.003	0.015
400	8	22.0	5,600	1,500	2.50	1.88	1.07	0.54	4	0.8	12	8	0.004	0.020
500	8	24.0	7,000	1,700	2.83	2.13	1.21	0.61	5	1.0	15	10	0.005	0.025
600	8	25.0	8,400	2,000	3.33	2.50	1.43	0.71	6	1.2	18	12	0.006	0.030
700	8	27.0	9,800	2,200	3.67	2.75	1.57	0.79	7	1.4	21	14	0.007	0.035
800	8	28.0	11,200	2,400	4.00	3.00	1.71	0.86	8	1.6	24	16	0.008	0.040
900	8	29.0	12,600	2,600	4.33	3.25	1.86	0.93	9	1.8	27	18	0.009	0.045
1,000	9	30.0	14,000	2,800	4.67	3.50	2.00	1.00	10	2.0	30	20	0.010	0.050
2,000	9	36.0	28,000	4,300	7.17	5.38	3.07	1.54	20	4.0	60	40	0.020	0.100
3,000	9	42.0	42,000	5,700	9.50	7.13	4.07	2.04	30	6.0	90	60	0.030	0.150
4,000	9	47.0	56,000	7,000	11.67	8.75	5.00	2.50	40	8.0	120	80	0.040	0.200
5,000	9	51.0	70,000	8,000	13.33	10.00	5.71	2.86	50	10.0	150	100	0.050	0.250

Dome/Disc Hull

Price Modifiers: No SL 1.4; SL 1.6; AF 1.2

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	10.5	140	228	0.38	0.29	0.16	0.08	1	0.2	3	2	0.001	0.005
20	7	12.0	280	276	0.46	0.35	0.20	0.10	1	0.2	3	2	0.001	0.005
30	7	13.8	420	324	0.54	0.41	0.23	0.12	1	0.2	3	2	0.001	0.005
40	7	15.6	560	372	0.62	0.47	0.27	0.13	1	0.2	3	2	0.001	0.005
50	7	16.8	700	456	0.76	0.57	0.33	0.16	1	0.2	3	2	0.001	0.005
60	7	17.4	840	504	0.84	0.63	0.36	0.18	1	0.2	3	2	0.001	0.005
70	7	18.8	980	552	0.92	0.69	0.39	0.20	1	0.2	3	2	0.001	0.005
80	7	19.8	1,120	612	1.02	0.77	0.44	0.22	1	0.2	3	2	0.001	0.005
90	7	20.4	1,260	660	1.10	0.83	0.47	0.24	1	0.2	3	2	0.001	0.005
100	8	21.0	1,400	720	1.20	0.90	0.51	0.26	1	0.2	3	2	0.001	0.005
200	8	25.5	2,800	1,080	1.80	1.35	0.77	0.39	2	0.4	6	4	0.002	0.010
300	8	30.0	4,200	1,440	2.40	1.80	1.03	0.51	3	0.6	9	6	0.003	0.015
400	8	33.0	5,600	1,800	3.00	2.25	1.29	0.64	4	0.8	12	8	0.004	0.020
500	8	36.0	7,000	2,040	3.40	2.55	1.46	0.73	5	1.0	15	10	0.005	0.025
600	8	37.5	8,400	2,400	4.00	3.00	1.71	0.86	6	1.2	18	12	0.006	0.030
700	8	40.5	9,800	2,640	4.40	3.30	1.89	0.94	7	1.4	21	14	0.007	0.035
800	8	42.0	11,200	2,880	4.80	3.60	2.06	1.03	8	1.6	24	16	0.008	0.040
900	8	43.5	12,600	3,120	5.20	3.90	2.23	1.11	9	1.8	27	18	0.009	0.045
1,000	9	45.0	14,000	3,360	5.60	4.20	2.40	1.20	10	2.0	30	20	0.010	0.050
2,000	9	54.0	28,000	5,160	8.60	6.45	3.69	1.84	20	4.0	60	40	0.020	0.100
3,000	9	63.0	42,000	6,840	11.40	8.55	4.89	2.44	30	6.0	90	60	0.030	0.150
4,000	9	70.5	56,000	8,400	14.00	10.50	6.00	3.00	40	8.0	120	80	0.040	0.200
5,000	9	76.5	70,000	9,600	16.00	12.00	6.86	3.43	50	10.0	150	100	0.050	0.250

Close Structure Hull

Price Modifiers: No SL 0.3; SL n/a; AF n/a

					Volume Factor				Airlocks					
Size (T_d)	Size Code	Length (m)	Total Volume (m^3)	Surface Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	12.3	140	266	0.44	0.33	0.19	0.10	1	0.2	3	2	0.001	0.005
20	7	14.0	280	322	0.54	0.40	0.23	0.12	1	0.2	3	2	0.001	0.005
30	7	16.1	420	378	0.63	0.47	0.27	0.14	1	0.2	3	2	0.001	0.005
40	7	18.2	560	434	0.72	0.54	0.31	0.16	1	0.2	3	2	0.001	0.005
50	7	19.6	700	532	0.89	0.67	0.38	0.19	1	0.2	3	2	0.001	0.005
60	7	20.3	840	588	0.98	0.74	0.42	0.21	1	0.2	3	2	0.001	0.005
70	7	21.9	980	644	1.07	0.81	0.46	0.23	1	0.2	3	2	0.001	0.005
80	7	23.1	1,120	714	1.19	0.89	0.51	0.26	1	0.2	3	2	0.001	0.005
90	7	23.8	1,260	770	1.28	0.96	0.55	0.28	1	0.2	3	2	0.001	0.005
100	8	24.5	1,400	840	1.40	1.05	0.60	0.30	1	0.2	3	2	0.001	0.005
200	8	29.8	2,800	1,260	2.10	1.58	0.90	0.45	2	0.4	6	4	0.002	0.010
300	8	35.0	4,200	1,680	2.80	2.10	1.20	0.60	3	0.6	9	6	0.003	0.015
400	8	38.5	5,600	2,100	3.50	2.63	1.50	0.75	4	0.8	12	8	0.004	0.020
500	8	42.0	7,000	2,380	3.97	2.98	1.70	0.85	5	1.0	15	10	0.005	0.025
600	8	43.8	8,400	2,800	4.67	3.50	2.00	1.00	6	1.2	18	12	0.006	0.030
700	8	47.3	9,800	3,080	5.13	3.85	2.20	1.10	7	1.4	21	14	0.007	0.035
800	8	49.0	11,200	3,360	5.60	4.20	2.40	1.20	8	1.6	24	16	0.008	0.040
900	8	50.8	12,600	3,640	6.07	4.55	2.60	1.30	9	1.8	27	18	0.009	0.045
1,000	9	52.5	14,000	3,920	6.53	4.90	2.80	1.40	10	2.0	30	20	0.010	0.050
2,000	9	63.0	28,000	6,020	10.03	7.53	4.30	2.15	20	4.0	60	40	0.020	0.100
3,000	9	73.5	42,000	7,980	13.30	9.98	5.70	2.85	30	6.0	90	60	0.030	0.150
4,000	9	82.3	56,000	9,800	16.33	12.25	7.00	3.50	40	8.0	120	80	0.040	0.200
5,000	9	89.3	70,000	11,200	18.67	14.00	8.00	4.00	50	10.0	150	100	0.050	0.250

Slab Hull

Price Modifiers: No SL 0.5; SL 0.7; AF 1.5

			Volume Factor				Airlocks
		Total	Surface				

Disp (T_d)	Size Code	Length (m)	Volume (m^3)	Area (m^2)	TL 8-9	TL 10-11	TL 12-13	TL 14-16	Qty	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	7	19.3	140	285	0.48	0.36	0.20	0.10	1	0.2	3	2	0.001	0.005
20	7	22.0	280	345	0.58	0.43	0.25	0.12	1	0.2	3	2	0.001	0.005
30	7	25.3	420	405	0.68	0.51	0.29	0.14	1	0.2	3	2	0.001	0.005
40	7	28.6	560	465	0.78	0.58	0.33	0.17	1	0.2	3	2	0.001	0.005
50	7	30.8	700	570	0.95	0.71	0.41	0.20	1	0.2	3	2	0.001	0.005
60	7	31.9	840	630	1.05	0.79	0.45	0.23	1	0.2	3	2	0.001	0.005
70	7	34.4	980	690	1.15	0.86	0.49	0.25	1	0.2	3	2	0.001	0.005
80	7	36.3	1,120	765	1.28	0.96	0.55	0.27	1	0.2	3	2	0.001	0.005
90	7	37.4	1,260	825	1.38	1.03	0.59	0.29	1	0.2	3	2	0.001	0.005
100	8	38.5	1,400	900	1.50	1.13	0.64	0.32	1	0.2	3	2	0.001	0.005
200	8	46.8	2,800	1,350	2.25	1.69	0.96	0.48	2	0.4	6	4	0.002	0.010
300	8	55.0	4,200	1,800	3.00	2.25	1.29	0.64	3	0.6	9	6	0.003	0.015
400	8	60.5	5,600	2,250	3.75	2.81	1.61	0.80	4	0.8	12	8	0.004	0.020
500	8	66.0	7,000	2,550	4.25	3.19	1.82	0.91	5	1.0	15	10	0.005	0.025
600	8	68.8	8,400	3,000	5.00	3.75	2.14	1.07	6	1.2	18	12	0.006	0.030
700	8	74.3	9,800	3,300	5.50	4.13	2.36	1.18	7	1.4	21	14	0.007	0.035
800	8	77.0	11,200	3,600	6.00	4.50	2.57	1.29	8	1.6	24	16	0.008	0.040
900	8	79.8	12,600	3,900	6.50	4.88	2.79	1.39	9	1.8	27	18	0.009	0.045
1,000	9	82.5	14,000	4,200	7.00	5.25	3.00	1.50	10	2.0	30	20	0.010	0.050
2,000	9	99.0	28,000	6,450	10.75	8.06	4.61	2.30	20	4.0	60	40	0.020	0.100
3,000	9	115.5	42,000	8,550	14.25	10.69	6.11	3.05	30	6.0	90	60	0.030	0.150
4,000	9	129.3	56,000	10,500	17.50	13.13	7.50	3.75	40	8.0	120	80	0.040	0.200
5,000	9	140.3	70,000	12,000	20.00	15.00	8.57	4.29	50	10.0	150	100	0.050	0.250

SELECT JUMP DRIVE

Decide what Jump capacity the ship requires (limited by tech level).

On the Jump Drive Size table, find the ship's size, then go across to the column under the required jump number. This is the volume the jump drive requires. Also listed is the price and mass.

At the end of the row is a column that lists how much fuel is needed for a jump of one parsec. Multiply that by the jump rating of the ship to determine how much fuel needed for a full jump. If more than one jump is needed, include more fuel.

Record mass, volume, area and cost, as well as the Crew Factor.

Jump Drives

	1 Parsec (TL9)					2 Parsecs (TL11)					3 Parsecs (TL12)					
Ship Size	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Fuel (m^3/psc)
100	84	28	9	8.4	0.17	126	42	14	12.6	0.26	168	56	19	16.8	0.34	140
200	168	56	19	16.8	0.34	252	84	28	25.2	0.51	336	112	37	33.6	0.68	280
300	252	84	28	25.2	0.51	378	126	42	37.8	0.76	504	168	56	50.4	1.01	420
400	336	112	37	33.6	0.68	504	168	56	50.4	1.01	672	224	75	67.2	1.35	560
500	420	140	47	42.0	0.84	630	210	70	63.0	1.26	840	280	93	84.0	1.68	700
600	504	168	56	50.4	1.01	756	252	84	75.6	1.52	1,008	336	112	100.8	2.02	840
700	588	196	65	58.8	1.18	882	294	98	88.2	1.77	1,176	392	131	117.6	2.36	980
800	672	224	75	67.2	1.35	1,008	336	112	100.8	2.02	1,344	448	149	134.4	2.69	1,120
900	756	252	84	75.6	1.52	1,134	378	126	113.4	2.27	1,512	504	168	151.2	3.03	1,260
1,000	840	280	93	84.0	1.68	1,260	420	140	126.0	2.52	1,680	560	187	168.0	3.36	1,400
2,000	1,680	560	187	168.0	3.36	2,520	840	280	252.0	5.04	3,360	1,120	373	336.0	6.72	2,800
3,000	2,520	840	280	252.0	5.04	3,780	1,260	420	378.0	7.56	5,040	1,680	560	504.0	10.08	4,200
4,000	3,360	1,120	373	336.0	6.72	5,040	1,680	560	504.0	10.08	6,720	2,240	747	672.0	13.44	5,600
5,000	4,200	1,400	467	420.0	8.40	6,300	2,100	700	630.0	12.60	8,400	2,800	933	840.0	16.80	7,000

	4 Parsecs (TL13)					5 Parsecs (TL14)					6 Parsecs (TL15)					
Ship Size	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)	Crew (Mx)	Fuel (m^3/psc)
100	210	70	23	21.0	0.42	210	84	28	25.2	0.42	196	98	33	29.4	0.40	140
200	420	140	47	42.0	0.84	420	168	56	50.4	0.84	392	196	65	58.8	0.79	280
300	630	210	70	63.0	1.26	630	252	84	75.6	1.26	588	294	98	88.2	1.18	420
400	840	280	93	84.0	1.68	840	336	112	100.8	1.68	784	392	131	117.6	1.57	560
500	1,050	350	117	105.0	2.10	1,050	420	140	126.0	2.10	980	490	163	147.0	1.96	700
600	1,260	420	140	126.0	2.52	1,260	504	168	151.2	2.52	1,176	588	196	176.4	2.36	840
700	1,470	490	163	147.0	2.94	1,470	588	196	176.4	2.94	1,372	686	229	205.8	2.75	980
800	1,680	560	187	168.0	3.36	1,680	672	224	201.6	3.36	1,568	784	261	235.2	3.14	1,120
900	1,890	630	210	189.0	3.78	1,890	756	252	226.8	3.78	1,764	882	294	264.6	3.53	1,260
1,000	2,100	700	233	210.0	4.20	2,100	840	280	252.0	4.20	1,960	980	327	294.0	3.92	1,400
2,000	4,200	1,400	467	420.0	8.40	4,200	1,680	560	504.0	8.40	3,920	1,960	653	588.0	7.84	2,800
3,000	6,300	2,100	700	630.0	12.60	6,300	2,520	840	756.0	12.60	5,880	2,940	980	882.0	11.76	4,200
4,000	8,400	2,800	933	840.0	16.80	8,400	3,360	1,120	1,008.0	16.80	7,840	3,920	1,307	1,176.0	15.68	5,600
5,000	10,500	3,500	1,167	1,050.0	21.00	10,500	4,200	1,400	1,260.0	21.00	9,800	4,900	1,633	1,470.0	19.60	7,000

SELECT MANEUVER DRIVES

Decide how many Gs of acceleration the ship requires. Actually, you should have decided this under Hulls, since it affects the hull structure.

Decide which type of drive to use, consistent with the tech level available.

Multiply the hull size, in displacement tons (T_d), by 10xGs to determine the thrust required. Find the value in the thrust column where the thrust is greater than or equal to what is needed. That row is the drive that will give the desired performance.

Note the fuel requirement per hour. Multiply by the number of hours of sustained travel at full acceleration to get the volume required for fuel. Merchant vessels can get by with 40-60 divided by their maximum acceleration. Warships require more. Remember that Thruster Plates do not requre fuel.

Note the power requirements of the drive. If the number is in parentheses like this (10), then that is how much excess power the drive produces, which is available to other systems.

Note the Crew Factor the drive requires. This will be used later to determine the crew requirements for the ship.

Record how much volume the drive and fuel require, and how much is still available. Also record the surface area taken up by the exhaust ports.

ContraGravity (tech level9+)

ContraGravity drives are not real maneuver drives, and aren't useful outside of a gravity well. Their primary use is gravity vehicles. They are included here so that ships below tech level 11 (thruster plates) can hover and maneuver in an atmosphere. By 10 diameters out from a planet, the ContraGravity drive is virtually worthless, only producing 1% of the thrust it would on the surface. Note that the accelerations listed below can only be achieved in a 1G gravity well. Ships that use ContraGravity still need another form of maneuver drive to get out to jump distance. Normally, only enough CG is installed to counter the mass of the ship (use 10x displacement tons as a rule of thumb).

Basic ContraGravity Drives (Tech Level 9)

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Mx)
100	2.7	3.4	2	2.0	0.14	0.1
200	5.3	6.7	4	4.0	0.27	0.1
300	8.0	10.0	6	6.0	0.40	0.1
400	10.7	13.4	8	8.0	0.54	0.1
500	13.3	16.7	10	10.0	0.67	0.1
600	16.0	20.0	12	12.0	0.80	0.1
800	21.3	26.7	16	16.0	1.07	0.1
900	24.0	30.0	18	18.0	1.20	0.1
1,000	26.7	33.4	20	20.0	1.34	0.1
1,200	32.0	40.0	24	24.0	1.60	0.1
1,400	37.3	46.7	28	28.0	1.87	0.1
1,500	40.0	50.0	30	30.0	2.00	0.1
1,600	42.7	53.4	32	32.0	2.14	0.1
1,800	48.0	60.0	36	36.0	2.40	0.1
2,000	53.3	66.7	40	40.0	2.67	0.2
2,100	56.0	70.0	42	42.0	2.80	0.2
2,400	64.0	80.0	48	48.0	3.20	0.2
2,500	66.7	83.4	50	50.0	3.34	0.2
2,700	72.0	90.0	54	54.0	3.60	0.2
2,800	74.7	93.4	56	56.0	3.74	0.2
3,000	80.0	100.0	60	60.0	4.00	0.2
3,200	85.3	106.7	64	64.0	4.27	0.2
3,500	93.3	116.7	70	70.0	4.67	0.2
3,600	96.0	120.0	72	72.0	4.80	0.2
4,000	106.7	133.4	80	80.0	5.34	0.3
4,200	112.0	140.0	84	84.0	5.60	0.3
4,500	120.0	150.0	90	90.0	6.00	0.3
4,800	128.0	160.0	96	96.0	6.40	0.3
5,000	133.3	166.7	100	100.0	6.67	0.3

5,400	144.0	180.0	108	108.0	7.20	0.3
6,000	160.0	200.0	120	120.0	8.00	0.4
8,000	213.3	266.7	160	160.0	10.67	0.5
9,000	240.0	300.0	180	180.0	12.00	0.5
10,000	266.7	333.4	200	200.0	13.34	0.6
12,000	320.0	400.0	240	240.0	16.00	0.7
14,000	373.3	466.7	280	280.0	18.67	0.8
15,000	400.0	500.0	300	300.0	20.00	0.8
16,000	426.7	533.4	320	320.0	21.34	0.9
18,000	480.0	600.0	360	360.0	24.00	1.0
20,000	533.3	666.7	400	400.0	26.67	1.1
21,000	560.0	700.0	420	420.0	28.00	1.2
24,000	640.0	800.0	480	480.0	32.00	1.3
25,000	666.7	833.4	500	500.0	33.34	1.4
27,000	720.0	900.0	540	540.0	36.00	1.5
28,000	746.7	933.4	560	560.0	37.34	1.5
30,000	800.0	1,000.0	600	600.0	40.00	1.6
32,000	853.3	1,066.7	640	640.0	42.67	1.8
35,000	933.3	1,166.7	700	700.0	46.67	1.9
36,000	960.0	1,200.0	720	720.0	48.00	2.0
40,000	1,066.7	1,333.4	800	800.0	53.34	2.2
42,000	1,120.0	1,400.0	840	840.0	56.00	2.3
45,000	1,200.0	1,500.0	900	900.0	60.00	2.4
48,000	1,280.0	1,600.0	960	960.0	64.00	2.6
50,000	1,333.3	1,666.7	1,000	1,000.0	66.67	2.7
54,000	1,440.0	1,800.0	1,080	1,080.0	72.00	2.9
60,000	1,600.0	2,000.0	1,200	1,200.0	80.00	3.2
80,000	2,133.3	2,666.7	1,600	1,600.0	106.67	4.3
90,000	2,400.0	3,000.0	1,800	1,800.0	120.00	4.8
100,000	2,666.7	3,333.4	2,000	2,000.0	133.34	5.4
120,000	3,200.0	4,000.0	2,400	2,400.0	160.00	6.4
150,000	4,000.0	5,000.0	3,000	3,000.0	200.00	8.0
160,000	4,266.7	5,333.4	3,200	3,200.0	213.34	8.6
180,000	4,800.0	6,000.0	3,600	3,600.0	240.00	9.6
200,000	5,333.3	6,666.7	4,000	4,000.0	266.67	10.7
240,000	6,400.0	8,000.0	4,800	4,800.0	320.00	12.8
250,000	6,666.7	8,333.4	5,000	5,000.0	333.34	13.4
300,000	8,000.0	10,000.0	6,000	6,000.0	400.00	16.0

Standard ContraGravity Drives (Tech Level 10)

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Mx)
100	2.0	2.0	2	1.4	0.17	0.1
200	4.0	4.0	4	2.7	0.34	0.1
300	6.0	6.0	6	4.0	0.50	0.1
400	8.0	8.0	8	5.4	0.67	0.1
500	10.0	10.0	10	6.7	0.84	0.1
600	12.0	12.0	12	8.0	1.00	0.1
800	16.0	16.0	16	10.7	1.34	0.1
900	18.0	18.0	18	12.0	1.50	0.1
1,000	20.0	20.0	20	13.4	1.67	0.1
1,200	24.0	24.0	24	16.0	2.00	0.1
1,400	28.0	28.0	28	18.7	2.34	0.1
1,500	30.0	30.0	30	20.0	2.50	0.1
1,600	32.0	32.0	32	21.4	2.67	0.1
1,800	36.0	36.0	36	24.0	3.00	0.1
2,000	40.0	40.0	40	26.7	3.34	0.1
2,100	42.0	42.0	42	28.0	3.50	0.1
2,400	48.0	48.0	48	32.0	4.00	0.1
2,500	50.0	50.0	50	33.4	4.17	0.1
2,700	54.0	54.0	54	36.0	4.50	0.2
2,800	56.0	56.0	56	37.4	4.67	0.2
3,000	60.0	60.0	60	40.0	5.00	0.2
3,200	64.0	64.0	64	42.7	5.34	0.2
3,500	70.0	70.0	70	46.7	5.84	0.2
3,600	72.0	72.0	72	48.0	6.00	0.2
4,000	80.0	80.0	80	53.4	6.67	0.2
4,200	84.0	84.0	84	56.0	7.00	0.2
4,500	90.0	90.0	90	60.0	7.50	0.2
4,800	96.0	96.0	96	64.0	8.00	0.2
5,000	100.0	100.0	100	66.7	8.34	0.2
5,400	108.0	108.0	108	72.0	9.00	0.3
6,000	120.0	120.0	120	80.0	10.00	0.3
8,000	160.0	160.0	160	106.7	13.34	0.4

9,000	180.0	180.0	180	120.0	15.00	0.4
10,000	200.0	200.0	200	133.4	16.67	0.4
12,000	240.0	240.0	240	160.0	20.00	0.5
14,000	280.0	280.0	280	186.7	23.34	0.6
15,000	300.0	300.0	300	200.0	25.00	0.6
16,000	320.0	320.0	320	213.4	26.67	0.7
18,000	360.0	360.0	360	240.0	30.00	0.8
20,000	400.0	400.0	400	266.7	33.34	0.8
21,000	420.0	420.0	420	280.0	35.00	0.9
24,000	480.0	480.0	480	320.0	40.00	1.0
25,000	500.0	500.0	500	333.4	41.67	1.0
27,000	540.0	540.0	540	360.0	45.00	1.1
28,000	560.0	560.0	560	373.4	46.67	1.2
30,000	600.0	600.0	600	400.0	50.00	1.2
32,000	640.0	640.0	640	426.7	53.34	1.3
35,000	700.0	700.0	700	466.7	58.34	1.4
36,000	720.0	720.0	720	480.0	60.00	1.5
40,000	800.0	800.0	800	533.4	66.67	1.6
42,000	840.0	840.0	840	560.0	70.00	1.7
45,000	900.0	900.0	900	600.0	75.00	1.8
48,000	960.0	960.0	960	640.0	80.00	2.0
50,000	1,000.0	1,000.0	1,000	666.7	83.34	2.0
54,000	1,080.0	1,080.0	1,080	720.0	90.00	2.2
60,000	1,200.0	1,200.0	1,200	800.0	100.00	2.4
80,000	1,600.0	1,600.0	1,600	1,066.7	133.34	3.2
90,000	1,800.0	1,800.0	1,800	1,200.0	150.00	3.6
100,000	2,000.0	2,000.0	2,000	1,333.4	166.67	4.0
120,000	2,400.0	2,400.0	2,400	1,600.0	200.00	4.8
150,000	3,000.0	3,000.0	3,000	2,000.0	250.00	6.0
160,000	3,200.0	3,200.0	3,200	2,133.4	266.67	6.4
180,000	3,600.0	3,600.0	3,600	2,400.0	300.00	7.2
200,000	4,000.0	4,000.0	4,000	2,666.7	333.34	8.0
240,000	4,800.0	4,800.0	4,800	3,200.0	400.00	9.6
250,000	5,000.0	5,000.0	5,000	3,333.4	416.67	10.0
300,000	6,000.0	6,000.0	6,000	4,000.0	500.00	12.0

High Efficiency ContraGravity Drives (Tech Level 12)

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Mx)
100	1.3	2.0	2	0.7	0.20	0.1
200	2.7	4.0	4	1.4	0.40	0.1
300	4.0	6.0	6	2.0	0.60	0.1
400	5.3	8.0	8	2.7	0.80	0.1
500	6.7	10.0	10	3.4	1.00	0.1
600	8.0	12.0	12	4.0	1.20	0.1
800	10.7	16.0	16	5.4	1.60	0.1
900	12.0	18.0	18	6.0	1.80	0.1
1,000	13.3	20.0	20	6.7	2.00	0.1
1,200	16.0	24.0	24	8.0	2.40	0.1
1,400	18.7	28.0	28	9.4	2.80	0.1
1,500	20.0	30.0	30	10.0	3.00	0.1
1,600	21.3	32.0	32	10.7	3.20	0.1
1,800	24.0	36.0	36	12.0	3.60	0.1
2,000	26.7	40.0	40	13.4	4.00	0.1
2,100	28.0	42.0	42	14.0	4.20	0.1
2,400	32.0	48.0	48	16.0	4.80	0.1
2,500	33.3	50.0	50	16.7	5.00	0.1
2,700	36.0	54.0	54	18.0	5.40	0.1
2,800	37.3	56.0	56	18.7	5.60	0.1
3,000	40.0	60.0	60	20.0	6.00	0.1
3,200	42.7	64.0	64	21.4	6.40	0.1
3,500	46.7	70.0	70	23.4	7.00	0.1
3,600	48.0	72.0	72	24.0	7.20	0.1
4,000	53.3	80.0	80	26.7	8.00	0.2
4,200	56.0	84.0	84	28.0	8.40	0.2
4,500	60.0	90.0	90	30.0	9.00	0.2
4,800	64.0	96.0	96	32.0	9.60	0.2
5,000	66.7	100.0	100	33.4	10.00	0.2
5,400	72.0	108.0	108	36.0	10.80	0.2
6,000	80.0	120.0	120	40.0	12.00	0.2
8,000	106.7	160.0	160	53.4	16.00	0.3
9,000	120.0	180.0	180	60.0	18.00	0.3
10,000	133.3	200.0	200	66.7	20.00	0.3
12,000	160.0	240.0	240	80.0	24.00	0.4

14,000	186.7	280.0	280	93.4	28.00	0.4
15,000	200.0	300.0	300	100.0	30.00	0.4
16,000	213.3	320.0	320	106.7	32.00	0.5
18,000	240.0	360.0	360	120.0	36.00	0.5
20,000	266.7	400.0	400	133.4	40.00	0.6
21,000	280.0	420.0	420	140.0	42.00	0.6
24,000	320.0	480.0	480	160.0	48.00	0.7
25,000	333.3	500.0	500	166.7	50.00	0.7
27,000	360.0	540.0	540	180.0	54.00	0.8
28,000	373.3	560.0	560	186.7	56.00	0.8
30,000	400.0	600.0	600	200.0	60.00	0.8
32,000	426.7	640.0	640	213.4	64.00	0.9
35,000	466.7	700.0	700	233.4	70.00	1.0
36,000	480.0	720.0	720	240.0	72.00	1.0
40,000	533.3	800.0	800	266.7	80.00	1.1
42,000	560.0	840.0	840	280.0	84.00	1.2
45,000	600.0	900.0	900	300.0	90.00	1.2
48,000	640.0	960.0	960	320.0	96.00	1.3
50,000	666.7	1,000.0	1,000	333.4	100.00	1.4
54,000	720.0	1,080.0	1,080	360.0	108.00	1.5
60,000	800.0	1,200.0	1,200	400.0	120.00	1.6
80,000	1,066.7	1,600.0	1,600	533.4	160.00	2.2
90,000	1,200.0	1,800.0	1,800	600.0	180.00	2.4
100,000	1,333.3	2,000.0	2,000	666.7	200.00	2.7
120,000	1,600.0	2,400.0	2,400	800.0	240.00	3.2
150,000	2,000.0	3,000.0	3,000	1,000.0	300.00	4.0
160,000	2,133.3	3,200.0	3,200	1,066.7	320.00	4.3
180,000	2,400.0	3,600.0	3,600	1,200.0	360.00	4.8
200,000	2,666.7	4,000.0	4,000	1,333.4	400.00	5.4
240,000	3,200.0	4,800.0	4,800	1,600.0	480.00	6.4
250,000	3,333.3	5,000.0	5,000	1,666.7	500.00	6.7
300,000	4,000.0	6,000.0	6,000	2,000.0	600.00	8.0

Fusion Drive (Tech Level 9)

A fusion rocket is not much more than a fusion reactor with a steady stream of hydrogen going in one end and a hole in the other. Super-heated hydrogen plasma expelled at tremendous velocities forms the reaction mass. Because of the nature of the drive, the exhaust is extremely dangerous. It cannot be used within planetary atmospheres, and ships which intend to land must have some form of auxiliary drive, such as ContraGravity. Other ships passing through the hydrogen wake will generally do so quickly enough that they won't suffer any ill effects, unless extremely close (~200km, referee's discretion). In that case, each crewperson must make a Difficult roll versus Constitution to avoid incapacitation by radiation (Average if wearing radiation-protective clothing), and each system on the ship suffers a minor damage result. All crew will require blood and bone-marrow therapy over the next several months to avoid long-term health problems. If the ship has sufficient sick-bay space, this can be done on board. Otherwise, it must be done at a local hospital.

Because of this effect, many systems have restrictions on the use of fusion drive within the local traffic area (10 planetary diameters). Restrictions range from strict control as to when and where the drive may be aimed for course changes, to requiring the drive to be "run rich," increasing the fuel flow tenfold to dilute the effects somewhat. This also reduces the drive's thrust.

Note that the fusion drive does not require power, it generates excess power for use by other ship's systems.

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Fuel (m^3/hr)	Crew (Mx)
100	11	11	1	(2.0)	3.9	0.04	0.1
200	22	22	1	(4.0)	7.8	0.07	0.1
300	33	33	2	(6.0)	11.7	0.11	0.1
400	45	45	2	(8.0)	15.6	0.14	0.1
500	56	56	3	(10.0)	19.4	0.18	0.2
600	67	67	3	(12.0)	23.3	0.21	0.2
800	89	89	4	(16.0)	31.1	0.28	0.2
900	100	100	5	(18.0)	35.0	0.32	0.2
1,000	111	111	5	(20.0)	38.9	0.35	0.3
1,200	133	133	6	(24.0)	46.7	0.42	0.3
1,400	156	156	7	(28.0)	54.4	0.49	0.4
1,500	167	167	8	(30.0)	58.3	0.53	0.4
1,600	178	178	8	(32.0)	62.2	0.56	0.4
1,800	200	200	9	(36.0)	70.0	0.63	0.4
2,000	222	222	10	(40.0)	77.8	0.70	0.5
2,100	233	233	11	(42.0)	81.7	0.74	0.5
2,400	267	267	12	(48.0)	93.3	0.84	0.6

2,500	278	278	13	(50.0)	97.2	0.88	0.6
2,700	300	300	14	(54.0)	105.0	0.95	0.6
2,800	311	311	14	(56.0)	108.9	0.98	0.7
3,000	333	333	15	(60.0)	116.7	1.05	0.7
3,200	356	356	16	(64.0)	124.4	1.12	0.8
3,500	389	389	18	(70.0)	136.1	1.23	0.8
3,600	400	400	18	(72.0)	140.0	1.26	0.8
4,000	445	445	20	(80.0)	155.6	1.40	0.9
4,200	467	467	21	(84.0)	163.3	1.47	1.0
4,500	500	500	23	(90.0)	175.0	1.58	1.0
4,800	533	533	24	(96.0)	186.7	1.68	1.1
5,000	556	556	25	(100.0)	194.4	1.75	1.2
5,400	600	600	27	(108.0)	210.0	1.89	1.2
6,000	667	667	30	(120.0)	233.3	2.10	1.4
8,000	889	889	40	(160.0)	311.1	2.80	1.8
9,000	1,000	1,000	45	(180.0)	350.0	3.15	2.0
10,000	1,111	1,111	50	(200.0)	388.9	3.50	2.3
12,000	1,333	1,333	60	(240.0)	466.7	4.20	2.7
14,000	1,556	1,556	70	(280.0)	544.4	4.90	3.2
15,000	1,667	1,667	75	(300.0)	583.3	5.25	3.4
16,000	1,778	1,778	80	(320.0)	622.2	5.60	3.6
18,000	2,000	2,000	90	(360.0)	700.0	6.30	4.0
20,000	2,222	2,222	100	(400.0)	777.8	7.00	4.5
21,000	2,333	2,333	105	(420.0)	816.7	7.35	4.7
24,000	2,667	2,667	120	(480.0)	933.3	8.40	5.4
25,000	2,778	2,778	125	(500.0)	972.2	8.75	5.6
27,000	3,000	3,000	135	(540.0)	1,050.0	9.45	6.0
28,000	3,111	3,111	140	(560.0)	1,088.9	9.80	6.3
30,000	3,333	3,333	150	(600.0)	1,166.7	10.50	6.7
32,000	3,556	3,556	160	(640.0)	1,244.4	11.20	7.2
35,000	3,889	3,889	175	(700.0)	1,361.1	12.25	7.8
36,000	4,000	4,000	180	(720.0)	1,400.0	12.60	8.0
40,000	4,445	4,445	200	(800.0)	1,555.6	14.00	8.9
42,000	4,667	4,667	210	(840.0)	1,633.3	14.70	9.4
45,000	5,000	5,000	225	(900.0)	1,750.0	15.75	10.0
48,000	5,333	5,333	240	(960.0)	1,866.7	16.80	10.7
50,000	5,556	5,556	250	(1,000.0)	1,944.4	17.50	11.2
54,000	6,000	6,000	270	(1,080.0)	2,100.0	18.90	12.0
60,000	6,667	6,667	300	(1,200.0)	2,333.3	21.00	13.4
80,000	8,889	8,889	400	(1,600.0)	3,111.1	28.00	17.8
90,000	10,000	10,000	450	(1,800.0)	3,500.0	31.50	20.0
100,000	11,111	11,111	500	(2,000.0)	3,888.9	35.00	22.3
120,000	13,333	13,333	600	(2,400.0)	4,666.7	42.00	26.7
150,000	16,667	16,667	750	(3,000.0)	5,833.3	52.50	33.4
160,000	17,778	17,778	800	(3,200.0)	6,222.2	56.00	35.6
180,000	20,000	20,000	900	(3,600.0)	7,000.0	63.00	40.0
200,000	22,222	22,222	1,000	(4,000.0)	7,777.8	70.00	44.5
240,000	26,667	26,667	1,200	(4,800.0)	9,333.3	84.00	53.4
250,000	27,778	27,778	1,250	(5,000.0)	9,722.2	87.50	55.6
300,000	33,333	33,333	1,500	(6,000.0)	11,666.7	105.00	66.7

High Efficiency Plasma Recombustion (HEPlaR) Drive (Tech Level 10)

HEPlaR consists of a heat exchanger and recombustion chamber added to any power plant. Hydrogen is injected into the recombustion chamber, and the power generated by the power plant heats the hydrogen to a plasma state, causing a small fraction of the hydrogen to undergo damper-mediated fusion. The plasma is then released as a high velocity stream of reaction mass, providing thrust.

Note the power required below and make sure it's included in your power requirements when you select a power plant. The prices and volumes below may seem like a bargain compared to the other drives, but remember: you still need a power plant!

HEPlaR Drives

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Fuel (m^3/hr)	Crew (Mx)
100	0.5	0.5	1	5.0	0.005	1.25	0.1
200	1.0	1.0	1	10.0	0.010	2.50	0.1
300	1.5	1.5	2	15.0	0.015	3.75	0.1
400	2.0	2.0	2	20.0	0.020	5.00	0.1
500	2.5	2.5	3	25.0	0.025	6.25	0.1
600	3.0	3.0	3	30.0	0.030	7.50	0.1
800	4.0	4.0	4	40.0	0.040	10.00	0.1
900	4.5	4.5	5	45.0	0.045	11.25	0.1
1,000	5.0	5.0	5	50.0	0.050	12.50	0.1

1,200	6.0	6.0	6	60.0	0.060	15.00	0.1
1,400	7.0	7.0	7	70.0	0.070	17.50	0.1
1,500	7.5	7.5	8	75.0	0.075	18.75	0.1
1,600	8.0	8.0	8	80.0	0.080	20.00	0.1
1,800	9.0	9.0	9	90.0	0.090	22.50	0.1
2,000	10.0	10.0	10	100.0	0.100	25.00	0.1
2,100	10.5	10.5	11	105.0	0.105	26.25	0.1
2,400	12.0	12.0	12	120.0	0.120	30.00	0.1
2,500	12.5	12.5	13	125.0	0.125	31.25	0.1
2,700	13.5	13.5	14	135.0	0.135	33.75	0.1
2,800	14.0	14.0	14	140.0	0.140	35.00	0.1
3,000	15.0	15.0	15	150.0	0.150	37.50	0.1
3,200	16.0	16.0	16	160.0	0.160	40.00	0.1
3,500	17.5	17.5	18	175.0	0.175	43.75	0.1
3,600	18.0	18.0	18	180.0	0.180	45.00	0.1
4,000	20.0	20.0	20	200.0	0.200	50.00	0.1
4,200	21.0	21.0	21	210.0	0.210	52.50	0.1
4,500	22.5	22.5	23	225.0	0.225	56.25	0.1
4,800	24.0	24.0	24	240.0	0.240	60.00	0.1
5,000	25.0	25.0	25	250.0	0.250	62.50	0.1
5,400	27.0	27.0	27	270.0	0.270	67.50	0.1
6,000	30.0	30.0	30	300.0	0.300	75.00	0.1
8,000	40.0	40.0	40	400.0	0.400	100.00	0.1
9,000	45.0	45.0	45	450.0	0.450	112.50	0.1
10,000	50.0	50.0	50	500.0	0.500	125.00	0.1
12,000	60.0	60.0	60	600.0	0.600	150.00	0.2
14,000	70.0	70.0	70	700.0	0.700	175.00	0.2
15,000	75.0	75.0	75	750.0	0.750	187.50	0.2
16,000	80.0	80.0	80	800.0	0.800	200.00	0.2
18,000	90.0	90.0	90	900.0	0.900	225.00	0.2
20,000	100.0	100.0	100	1,000.0	1.000	250.00	0.2
21,000	105.0	105.0	105	1,050.0	1.050	262.50	0.3
24,000	120.0	120.0	120	1,200.0	1.200	300.00	0.3
25,000	125.0	125.0	125	1,250.0	1.250	312.50	0.3
27,000	135.0	135.0	135	1,350.0	1.350	337.50	0.3
28,000	140.0	140.0	140	1,400.0	1.400	350.00	0.3
30,000	150.0	150.0	150	1,500.0	1.500	375.00	0.3
32,000	160.0	160.0	160	1,600.0	1.600	400.00	0.4
35,000	175.0	175.0	175	1,750.0	1.750	437.50	0.4
36,000	180.0	180.0	180	1,800.0	1.800	450.00	0.4
40,000	200.0	200.0	200	2,000.0	2.000	500.00	0.4
42,000	210.0	210.0	210	2,100.0	2.100	525.00	0.5
45,000	225.0	225.0	225	2,250.0	2.250	562.50	0.5
48,000	240.0	240.0	240	2,400.0	2.400	600.00	0.5
50,000	250.0	250.0	250	2,500.0	2.500	625.00	0.5
54,000	270.0	270.0	270	2,700.0	2.700	675.00	0.6
60,000	300.0	300.0	300	3,000.0	3.000	750.00	0.6
80,000	400.0	400.0	400	4,000.0	4.000	1,000.00	0.8
90,000	450.0	450.0	450	4,500.0	4.500	1,125.00	0.9
100,000	500.0	500.0	500	5,000.0	5.000	1,250.00	1.0
120,000	600.0	600.0	600	6,000.0	6.000	1,500.00	1.2
150,000	750.0	750.0	750	7,500.0	7.500	1,875.00	1.5
160,000	800.0	800.0	800	8,000.0	8.000	2,000.00	1.6
180,000	900.0	900.0	900	9,000.0	9.000	2,250.00	1.8
200,000	1,000.0	1,000.0	1,000	10,000.0	10.000	2,500.00	2.0
240,000	1,200.0	1,200.0	1,200	12,000.0	12.000	3,000.00	2.4
250,000	1,250.0	1,250.0	1,250	12,500.0	12.500	3,125.00	2.5
300,000	1,500.0	1,500.0	1,500	15,000.0	15.000	3,750.00	3.0

Thruster Plates (Tech Level 11+)

Another effect of the tech level 11 mastery of gravitics (the science of gravity) is the invention of thruster plates. Earlier contra-grav technology only negates the effects of a gravitational field: thruster plates actually use the field itself for propulsion, by ‘grabbing on’ to the curvature of space and running along it much like an ant on the slope of a sugar-bowl. Rather than wasting valuable mass by hurling it out the rear of the ship, as lower-tech rockets do, gravity drives use the stellar system itself as their reaction mass (much as a train pushes against its track, and the planet below, rather than by expelling exhaust). A small change in a star’s momentum translates to a huge velocity change for the much smaller spacecraft.

Unlike the ant of the earlier example, however, the slope of the “bowl” has a different effect on gravitic-drive ships. They depend on the slope for propulsion. Beyond a certain point, quantum-gravitic effects drastically reduce the efficiency of a gravitic-drive ship, by a factor of a hundred or more, and thus they cannot maneuver effectively in deep-space (empty) stellar hexes on the star map unless they have an auxiliary drive, though they can remain there while, for example, computing jump parameters. The cutoff parameter turns out to be around 2,000 solar radii. Beyond this point, thruster plates are virtually worthless for anything beyond stationkeeping,

and some alternate form of propulsion is needed. Thus, the Drenid Deep Space Research Facility in Silea system is still resupplied using an automated freighter driven by a fusion rocket.

Another disadvantage of thruster plates is their gravitic and visual signature: gravity-wave sensors can easily detect the peculiar emissions characteristic of the system. Normal telescopic sensors are approximately as useful: the 'thruster plates' themselves give off exotic particles, which very quickly decay as they leave the thruster field. The bright blue glow emanating from the rear of many new Imperial vessel is, perhaps, more distinctive than the subtle space-warp.

Thruster Plate Drives

Thrust (tonnes)	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Mx)
100	5	3	1	2.5	0.6	0.1
200	10	5	1	5.0	1.3	0.1
300	15	8	2	7.5	1.9	0.1
400	20	10	2	10.0	2.5	0.1
500	25	13	3	12.5	3.1	0.1
600	30	15	3	15.0	3.8	0.1
800	40	20	4	20.0	5.0	0.1
900	45	23	5	22.5	5.6	0.1
1,000	50	25	5	25.0	6.3	0.1
1,200	60	30	6	30.0	7.5	0.2
1,400	70	35	7	35.0	8.8	0.2
1,500	75	38	8	37.5	9.4	0.2
1,600	80	40	8	40.0	10.0	0.2
1,800	90	45	9	45.0	11.3	0.2
2,000	100	50	10	50.0	12.5	0.2
2,100	105	53	11	52.5	13.1	0.3
2,400	120	60	12	60.0	15.0	0.3
2,500	125	63	13	62.5	15.6	0.3
2,700	135	68	14	67.5	16.9	0.3
2,800	140	70	14	70.0	17.5	0.3
3,000	150	75	15	75.0	18.8	0.3
3,200	160	80	16	80.0	20.0	0.4
3,500	175	88	18	87.5	21.9	0.4
3,600	180	90	18	90.0	22.5	0.4
4,000	200	100	20	100.0	25.0	0.4
4,200	210	105	21	105.0	26.3	0.5
4,500	225	113	23	112.5	28.1	0.5
4,800	240	120	24	120.0	30.0	0.5
5,000	250	125	25	125.0	31.3	0.5
5,400	270	135	27	135.0	33.8	0.6
6,000	300	150	30	150.0	37.5	0.6
8,000	400	200	40	200.0	50.0	0.8
9,000	450	225	45	225.0	56.3	0.9
10,000	500	250	50	250.0	62.5	1.0
12,000	600	300	60	300.0	75.0	1.2
14,000	700	350	70	350.0	87.5	1.4
15,000	750	375	75	375.0	93.8	1.5
16,000	800	400	80	400.0	100.0	1.6
18,000	900	450	90	450.0	112.5	1.8
20,000	1,000	500	100	500.0	125.0	2.0
21,000	1,050	525	105	525.0	131.3	2.1
24,000	1,200	600	120	600.0	150.0	2.4
25,000	1,250	625	125	625.0	156.3	2.5
27,000	1,350	675	135	675.0	168.8	2.7
28,000	1,400	700	140	700.0	175.0	2.8
30,000	1,500	750	150	750.0	187.5	3.0
32,000	1,600	800	160	800.0	200.0	3.2
35,000	1,750	875	175	875.0	218.8	3.5
36,000	1,800	900	180	900.0	225.0	3.6
40,000	2,000	1,000	200	1,000.0	250.0	4.0
42,000	2,100	1,050	210	1,050.0	262.5	4.2
45,000	2,250	1,125	225	1,125.0	281.3	4.5
48,000	2,400	1,200	240	1,200.0	300.0	4.8
50,000	2,500	1,250	250	1,250.0	312.5	5.0
54,000	2,700	1,350	270	1,350.0	337.5	5.4
60,000	3,000	1,500	300	1,500.0	375.0	6.0
80,000	4,000	2,000	400	2,000.0	500.0	8.0
90,000	4,500	2,250	450	2,250.0	562.5	9.0
100,000	5,000	2,500	500	2,500.0	625.0	10.0
120,000	6,000	3,000	600	3,000.0	750.0	12.0

150,00(	7,500	3,75(	750	3,750.(	937.5	15.(
160,00(	8,000	4,00(	800	4,000.(	1,000.(	16.(
180,00(	9,000	4,50(	900	4,500.(	1,125.(	18.(
200,00(	10,00(	5,00(	1,00(	5,000.(	1,250.(	20.(
240,00(	12,00(	6,00(	1,20(	6,000.(	1,500.(	24.(
250,00(	12,50(	6,25(	1,25(	6,250.(	1,562.5	25.(
300,00(	15,00(	7,50(	1,50(	7,500.(	1,875.(	30.(

SELECT OFFENSIVE WEAPONS

Select any weapons that the ship will carry. They must be placed in either turrets, bays or spinal mounts. Record their volume, mass, area, power, price and Crew Factor

Group any chosen turrets into batteries. All weapons in a single battery must be identical. Record their volume, mass, area, power, price and Crew Factor

For each battery created in step 2, install a Master Fire Director to control it. Record their volume, mass, area, power, price and Crew Factor. Single turrets, while considered a battery of 1, don't require a Master Fire Director (MFD). However, in combat they only get a Fire Control rating of 1 without an MFD. All bays and spinal mounts count as separate batteries, and have MFDs built in.

Particle Accelerators weapons use powerful electrical and/or magnetic fields to accelerate ions or charged subatomic particles to near-relativistic speeds, and to focus these particles into a concentrated beam that retains its power density over long distances. Because neutral (uncharged) particles can't be affected by electrical or magnetic fields, they're charged while they are accelerated. Unfortunately, charged particle accelerator weapon (CPAW) are useless in space combat -- all the like-charged particles repel each other and the beam quickly loses focus and falls apart. By having a device at the end of the barrel to neutralize the particles again (either by adding an electron to a positive ion, or stripping the extra electron from a negative ion), you convert the weapon to a neutral particle accelerator weapon (NPAW). These weapons are much more useful for combat in space, where the CPAW is ideal for targets within an atmosphere.

Meson Guns are an extremely advanced form of particle accelerator, becoming available by Tech Level 11. Instead of simply firing subatomic particles at the target, the particles are made to collide, resulting in another kind of particle, the meson. Since mesons don't interact with normal matter, they pass right through armor or anything else. However, they have a very short life span, and when they decay, they produce radiation and damaging particles. By accelerating the original particles to carefully-calculated relativistic speeds, you can precisely control the decay so that it occurs within your target.

For all weapon charts, there are four range bands listed. Each entry has a range (in tenths of a light second), a penetration value for lasers only, and a damage value (R: P/PP - DD). For the Basic Ship Combat System, only the range and the damage values are needed to calculate the USD values of the weapons.

Note that lasers below TL13 are tunable, and all use gravitic focusing to increase their range; TL13+ lasers are straight x-ray lasers. Those marked with an * don't use gravitic focusing (allowing more powerful lasers at short range, but with reduced long range performance). Those without an * use gravitic focusing to ensure lethality is preserved at longer ranges, but are limited by the increased size of the focal array required for the gravitic mechanism.

Turret Weapons

Turrets can be

- Empty (reserving space for later)
- Missile, or
- Laser

Empty Sockets

These can be installed in a ship to reserve space for weapons to be added later, by the purchaser of the ship. They require no power or crew, and cost nothing, but some power should be reserved for whatever weapon is expected.

Empty Turret Sockets

TL	Vol (m^3)	Area (m^2)	Price (MCr)
any	42	10	0.005
any	84	16	0.005

Light Laser Turrets (3 displacement ton socket)

The rate of fire of any turret can be increased up to ROF 100 by increasing the power usage by the same factor.

Description	TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Gn	Crew Mx	Very Short Range	Short Range	Medium Range	Long Range	ROF
67Mj Laser	10	61.82	42	10	1.86	1.75	1	0.12	1:1/7-20	2:1/6-20	4:1/3-10	8:1/2-5	10
72Mj Laser	11	56.73	42	10	2.00	2.28	1	0.11	5: 1/7-21	10: 1/5-15	20: 1/2-7	40: 1/1-4	10
95Mj Laser	12	58.67	42	10	2.64	1.43	1	0.12	10: 1/8-24	20: 1/4-13	40: 1/2-7	80: 1/1-3	10
105Mj Laser	13	58.52	42	10	2.92	1.45	1	0.12	10: 1/8-26	20: 1/8-26	40: 1/8-26	80: 1/8-26	10
314Mj Laser*	13	56.87	42	10	2.68	1.86	1	0.11	10: 1/14-44	20: 1/8-27	40: 1/4-13	80: 1/2-7	10
135Mj Laser	14	61.57	42	10	3.75	1.15	1	0.12	10: 1/9-29	20: 1/9-29	40: 1/9-29	80: 1/9-29	10
455Mj Laser*	14	59.36	42	10	3.37	1.77	1	0.12	10: 1/17-53	20: 1/10-32	40: 1/5-16	80: 1/3-8	10
170Mj Laser	15	64.43	42	10	4.72	0.95	1	0.13	10: 1/10-33	20: 1/10-33	40: 1/10-33	80: 1/10-33	10
620Mj Laser*	15	60.57	42	10	4.05	1.82	1	0.12	10: 1/20-62	20: 1/12-37	40: 1/6-19	80: 1/3-9	10

Heavy Laser Turrets (6 displacement ton socket)

The rate of fire of any turret can be increased up to ROF 100 by increasing the power usage by the same factor.

Description	TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Gn	Crew Mx	Very Short Range	Short Range	Medium Range	Long Range	ROF
130Mj Laser	10	128.58	84	16	3.61	5.03	1	0.26	3: 1/9-29	6: 1/5-14	12: 1/2-7	24: 1/1-4	10
143Mj Laser	11	119.74	84	16	3.97	6.08	1	0.24	10: 1/10-30	20: 1/5-16	40: 1/3-8	80: 1/1-4	10
251Mj Laser	12	139.69	84	16	6.97	2.43	1	0.28	10: 1/13-40	20: 1/11-33	40: 1/5-17	80: 1/3-8	10
275Mj Laser	13	138.32	84	16	7.64	2.49	1	0.28	10: 1/13-41	20: 1/13-41	40: 1/13-41	80: 1/13-41	10
650Mj Laser*	13	110.54	84	16	5.56	3.52	1	0.22	10: 1/20-64	20: 1/15-48	40: 1/8-24	80: 1/4-12	10
325Mj Laser	14	141.37	84	16	9.03	2.29	1	0.28	10: 1/14-45	20: 1/14-45	40: 1/14-45	80: 1/14-45	10
700Mj Laser*	14	92.00	84	16	5.19	3.20	1	0.18	10: 1/21-66	20: 1/16-50	40: 1/8-25	80: 1/4-12	10
385Mj Laser	15	144.07	84	16	10.69	2.20	1	0.29	10: 1/16-49	20: 1/16-49	40: 1/16-49	80: 1/16-49	10
750Mj Laser*	15	76.89	84	16	4.90	3.00	1	0.15	10: 1/22-68	20: 1/16-51	40: 1/8-26	80: 1/4-13	10

Missile Launcher Turrets

Type	TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Factor	Missile Size (m^3)	Ready Missiles
Standard	8	28.4	42	10	0.15	0.08	Gn 1, Mx 0.06	7	3
Heavy	8	70.4	84	16	0.15	0.11	Gn 1, Mx 0.15	7	5

Bay Weapons

Bays may be installed as desired (up to the surface area or 1 per 1,000 displacement ton limit).

Laser Bays

Note that bays include a built-in MFD, but no workstation. Workstations for bays are allocated under the crew step as for MFDs. All of these weapons are grav-focussed. Also note that the weapons do not fill the entire bay; the bay size was chosen to allow the proper surface area for the focal arrays.

50 displacement ton Laser Bays

The rate of fire of any bay can be increased up to ROF 100 by increasing the power usage by the same factor.

Description	TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Gn	Crew Mx	Very Short Range	Short Range	Medium Range	Long Range	ROF
550Mj Laser	11	630.08	700	48	21.68	85.45	1	1.26	10: 1/19-59	20: 1/19-59	40: 1/14-44	80: 1/7-22	10
600Mj Laser	12	367.61	700	47	19.77	33.40	1	0.74	10: 1/20-61	20: 1/20-61	40: 1/20-61	80: 1/11-36	10
600MjLaser	12	394.31	700	47	336.43	38.70	1	0.79	10:1/20-61	20:1/20-61	40:1/20-61	80:1/11-36	200
600MjLaser	12	447.33	700	47	669.77	49.31	1	0.89	10:1/20-61	20:1/20-61	40:1/20-61	80:1/11-36	400
600MjLaser	12	553.36	700	47	1,336.4	70.51	1	1.11	10:1/20-61	20:1/20-61	40:1/20-61	80:1/11-36	800
650Mj Laser	13	362.32	700	47	21.16	33.81	1	0.72	10: 1/20-64	20: 1/20-64	40: 1/20-64	80: 1/20-64	10
650MjLaser	13	391.23	700	47	364.21	39.55	1	0.78	10:1/20-64	20:1/20-64	40:1/20-64	80:1/20-64	200
650MjLaser	13	448.66	700	47	725.32	51.04	1	0.90	10:1/20-64	20:1/20-64	40:1/20-64	80:1/20-64	400
650MjLaser	13	563.53	700	47	1,447.5	74.01	1	1.13	10:1/20-64	20:1/20-64	40:1/20-64	80:1/20-64	800
700Mj Laser	14	335.03	700	46	21.24	23.29	1	0.67	10: 1/21-66	20: 1/21-66	40: 1/21-66	80: 1/21-66	10
700MjLaser	14	366.15	700	46	390.69	29.47	1	0.73	10:1/21-66	20:1/21-66	40:1/21-66	80:1/21-66	200
700MjLaser	14	428.00	700	46	779.58	41.84	1	0.86	10:1/21-66	20:1/21-66	40:1/21-66	80:1/21-66	400
700MjLaser	14	551.70	700	46	1,557.4	66.58	1	1.10	10:1/21-66	20:1/21-66	40:1/21-66	80:1/21-66	800
750Mj Laser	15	310.73	700	46	22.63	17.34	1	0.62	10: 1/22-68	20: 1/22-68	40: 1/22-68	80: 1/22-68	10
750MjLaser	15	344.07	700	46	418.47	23.97	1	0.69	10:1/22-68	20:1/22-68	40:1/22-68	80:1/22-68	200
750MjLaser	15	410.34	700	46	835.13	37.22	1	0.82	10:1/22-68	20:1/22-68	40:1/22-68	80:1/22-68	400

750MjLaser	15	542.87	700	46	1,668.5	63.73	1	1.09	10:1/22-68	20:1/22-68	40:1/22-68	80:1/22-68	800

100 displacement ton Laser Bays

Description	TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Gn	Crew Mx	Very Short Range	Short Range	Medium Range	Long Range	ROF
500Mj Laser	10	839.51	1,400	78	27.29	122.08	1	1.68	10: 1/18-56	20: 1/12-38	40: 1/6-19	80: 1/3-9	10
500MjLaser	10	1,194.1	1,400	78	291.18	192.97	1	2.39	10:1/18-56	20:1/12-38	40:1/6-19	80:1/3-9	200

Missile Bays

The column Launchers specifies how many individual launchers are contained within the bay. The column Reloads per Launcher indicates how many ready missiles are available for each launcher.

Missile Bays

TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Gn	Mx	Launchers	Reloads per Launcher
10	382.4	700	8	13.55	48.29	1	0.77	4	12
10	732.4	1,400	8	13.55	48.43	1	1.47	8	13
11	375.4	700	5	6.55	34.30	1	0.76	4	13
11	711.4	1,400	5	6.55	34.46	1	1.43	10	10
12	363.9	700	4	3.25	25.81	1	0.73	5	10
12	696.4	1,400	4	3.25	25.96	1	1.40	10	10
14	350.9	700	3	1.95	15.31	1	0.71	5	10
14	690.4	1,400	3	1.95	15.50	1	1.39	12	8
15	348.4	700	3	1.95	9.33	1	0.70	6	8
15	684.4	1,400	3	1.95	9.50	1	1.37	12	8

Meson Bays

Description	TL	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Gn	Mx	Len (m)	Very Short Range	Short Range	Medium Range	Long Range	ROF
2,020MjMesonGun	11	1,911.02	1400	44	62.51	105.40	3	3.82	16	5:20	10:10	20:5	40:2	10
3,250MjMesonGun	12	2,066.46	1400	37	96.68	94.73	2	4.13	16	5:30	10:15	20:8	40:4	10
3,200MjMesonGun	13	1,875.41	1400	36	95.29	93.00	2	3.75	16	5:30	10:15	20:8	40:4	10
3,200MjMesonGun	14	1,636.56	1400	36	95.29	92.00	1	3.27	16	5:35	10:18	20:9	40:5	10
4,000MjMesonGun	15	1,831.86	1400	44	117.51	105.25	1	3.66	16	5:40	10:20	20:10	40:5	10

Spinal Mount Weapons

The spinal mount tables list the length of the weapon; the ship must be at least this long.

Meson Gun Spinal Mounts

Description	TL	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Gn	Mx	Len (m)	Very Short Range	Short Range	Medium Range	Long Range	ROF
1,000MjMesonGun	11	1,572.84	1,285.86	24	34.18	129.71	4	3.15	46	5:40	10:20	20:10	40:5	10
2,000MjMesonGun	11	4,014.31	3,477.38	44	61.96	316.72	11	8.03	69	5:89	10:41	20:20	40:10	10
5,000MjMesonGun	11	11,959.22	10,689.30	104	145.29	939.75	36	24.0	89	5:177	10:88	20:42	40:21	10
1,000MjMesonGun	12	813.86	659.67	13	30.88	65.60	1	1.63	37	5:40	10:20	20:10	40:5	10
2,000MjMesonGun	12	1,861.87	1,657.55	23	58.66	141.11	4	3.72	55	5:89	10:41	20:20	40:10	10
5,000MjMesonGun	12	5,201.09	4,917.58	53	141.99	393.62	12	10.4	71	5:177	10:88	20:42	40:21	10
1,000MjMesonGun	13	763.82	633.37	13	30.88	65.35	1	1.53	37	5:40	10:20	20:10	40:5	10
2,000MjMesonGun	13	1,761.76	1,603.70	23	58.66	140.60	3	3.52	55	5:89	10:41	20:20	40:10	10
5,000MjMesonGun	13	4,950.73	4,780.15	53	141.99	392.37	11	9.90	71	5:177	10:88	20:42	40:21	10
1,000MjMesonGun	14	607.26	533.53	12	29.58	48.40	1	1.21	31	5:40	10:20	20:10	40:5	10
2,000MjMesonGun	14	1,373.56	1,354.20	22	57.36	111.40	2	2.75	46	5:89	10:41	20:20	40:10	10
5,000MjMesonGun	14	3,792.58	4,019.73	52	140.69	320.41	7	7.59	59	5:177	10:88	20:42	40:21	10
1,000MjMesonGun	15	549.72	499.94	12	29.58	42.00	1	1.10	31	5:40	10:20	20:10	40:5	10
2,000MjMesonGun	15	1,265.97	1,293.48	22	57.36	104.75	2	2.53	46	5:89	10:41	20:20	40:10	10
5,000MjMesonGun	15	3,534.78	3,876.90	52	140.69	313.01	6	7.07	59	5:177	10:88	20:42	40:21	10

Particle Accelerator Spinal Mounts

Description	TL	Mass (t)	Volume (m3)	Area (m2)	Power (MW)	Price (MCr)	Gn	Mx	Len (m)	Very Short Range	Short Range	Medium Range	Long Range	ROF
1,025MjNPAW	10	2,783.08	2,404.49	38	41.87	240.94	8	5.57	60	10:160	20:80	40:40	80:20	10
2,500MjNPAW	10	4,489.36	3,536.86	41	82.84	299.43	11	8.98	70	10:250	20:160	40:80	80:40	10
3,600MjNPAW	10	6,950.21	5,606.05	47	113.40	461.78	18	13.90	100	10:300	20:300	40:160	80:80	10
1,025MjNPAW	11	1,238.43	1,128.02	23	34.87	113.71	3	2.48	40	10:160	20:80	40:40	80:20	10
2,500MjNPAW	11	2,716.55	2,382.63	28	75.84	197.14	6	5.43	65	10:250	20:250	40:129	80:64	10
3,600MjNPAW	11	4,664.44	4,476.01	51	106.40	371.98	13	9.33	70	10:300	20:300	40:300	80:163	10
1,025MjNPAW	12	854.17	702.05	13	31.57	69.20	1	1.71	40	10:160	20:80	40:40	80:20	10
2,025MjNPAW	12	1,692.58	1,413.88	17	59.35	116.78	3	3.39	60	10:225	20:225	40:120	80:60	10
3,600MjNPAW	12	3,135.39	2,701.95	28	103.10	208.02	6	6.27	70	10:300	20:300	40:300	80:161	10

1,025MjNPAW	13	1,003.4	947.9	20	31.57	95.67	2	2.01	40	10:160	20:160	40:80	80:40	10
2,500MjNPAW	13	1,806.3	1,468.9	19	72.54	117.52	3	3.61	52	10:250	20:250	40:160	80:80	10
3,600MjNPAW	13	3,655.7	3,558.8	43	103.1	300.45	8	7.31	66	10:300	20:300	40:300	80:300	10
1,025MjNPAW	14	660.68	533.29	10	30.27	47.94	1	1.32	40	10:160	20:160	40:80	80:40	10
2,500MjNPAW	14	1,474.6	1,131.9	14	71.24	80.74	2	2.95	50	10:250	20:250	40:250	80:125	10
3,600MjNPAW	14	2,362.1	1,958.6	26	101.8	142.56	3	4.72	50	10:300	20:300	40:300	80:300	10
1,025MjNPAW	15	826.11	802.61	17	30.27	71.47	1	1.65	40	10:160	20:160	40:160	80:160	10
2,500MjNPAW	15	1,342.3	1,060.7	17	71.24	74.05	1	2.68	40	10:250	20:250	40:250	80:250	10
3,600MjNPAW	15	1,727.3	1,253.2	17	101.8	75.97	1	3.45	40	10:300	20:300	40:300	80:300	10

Master Fire Directors

TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Gn)	Crew (Mx)	FC Rating
TL 10	74.1	48.1	7	13.4	48.1	1	0.15	3
TL 11	46.1	34.1	4	6.4	34.1	1	0.10	3
TL 12	31.1	25.6	3	3.1	25.6	1	0.07	4
TL 14	18.1	15.1	2	1.8	15.1	1	0.04	5
TL 15	12.1	9.1	2	1.8	9.1	1	0.03	6

The maximum number of weapons per MFD is 10.

SELECT DEFENSIVE WEAPONS

Choose from the available defenses:

- Nuclear Dampers – Simply choose the one with the defensive factor you want.
- Meson Screens – Choose a meson screen from the chart. In the column under the ship size category for your hull, note the protective value that screen provides.
- Sandcasters – Sandcasters are just like turret weapons, in that they can be aggregated into batteries. Choose how many batteries you want, and how many sandcaster turrets should be in each. Install the sandcasters, and one Master Fire Director per battery.
- Tractor/Repulsors – Choose what strength you want, then find the system on the chart.
- Black Globes

For each chosen system, record the mass, volume, price, power, antenna area and crew requirements.

Nuclear Dampers – Tech Level 12

Range (km)	USD Rating	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Gn)	Crew (Mx)
30,000	1	76.2	83	7.5	15	2.05	1	0.16
60,000	2	152	159	15.0	30	4.10	1	0.31
90,000	3	228	235	22.5	45	6.15	1	0.46
120,000	4	304	311	30.0	60	8.20	1	0.61
150,000	5	380	387	37.5	75	10.25	1	0.76
180,000	6	456	463	45.0	90	12.30	1	0.92
210,000	7	532	539	52.5	105	14.35	1	1.07
240,000	8	608	615	60.0	120	16.40	1	1.22
270,000	9	684	691	67.5	135	18.45	1	1.37
300,000	10	760	767	75.0	150	20.50	1	1.52

Nuclear Dampers – Tech Level 14

Range (km)	USD Rating	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Gn)	Crew (Mx)
30,000	1	60.8	67.6	6.0	6	4.08	1	0.13
60,000	2	121	128.2	12.0	12	8.16	1	0.25
90,000	3	182	188.8	18.0	18	12.24	1	0.37
120,000	4	243	249.4	24.0	24	16.32	1	0.49
150,000	5	303	310	30.0	30	20.40	1	0.61
180,000	6	364	370.6	36.0	36	24.48	1	0.73
210,000	7	424	431.2	42.0	42	28.56	1	0.85
240,000	8	485	491.8	48.0	48	32.64	1	0.97
270,000	9	546	552.4	54.0	54	36.72	1	1.1
300,000	10	606	613	60.0	60	40.80	1	1.22

Meson Screens

	Ship Size Class								
TL	7	8 or 9	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Gn)	Crew (Mx)
12	158	112	155	207	100	10	20.7	1.6	0.4
12	250	177	380	507	250	25	50.7	4.0	0.8
12	354	250	755	1,007	500	50	100.7	7.6	1.6

12	500	354	1,505	2,007	1,000	100	200.7	15.2	3.2
12	791	559	3,755	5,007	2,500	250	500.7	37.6	7.6
13	190	134	155	207	100	10	20.7	1.6	0.4
13	300	212	380	507	250	25	50.7	4.0	0.8
13	424	300	755	1,007	500	50	100.7	7.6	1.6
13	600	424	1,505	2,007	1,000	100	200.7	15.2	3.2
13	949	671	3,755	5,007	2,500	250	500.7	37.6	7.6
14	221	157	155	207	100	10	20.7	1.6	0.4
14	350	247	380	507	250	25	50.7	4.0	0.8
14	495	350	755	1,007	500	50	100.7	7.6	1.6
14	700	495	1,505	2,007	1,000	100	200.7	15.2	3.2
14	1,107	783	3,755	5,007	2,500	250	500.7	37.6	7.6
15	253	179	155	207	100	10	20.7	1.6	0.4
15	400	283	380	507	250	25	50.7	4.0	0.8
15	566	400	755	1,007	500	50	100.7	7.6	1.6
15	800	566	1,505	2,007	1,000	100	200.7	15.2	3.2
15	1,265	894	3,755	5,007	2,500	250	500.7	37.6	7.6

Sandcasters

TL	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew Factor	Cannisters Carried	Beam Reduction	USD Rating	Cannister Price (Cr)
8	50	42	10	1	0.60	Gn 1, Mx 0.1	16	1d6x 5	1	400
9	50	42	10	1	0.65	Gn 1, Mx 0.1	18	1d6x 5	1	400
10	50	42	10	1	0.70	Gn 1, Mx 0.1	20	1d10x 5	2	600
11	50	42	10	1	0.75	Gn 1, Mx 0.1	24	1d10x 5	2	600
12	50	42	10	1	0.80	Gn 1, Mx 0.1	30	1d10x 5	2	600
13	50	42	10	1	0.85	Gn 1, Mx 0.1	35	2d6x 5	2	800
14	50	42	10	1	0.90	Gn 1, Mx 0.1	40	2d6x 5	2	800
15	50	42	10	1	1.00	Gn 1, Mx 0.1	50	2d10x 5	2	1,000

Force Fields

TL	Flicker	Mass (t)	Vol (m^3)	Power (MW)	Price (MCr)	Crew Factor
15+	10%	135	135	15	400	Mn: 0.27

SELECT CONTROLS AND ELECTRONICS

Control systems include control consoles from which the crew of a ship control its systems, and the interior circuitry linking the ship's electrical and mechanical systems to those controls. Installed computers must be from the same tech level as the controls, and avionics and navigation aids may not be installed from a tech level higher than that of the controls

This section provides systems for Basic Controls (the interior circuitry linking the consoles to the electrical and mechanical systems) and Electronics Packages (communications, sensors,computers, avionics and navigation aids). The consoles used by the crew will be installed as part of the Crew section, since the number needed will depend on the number of crew members.

There are three different levels of automation available. Low automation means there is no interconnection between different ship's systems. While this provides the most security (even if one system is broken into, you can't go anywhere else, and failures stay isolated), it also requires the most crew for the ship. Standard automation provides basic communications links between different systems, allowing data to be passed back and forth, but limits how much influence one system has on another. High automation means everything is highly interconnected, processors are shared, and any system can control any other. Naturally, this allows the smallest crews, but makes the ship the most vulnerable -- damage to one system, or hackers breaking in, can spread to other systems. Theoretically a hostile individual could take complete control of the ship.

Military ships, with their need for damage resistance and security, usually use Standard automation, as do exploration vessels and merchant ships venturing into risky territory. Civilian ships and merchants plying safe, well-known space go with High automation to maximize cargo space and minimize crew costs. Finally, ships designed in the "New Era" milieu, set in Imperial Year 1200 after the fall of the Imperium use Low automation out of fear of computer viruses.

Find the hull size of the ship on the table below, find the tech level of controls required, and copy the mass, volume, power, price and crew information to the worksheet.

The basic controls listed below are for a low level of automation (no interconnection between different ship's systems). For Standard automation, multiply the values listed by 5%. For High automation, increase them by 15%.

Basic Controls

TL9: Computer Linked TL10-12: Dynamic TL13-16 Holographic

Ship Size	Power (MW)	Price (MCr)	Linked Power (MW)	Linked Price (MCr)	Linked Power (MW)	Linked Price (MCr)	Mass (t)	Volume (m^3)	Crew (Mx)
10	0.005	0.010	0.010	0.015	0.010	0.020	0.014	0.140	0.0
20	0.010	0.020	0.020	0.030	0.020	0.040	0.028	0.280	0.0
30	0.015	0.030	0.030	0.045	0.030	0.060	0.042	0.420	0.0
40	0.020	0.040	0.040	0.060	0.040	0.080	0.056	0.560	0.0
50	0.025	0.050	0.050	0.075	0.050	0.100	0.070	0.700	0.0
60	0.030	0.060	0.060	0.090	0.060	0.120	0.084	0.840	0.0
70	0.035	0.070	0.070	0.105	0.070	0.140	0.098	0.980	0.0
80	0.040	0.080	0.080	0.120	0.080	0.160	0.112	1.120	0.0
90	0.045	0.090	0.090	0.135	0.090	0.180	0.126	1.260	0.0
100	0.050	0.100	0.100	0.150	0.100	0.200	0.140	1.400	0.0
200	0.100	0.200	0.200	0.300	0.200	0.400	0.280	2.800	0.0
300	0.150	0.300	0.300	0.450	0.300	0.600	0.420	4.200	0.0
400	0.200	0.400	0.400	0.600	0.400	0.800	0.560	5.600	0.0
500	0.250	0.500	0.500	0.750	0.500	1.000	0.700	7.000	0.0
600	0.300	0.600	0.600	0.900	0.600	1.200	0.840	8.400	0.0
700	0.350	0.700	0.700	1.050	0.700	1.400	0.980	9.800	0.0
800	0.400	0.800	0.800	1.200	0.800	1.600	1.120	11.200	0.0
900	0.450	0.900	0.900	1.350	0.900	1.800	1.260	12.600	0.0
1,000	0.500	1.000	1.000	1.500	1.000	2.000	1.400	14.000	0.0
2,000	1.000	2.000	2.000	3.000	2.000	4.000	2.800	28.000	0.1
3,000	1.500	3.000	3.000	4.500	3.000	6.000	4.200	42.000	0.1
4,000	2.000	4.000	4.000	6.000	4.000	8.000	5.600	56.000	0.2
5,000	2.500	5.000	5.000	7.500	5.000	10.000	7.000	70.000	0.2

Electronic Packages (Comm/Sensor)

Choose an electronics package. If additional systems are required beyond what is in the pre-defined packages, an add those items individually.

Minimum Capability

This is the minimum required for safe operations. It contains a short-range radio for communicating with Traffic Control and other ships nearby in orbit, avionics necessary for landings, a short-range radar for landing, a passive sensor package, and three computers. There's no way to communicate with somebody out of orbit, no private link, and no redundancy for battle-damage.

1x 3,000km Radio

1x 3,000km Radar (tech level8-9) or Active EMS (tech level10+)

1x 30,000km High Resolution Thermal (tech level8-9) or Passive EMS (tech level10+) fixed array

3x tech level-x Standard computers

tech level-x Flight Avionics

Minimal Electronics Packages

TL	Sensors Active Range	Sensors Passive Range	Min Length	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (El)	Crew (Mx)
8	0.1	0.1	5	67.2	47.6	51	6.95	33.91	3.00	0.15
9	0.1	0.1	5	34.9	31.2	19	4.01	18.11	3.00	0.09
10	0.1	0.1	5	19.1	25.9	19	36.16	18.66	3.00	0.05
11	0.1	0.1	5	11.2	24.6	9	16.29	13.16	3.00	0.04
12	0.1	0.1	5	8.7	26.0	6	9.43	13.11	3.00	0.03
13	0.1	0.1	5	9.3	29.0	5	9.58	16.08	3.00	0.04
14	0.1	0.1	5	7.5	25.4	4	6.73	17.87	3.00	0.03
15	0.1	0.1	5	6.9	22.4	4	6.88	20.86	3.00	0.03

Standard Civilian

This is the most common package for small private and merchant vessels. It contains a longer-range radio for broadcast communications in the "local area" (1/10th of a light second), a maser communicator for tight-beam private communications, radar, passive sensor package, and avionics. There is no redundancy for battle-damage.

1x 30,000km Radio

1x 30,000km MaserComm

1x 30,000km Radar (tech level8-9) or Active EMS (tech level10+)

1x 60,000km HRT (tech level8-9) or PEMS (tech level10+) fixed array

3x tech level-x Standard computers

tech level-x Flight Avionics

Standard Civilian Electronics Packages

	Sensors									
TL	Active Range	Passive Range	Min Length	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (El)	Crew (Mx)
8	1	2	10	93.6	62.3	131	10.15	48.47	4.00	0.21
9	1	2	10	48.4	38.7	71	6.15	25.57	4.00	0.11
10	1	2	5	27.3	30.1	39	52.30	26.72	4.00	0.07
11	1	2	5	16.7	27.4	25	27.40	18.52	4.00	0.04
12	1	2	5	10.1	24.0	18	13.36	12.02	4.00	0.03
13	1	2	5	11.2	30.0	17	13.66	17.97	4.00	0.04
14	1	2	5	8.2	25.7	14	8.79	18.55	4.00	0.03
15	1	2	5	8.7	28.7	14	8.64	15.53	4.00	0.04

Advanced Civilian

This package increases the ranges for communicators and sensors

1x 300,000km Radio

1x 1,000AU MaserComm (except at tech level8: only 300,000km range)

1x 60,000km Radar (tech level8-9) or 1x120,000km AEMS (tech level10+)

1x 120,00km HRT (tech level8-9) or PEMS (tech level10+) fixed array

3x tech level-x Standard computers

tech level-x Flight Avionics

Advanced Civilian Electronics Packages

	Sensors									
TL	Active Range	Passive Range	Min Length	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (El)	Crew (Mx)
8	2	4	40	175.8	131.4	1,351	21.45	117.53	4.00	0.38
9	2	4	10	99.9	78.5	711	17.30	65.13	4.00	0.23
10	4	4	20	47.3	42.9	253	91.40	46.38	4.00	0.13
11	4	4	20	27.9	34.4	177	51.50	29.38	4.00	0.09
12	4	4	20	15.8	27.6	138	27.95	17.48	4.00	0.05
13	4	4	20	16.2	32.8	123	28.25	22.73	4.00	0.06
14	4	4	20	11.3	27.5	114	20.85	21.43	4.00	0.04
15	4	4	20	11.4	30.1	108	20.70	18.13	4.00	0.04

Exploration/Survey

This package is for scout vessels and others needing to perform detailed sensor sweeps. It has a long-range radio, two tightbeam communicators for links with small craft, and a bevy of sensors

1x 300,000km Radio

3x 1,000AU MaserComm (at tech level8, only 300,000km)

2x 60,000km Radar (tech level8-9) or 2x 300,000km AEMS (tech level10+)

2x 120,000km HRT (tech level8-9) or PEMS (tech level10+) fixed array

1x Densitometer (tech level11+ only)

1x tech level-x Neural Activity Sensor (tech level13+ only)

1x Neutrino Sensor (tech level10+ only)

3x tech level-x Standard computers

tech level-x Avionics

Exploration/Survey Electronics Package

	Sensors									
TL	Active Range	Passive Range	Min Length	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (El)	Crew (Mx)
8	2	4	40	348.6	247.8	2,603	32.80	233.66	8.00	0.75
9	2	4	40	196.9	142.0	1,333	25.25	128.63	8.00	0.45
10	10	4	20	230.8	187.6	447	273.31	142.88	9.00	0.52

11	10	4	20	177.4	185.6	521	135.86	76.63	10.00	0.40
12	10	4	20	51.6	66.4	285	69.41	46.78	10.00	0.14
13	10	4	20	48.7	64.9	246	69.47	46.85	11.00	0.15
14	10	4	20	29.5	47.3	184	44.12	37.70	11.00	0.11
15	10	4	20	27.9	42.1	174	44.17	41.20	11.00	0.11

Military

This package is used for military vessels, and includes redundant combat-range sensors, hardened computers, and ECM

2x 300,000km Radio

2x 1,000AU MaserComm (300,000km at tech level8)

2x 300,000km LaserComm (for controlling missiles)

2x 60,000km Radar (tech level8-9) or 300,000km AEMS (tech level10+) (Note: power requirements only allow one of these to be powered up at a time.)

2x 120,000km PEMS folding array (ship can't accelerate while deployed)

1x 60,000km Radar Jammer (tech level8-9) or 300,000km AEMS Jammer (tech level10+)

3x tech level-x Fiber Optic computers

tech level-x Avionics

Military Electronics Packages

	Sensors									
	Active	Passive	Min	Mass	Volume	Area	Power	Price	Crew	Crew
TL	Range	Range	Length	(t)	(m^3)	(m^2)	(MW)	(MCr)	(El)	(Mx)
8	2	4	–	571.9	433.0	2,709	53.40	455.01	11.00	0.72
9	2	4	–	319.9	247.0	1,436	41.70	250.46	11.00	0.46
10	10	4	–	198.8	143.8	554	413.90	248.91	11.00	0.41
11	10	4	–	102.0	94.8	375	204.10	128.91	11.00	0.23
12	10	4	–	55.4	37.9	288	106.80	74.91	11.00	0.13
13	10	4	–	53.6	76.9	258	107.10	77.91	11.00	0.14
14	10	4	–	34.2	61.2	235	69.80	60.71	11.00	0.10
15	10	4	–	31.3	53.8	223	70.10	65.51	11.00	0.10

Stealth

Ship Size	Mass (t)	Vol (m^3)	Price (MCr)	Crew (Mx)
10	1	5	0.5	0.01
20	2	10	1.0	0.01
30	3	15	1.5	0.01
40	4	20	2.0	0.01
50	5	25	2.5	0.01
60	6	30	3.0	0.02
70	7	35	3.5	0.02
80	8	40	4.0	0.02
90	9	45	4.5	0.02
100	10	50	5.0	0.02
200	20	100	10.0	0.04
300	30	150	15.0	0.06
400	40	200	20.0	0.08
500	50	250	25.0	0.10
600	60	300	30.0	0.12
700	70	350	35.0	0.14
800	80	400	40.0	0.16
900	90	450	45.0	0.18
1,000	100	500	50.0	0.20
2,000	200	1,000	100.0	0.40
3,000	300	1,500	150.0	0.60
4,000	400	2,000	200.0	0.80
5,000	500	2,500	250.0	1.00

Electromagnetic Masking (tech level 10+)

Electromagnetic Masking is an advanced form of stealth design, and includes radiators to dissipate enormous IR signatures as well as more advanced electromagnetic absorbing material. EMM packages may not be installed in addition to stealth, but rather replace it.

Electromagnetic Masking (EMM)

Ship Size	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Crew (Mx)
10	1.4	2.8	1.4	0.14	0.7	0.0
20	2.8	5.6	2.8	0.28	1.4	0.1
30	4.2	8.4	4.2	0.42	2.1	0.1
40	5.6	11.2	5.6	0.56	2.8	0.1
50	7.0	14.0	7.0	0.70	3.5	0.1
60	8.4	16.8	8.4	0.84	4.2	0.1
70	9.8	19.6	9.8	0.98	4.9	0.1
80	11.2	22.4	11.2	1.12	5.6	0.1
90	12.6	25.2	12.6	1.26	6.3	0.1
100	14.0	28.0	14.0	1.40	7.0	0.1
200	28.0	56.0	28.0	2.80	14.0	0.1
300	42.0	84.0	42.0	4.20	21.0	0.1
400	56.0	112.0	56.0	5.60	28.0	0.2
500	70.0	140.0	70.0	7.00	35.0	0.2
600	84.0	168.0	84.0	8.40	42.0	0.2
700	98.0	196.0	98.0	9.80	49.0	0.2
800	112.0	224.0	112.0	11.20	56.0	0.3
900	126.0	252.0	126.0	12.60	63.0	0.3
1,000	140.0	280.0	140.0	14.00	70.0	0.3
2,000	280.0	560.0	280.0	28.00	140.0	0.6
3,000	420.0	840.0	420.0	42.00	210.0	0.9
4,000	560.0	1,120.0	560.0	56.00	280.0	1.2
5,000	700.0	1,400.0	700.0	70.00	350.0	1.4

SELECT LIFE SUPPORT

Find the hull size on the appropriate table and record the requirements.

Basic Life Support provides a sealed hull, air and water, and is intended for short periods of time (up to about eight hours). Standard Life Support provides the same, and adds waste disposal or recycling and food, and is for up to four weeks. Either form of life support has quite a bit of safety margin built in, and can be stretched to double its intended load twice as long.

Basic Life Support

Size (T_d)	Mass (t)	Volume (m^3)	Power (MW)	Price (MCr)
10	0.05	0.05	0.001	0.003
20	0.10	0.10	0.002	0.006
30	0.15	0.15	0.003	0.009
40	0.20	0.20	0.004	0.012
50	0.25	0.25	0.005	0.015
60	0.30	0.30	0.006	0.018
70	0.35	0.35	0.007	0.021
80	0.40	0.40	0.008	0.024
90	0.45	0.45	0.009	0.027
100	0.50	0.50	0.010	0.030
200	1.00	1.00	0.020	0.060
300	1.50	1.50	0.030	0.090
400	2.00	2.00	0.040	0.120
500	2.50	2.50	0.050	0.150
600	3.00	3.00	0.060	0.180
700	3.50	3.50	0.070	0.210
800	4.00	4.00	0.080	0.240
900	4.50	4.50	0.090	0.270
1,000	5.00	5.00	0.100	0.300
2,000	10.00	10.00	0.200	0.600
3,000	15.00	15.00	0.300	0.900
4,000	20.00	20.00	0.400	1.200
5,000	25.00	25.00	0.500	1.500

Standard Life Support

Size (T_d)	Mass (t)	Vol (m^3)	Power (MW)	Price (MCr)
10	0.08	0.08	0.002	0.005
20	0.16	0.16	0.004	0.010
30	0.24	0.24	0.006	0.015

40	0.32	0.32	0.008	0.020
50	0.40	0.40	0.010	0.025
60	0.48	0.48	0.012	0.030
70	0.56	0.56	0.014	0.035
80	0.64	0.64	0.016	0.040
90	0.72	0.72	0.018	0.045
100	0.80	0.80	0.020	0.050
200	1.60	1.60	0.040	0.100
300	2.40	2.40	0.060	0.150
400	3.20	3.20	0.080	0.200
500	4.00	4.00	0.100	0.250
600	4.80	4.80	0.120	0.300
700	5.60	5.60	0.140	0.350
800	6.40	6.40	0.160	0.400
900	7.20	7.20	0.180	0.450
1,000	8.00	8.00	0.200	0.500
2,000	16.00	16.00	0.400	1.000
3,000	24.00	24.00	0.600	1.500
4,000	32.00	32.00	0.800	2.000
5,000	40.00	40.00	1.000	2.500

Artifical Gravity / Inertial Compensators

G-Tanks (Tech Level 8-9)

Description	Mass (t)	Vol (m^3)	Price (MCr)
G-Tanks (passenger)	2	2	0.01
G-Tanks (crew)	2	2	1

Note that the difference between passenger and crew tanks (other than the price) is the special fittings and controls in the crew tanks that allow the crewmember to continue to perform duties.

Maximum Gs Compensated

TL	Compensated Gs	Max Accel out of/ in workstation	Max Evade out of/ in workstation
10	1G	2G/3G	1G/2G
11	2G	3G/4G	2G/3G
12	3G	4G/5G	3G/4G
13	4G	5G/6G	4G/5G
14	5G	6G/7G	5G/6G
15	6G	7G/8G	6G/7G

Artificial Gravity/Inertial Compensators

Find the hull size on the appropriate table, and record the requirements.

Ship Size	Mass (t)	Vol (m^3)	Power (MW)	Price (MCr)	Crew (Mx)
10	2.8	1.4	1	0.07	0.01
20	5.6	2.8	1	0.14	0.02
30	8.4	4.2	2	0.21	0.02
40	11.2	5.6	3	0.28	0.03
50	14.0	7.0	4	0.35	0.03
60	16.8	8.4	4	0.42	0.04
70	19.6	9.8	5	0.49	0.04
80	22.4	11.2	6	0.56	0.05
90	25.2	12.6	6	0.63	0.05
100	28.0	14.0	7	0.70	0.06
200	56.0	28.0	14	1.40	0.12
300	84.0	42.0	21	2.10	0.17
400	112.0	56.0	28	2.80	0.23
500	140.0	70.0	35	3.50	0.28
600	168.0	84.0	42	4.20	0.34
700	196.0	98.0	49	4.90	0.40
800	224.0	112.0	56	5.60	0.45
900	252.0	126.0	63	6.30	0.51
1,000	280.0	140.0	70	7.00	0.56
2,000	560.0	280.0	140	14.00	1.12
3,000	840.0	420.0	210	21.00	1.68
4,000	1,120.0	560.0	280	28.00	2.24
5,000	1,400.0	700.0	350	35.00	2.80

SELECT MISCELLANEOUS FEATURES

Labs and Shops

Description	Vol (m^3)	Mass (t)	Price (MCr)	Power (MW)
Electronics Shop	84	40	1	0.6
Machine Shop	140	120	2	1
Laboratory	112	50	5	0.8
Sick Bay	112	50	5	0.8

Small Craft & Launch Facilities

Reserve space for small craft; also record their crew information here since they'll need to be quartered aboard. Describe different types of facilities (FF&S p61) – spacious allows all maintenance and repairs on small craft, minimal makes them one task level more difficult, docking rings fit small craft with no space extra, so no repairs/maintenance possible. Maintenance (Mx) crew factor is the mass of the carried craft divided by 500.

Docking Rings

Small Craft Displacement	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)
10	0	140	49	0.11
20	0	280	64	0.18
30	0	420	85	0.26
40	0	560	109	0.34
50	0	700	126	0.41
60	0	840	135	0.47
70	0	980	157	0.55
80	0	1,120	175	0.63
90	0	1,260	185	0.69

Internal Hangar (Minimal)

Small Craft Displacement	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)
10	56	280	49	0.11
20	112	560	64	0.18
30	168	840	85	0.26
40	224	1,120	109	0.34
50	280	1,400	126	0.41
60	336	1,680	135	0.47
70	392	1,960	157	0.55
80	448	2,240	175	0.63
90	504	2,520	185	0.69

Internal Hangar (Spacious)

Small Craft Displacement	Mass (t)	Vol (m^3)	Area (m^2)	Price (MCr)
10	112	560	49	0.16
20	224	1,120	64	0.29
30	336	1,680	85	0.42
40	448	2,240	109	0.56
50	560	2,800	126	0.69
60	672	3,360	135	0.81
70	784	3,920	157	0.94
80	896	4,480	175	1.07
90	1,008	5,040	185	1.20

Launch Tubes

Small Craft Displacement	Mass (t)	Vol (m^3)	Area (m^2)	Power (MW)	Price (MCr)
10	1,750	3,500	98	35	0.53
20	3,500	7,000	128	70	1.05
30	5,250	10,500	170	105	1.58
40	7,000	14,000	217	140	2.10
50	8,750	17,500	251	175	2.63
60	10,500	21,000	270	210	3.15
70	12,250	24,500	313	245	3.68
80	14,000	28,000	349	280	4.20
90	15,750	31,500	370	315	4.73

Cargo

Any available space remaining may be designated as cargo. Simply record the volume. Cargo requires no additional power. Cargo hatches are required: one large cargo hatch per 350m^3 of cargo, or one small hatch if the total cargo space is under 100m^3.

Cargo Hatches

Hatch	Area (m^2)	Price (MCr)
Small Cargo Hatch	12	0.012
Large Cargo Hatch	20	0.02

Fuel Scoops

A ship may be outfitted with special "scoops" and internal equipment to allow it to skim the free raw materials of liquid hydrogen (LHyd) from oceans or gas giant atmospheres. They do not take up any volume, or add mass to the ship. They do take up surface area. For every 5% of surface area dedicated to fuel scoops, the ship can

scoop fuel equal to 20% of it's total maximum fuel volume in an hour. Cost is MCr0.000075 per cubic meter of hull

Purification

While fusion reactors and jump drives run on hydrogen, fuel skimmed from an ocean is water, and fuel from a gas giant is contaminated with a variety of other substances. Fusion reactors tolerate this moderately well; jump drives are a little more finicky, and are more likely to misjump if burning unrefined fuel. A fuel purification plant removes those impurities to produce pure liquid hydrogen. If the ship requires fuel purification, select a table from the list below for installation in the ship. The purification rate listed is the amount of fuel that can be processed in 6 hours.

Fuel Purification Plants

TL	Capacity (m^3 / 6 hrs)	Mass (t)	Vol (m^3)	Power (MW)	Price (MCr)
8	700	1,050	490	7.0	0.140
8	1,400	2,100	980	14.0	0.280
8	2,800	4,200	1,960	28.0	0.560
9	700	840	420	6.3	0.133
9	1,400	1,680	840	12.6	0.266
9	2,800	3,360	1,680	25.2	0.532
10	700	770	385	5.6	0.126
10	1,400	1,540	770	11.2	0.252
10	2,800	3,080	1,540	22.4	0.504
11	700	630	315	4.9	0.119
11	1,400	1,260	630	9.8	0.238
11	2,800	2,520	1,260	19.6	0.476
12	700	560	280	4.2	0.112
12	1,400	1,120	560	8.4	0.224
12	2,800	2,240	1,120	16.8	0.448
13	700	490	245	3.5	0.105
13	1,400	980	490	7.0	0.210
13	2,800	1,960	980	14.0	0.420
14	700	350	175	3.5	0.098
14	1,400	700	350	7.0	0.196
14	2,800	1,400	700	14.0	0.392
15	700	280	140	3.5	0.105
15	1,400	560	280	7.0	0.210
15	2,800	1,120	560	14.0	0.420

SELECT POWER PLANT

Determine how much power is need. Each section to this point has listed a power requirement. Total all of the power requirements.

Using the appropriate chart from the tables below, pick enough power plants to generate at least as much power as you've used so far. Note that using multiple power plants gains you redundancy.

Set aside enough space for the fuel the plant needs.

Record everything and procede to the next step.

Tech Level 8 Fission Plants

Fission plants and fusion plants require external radiators.

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	na	na	na	na	na	na	na
10	60.0	10.0	10	1.00	0.40	0.12	1.00
25	150.0	25.0	25	2.50	0.90	0.30	2.50
50	300.0	50.0	50	5.00	1.70	0.60	5.00
75	450.0	75.0	75	7.50	2.50	0.90	7.50
100	600.0	100.0	100	10.00	3.40	1.20	10.00
250	1,500.0	250.0	250	25.00	8.40	3.00	25.00
500	3,000.0	500.0	500	50.00	16.70	6.00	50.00
1,000	6,000.0	1,000.0	1,000	100.00	33.40	12.00	100.00
2,500	15,000.0	2,500.0	2,500	250.00	83.40	30.00	250.00
5,000	30,000.0	5,000.0	5,000	500.00	166.70	60.00	500.00

Tech Level 9 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	na	na	na	na	na	na	na

10	na	na	na	na	na	na	na
25	na	na	na	na	na	na	na
50	na	na	na	na	na	na	na
75	na	na	na	na	na	na	na
100	na	na	na	na	na	na	na
250	na	na	na	na	na	na	na
500	na	na	na	na	na	na	na
1,000	na	na	na	na	na	na	na
2,500	5,000.0	1,250.0	2,500	250.00	83.40	10.00	375.00
5,000	10,000.0	2,500.0	5,000	500.00	166.70	20.00	750.00

Tech Level 10 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na
25	na	na	na	na	na	na	na
50	na	na	na	na	na	na	na
75	na	na	na	na	na	na	na
100	na	na	na	na	na	na	na
250	na	na	na	na	na	na	na
500	na	na	na	na	na	na	na
1,000	2,000.0	500.0	1,000	100.00	33.40	4.00	150.00
2,500	5,000.0	1,250.0	2,500	250.00	83.40	10.00	375.00
5,000	10,000.0	2,500.0	5,000	500.00	166.70	20.00	750.00

Tech Level 11 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na
25	na	na	na	na	na	na	na
50	na	na	na	na	na	na	na
75	na	na	na	na	na	na	na
100	na	na	na	na	na	na	na
250	na	na	na	na	na	na	na
500	1,000.0	250.0	500	50.00	16.70	2.00	75.00
1,000	2,000.0	500.0	1,000	100.00	33.40	4.00	150.00
2,500	5,000.0	1,250.0	2,500	250.00	83.40	10.00	375.00
5,000	10,000.0	2,500.0	5,000	500.00	166.70	20.00	750.00

Tech Level 12 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na
25	50.0	12.5	25	2.50	0.90	0.10	3.75
50	100.0	25.0	50	5.00	1.70	0.20	7.50
75	150.0	37.5	75	7.50	2.50	0.30	11.25
100	200.0	50.0	100	10.00	3.40	0.40	15.00
250	500.0	125.0	250	25.00	8.40	1.00	37.50
500	1,000.0	250.0	500	50.00	16.70	2.00	75.00
1,000	2,000.0	500.0	1,000	100.00	33.40	4.00	150.00
2,500	5,000.0	1,250.0	2,500	250.00	83.40	10.00	375.00
5,000	10,000.0	2,500.0	5,000	500.00	166.70	20.00	750.00

Tech Level 13-14 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)
5	5.0	1.7	5	0.33	0.20	0.01	0.50
10	10.0	3.3	10	0.67	0.40	0.02	1.00
25	25.0	8.3	25	1.67	0.90	0.05	2.50
50	50.0	16.7	50	3.33	1.70	0.10	5.00
75	75.0	25.0	75	5.00	2.50	0.15	7.50
100	100.0	33.3	100	6.67	3.40	0.20	10.00
250	250.0	83.3	250	16.67	8.40	0.50	25.00
500	500.0	166.7	500	33.33	16.70	1.00	50.00
1,000	1,000.0	333.3	1,000	66.67	33.40	2.00	100.00
2,500	2,500.0	833.3	2,500	166.67	83.40	5.00	250.00
5,000	5,000.0	1,666.7	5,000	333.33	166.70	10.00	500.00

Tech Level 15 Fusion Plants

Power (MW)	Mass (t)	Volume (m^3)	Area (m^2)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/yr)

5	1.7	0.8	5	0.17	0.20	0.01	0.5(
10	3.3	1.7	10	0.33	0.40	0.01	1.0(
25	8.3	4.2	25	0.83	0.90	0.02	2.5(
50	16.7	8.3	50	1.67	1.70	0.04	5.0(
75	25.0	12.5	75	2.5(	2.50	0.05	7.5(
100	33.3	16.7	100	3.33	3.40	0.07	10.0(
250	83.3	41.7	250	8.33	8.40	0.17	25.0(
500	166.7	83.3	500	16.67	16.70	0.34	50.0(
1,000	333.3	166.7	1,00(	33.33	33.40	0.67	100.0(
2,500	833.3	416.7	2,50(	83.33	83.40	1.67	250.0(
5,000	1,666.7	833.3	5,00(	166.67	166.7(	3.34	500.0(

Tech Level 12 Fuel Cells

Output (MW)	Mass (t)	Volume (m^3)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/hr)
5	6.7	6.7	0.13	0.20	0.02	1.25
10	13.3	13.3	0.27	0.40	0.03	2.50
25	33.3	33.3	0.67	0.90	0.07	6.25
50	66.7	66.7	1.33	1.70	0.14	12.50
75	100.0	100.0	2.00	2.50	0.20	18.75
100	133.3	133.3	2.67	3.40	0.27	25.00
250	333.3	333.3	6.67	8.40	0.67	62.50
500	666.7	666.7	13.33	16.70	1.34	125.00
1,000	1,333.3	1,333.3	26.67	33.40	2.67	250.00
2,500	3,333.3	3,333.3	66.67	83.40	6.67	625.00
5,000	6,666.7	6,666.7	133.33	166.70	13.34	1,250.00

Tech Level 14 Fuel Cells

Output (MW)	Mass (t)	Volume (m^3)	Price (MCr)	Crew (En)	Crew (Mx)	Fuel (m^3/hr)
5	3.3	3.3	0.07	0.20	0.01	0.10
10	6.7	6.7	0.13	0.40	0.02	0.20
25	16.7	16.7	0.33	0.90	0.04	0.50
50	33.3	33.3	0.67	1.70	0.07	1.00
75	50.0	50.0	1.00	2.50	0.10	1.50
100	66.7	66.7	1.33	3.40	0.14	2.00
250	166.7	166.7	3.33	8.40	0.34	5.00
500	333.3	333.3	6.67	16.70	0.67	10.00
1,000	666.7	666.7	13.33	33.40	1.34	20.00
2,500	1,666.7	1,666.7	33.33	83.40	3.34	50.00
5,000	3,333.3	3,333.3	66.67	166.70	6.67	100.00

SELECT PASSENGER CAPACITY AND CREW REQUIREMENTS

The crew factors noted in all of the above steps are for minimally automated ships. If no crew factor is listed for a system or feature, then it does not require crew.

Automation can assist in reducing the number of crewmembers needed to run a ship. The first level of automation is the collection of relavant data at a single console for a working system. Thus, a weapons bay, for example, would need fewer crew to man than an unautomated system. The second level of automation is the linking of whole systems together across the ship. Fewer crew are needed to run the ship, but the ship becomes more vulnerable to accidental damage, hostile action (from weapons fire or enemy hackers.)

Total up all the crew categories currently listed on the worksheet.

These numbers are very “raw” – first they need to be modified according to the capabilities of the computers installed. Look up the “Control Modifier” in the table below, and multiply Engineering (En), Electronics (El) and Maintenance (Mx) by it. Other categories are unaffected. These are the basic crew numbers.

An automation level was chosen in the controls & electronics section: Low (no interconnection between systems), Standard (some level of interconnection between systems), or High (everything very tightly integrated). The basic crew numbers are modified as follows:

The crew numbers for Engineering only consider power plant crew. First, modify the PP crew according to the automation level : divide by 1.3 (low), 4 (standard), or 10 (high)

Next, determine the maneuver drive and jump drive crew based on the mass of the drives as recorded on the worksheet. Divide the volume in m^3 by 56 and multiply by the Control Modifier to get the basic crew, then divide by the drive automation factor: low=1, standard=2, or high=5. These crewmembers are also Engineering crew.

Maintenance crews are affected by automation as well. Divide the basic maintenance crew number by the drive automation factor also.

Meson gun and particle accelerator crews are also affected by automation. Divide the crew numbers listed in the tables by the weapon automation factor: low=1, standard=1.7, or high=2.8

Decide how many Ship's Troops are required.

Calculate Maneuvering Crew. If the ship only has a maneuver drive, only a pilot is required (Mn=1). If the ship has a jump drive, an astrogator is also needed (Mn=2).

Calculate the Command crew. Add up all the crew factors and divide by 6, dropping any fractions.

Decide how many passengers are to be carried.

High Passage—The best method of travel is called high passage, which involves first class accommodations and cuisine. High passengers have the services of the ship's steward, entertainment, and complete attention to their comfort.

Middle Passage— In order for starships to fill their staterooms with passengers, middle passage is offered on a standby basis, in the event that not enough high passages are sold. While middle passengers occupy staterooms normally similar to those occupied by high passengers, they do not receive the service or entertainment accorded the higher paying passengers. In addition, the quality of the cuisine is below that of High Passage. A middle passenger may be "bumped" and the stateroom taken by a late arriving high passenger; the middle passenger's ticket is returned, but no other compensation is made.

Low Passage—Transportation while in cold sleep (suspended animation) is possible at relatively low cost to the passenger. The passenger is placed in a low passage berth before the ship takes off, and travels the entire journey in a state of suspended animation. The passenger does not age, and requires very little life support. Unfortunately, the low passage system involves some intrinsic dangers to the passenger, and the passenger runs some risk of not surviving the voyage.

Assign stewards: one steward is needed for every 8 high passengers or command crew, and one per 100 middle passengers or remaining crew.

Assign medical crew: 1 is needed for every 20 low passengers, and one per every 120 high passenger, middle passenger, or crewmember.

Drop all fractions, except for categories that are less than one. Collect all those together, and add them up. If the result is greater than 1, there is an individual who has multiple jobs. Regardless of the results, any ship $100T_d$ and below can be run by one person, and ships up to $200T_d$ can be run by two persons.

Accommodations -- choose appropriate accommodations from the list below. High passengers require at least individual large staterooms, and middle passengers require at least individual small staterooms. Low passengers require a low berth. Crew can be assigned any kind of berth other than low berth, although it's customary for at least the captain, and on larger ships, his senior staff, to have individual staterooms. Emergency low berths can be installed (one for every four people) in case of emergencies.

Workstations -- If there are more than two command crewmembers, there must be a bridge on the ship. The bridge itself doesn't require extra room, it just requires larger workstations.

Command, Electronics, Maneuvering and any Master Fire Director gunners require either a bridge workstation (if there is a bridge), or a regular workstation (if not). Turret weapon crews have their workstations built into their weapon systems. Note that all bay and spinal weapon have an integral MFD, but still need the workstation.

Engineering crew require a regular workstation.

Note the only difference between a ship with or without a bridge is the volume. The only difference between tech levels is the price, and the automation factor in the automation table.

Control Modifier

TL	Modifier
8	0.60
9	0.50
10	0.45
11	0.40
12	0.35
13	0.30
14	0.25
15	0.20

Workstations

TL	Bridge W/S Vol (m^3)	Regular W/S Vol (m^3)	Mass (t)	Price (MCr)
8	14	7	0.2	0.00075
9	14	7	0.2	0.00100
10-12	14	7	0.2	0.00150
13-16	14	7	0.2	0.00200

Accommodations

Description	Vol (m^3)	Mass (t)	Power (MW)	Price (MCr)
Bunk	14	0.5	--	0.005
Low Berth	14	1.0	0.0010	0.050
Emergency Low Berth (holds 4)	28	2.0	0.0020	0.100
Small Stateroom	28	2.0	0.0005	0.040
Large Stateroom	56	4.0	0.0010	0.100

CALCULATE THE COST

The cost of the ship is determined by adding all of the costs of the various components together. This cost is discounted for the use of standardized components during assembly. Multiply the cost by 90% to calculate the final cost to the purchaser.

GENERATE THE UNIVERSAL SHIP DESCRIPTION

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

Hull size is taken from the table below:

Hull	USD Size
< 1	5
1 +	6
10 +	7
100 +	8
1000 +	9
10000+	10
100000 +	11
1000000 +	12

Jump Rating: Enter the jump drive capacity of the ship, in parsecs.

Fire Control Rating: If all of the batteries of the ship are controlled by a Master Fire Director, enter the number corresponding to the ship's from the table below. Otherwise enter zero.

TL	Rating
9	2
10	3
11	3
12	4
13	4
14	5
15	6

G Rating: Enter the maximum acceleration of the maneuver drive, in Gs, as well as the type of drive (HEPlaR or Thrust-Plate).

Power Plant Rating: 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.

Fuel Rating: 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 after the amount of fuel. If the ship is equipped with a fuel purification plant, also enter an R (for refining capability).

Meson Screen Rating: Enter the USD number from the meson screen table.

Sand Caster Rating: Enter the number of sandcasters, and in parentheses, the total number of canisters carried in ready storage.

Damper Rating: Enter the number of nuclear damper turrets installed.

Sensor Rating: 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.

Missiles: If the ship is equipped with missiles, note the number of missiles in ready storage, and in parentheses, the number of missiles that can be controlled in flight at any one time.

Notes: Note additional information about the ship here, including the hull shape, streamlining, and details of any carried craft.

GENERATE UNIVERSAL SHIP DESCRIPTIONS

The Universal Ship Description can be filled out with the information generated thus far. Each entry in the USD is listed below, along with a description of how to calculate the value.

Position in the USD	USD Rating
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/Medium Passengers	Enter the total number of high or medium passengers 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 Rating	Enter the value from the Hulls table of the hull chosen.
Fire Control	Listed in MFD table. For weapons without an MFD (single turrets), FC Rating is 0. List the highest rating available.
Jump Drive	Jump number
Maneuver Drive	G-Rating
Power Plant	2 * Total Output / Hull Displacement.
Fuel Rating	Enter the number of displacement tons of fuel carried on board. Add a /S if fuel scoops are installed. Add a /R if fuel refining is installed.
Meson Screen Rating	Enter the USD number from the meson screen table.
Sand Caster Rating	Enter the number of sandcasters, and in parentheses, the total number of canisters carried in ready storage.
Damper Rating	Enter the number of nuclear damper turrets installed.
Active/Passive/Jam Sensors	Enter the sensor's range for Active and Passive as the A and P USD values. All packages without jammers have a rating of 0 for jamming. Those packages listed as having jamming equipment use the Active USD value for their jamming USD value. Annotate the USD as having Stealth or EMM if the ship is equipped with either package.
Weapons 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. Weapons values are listed by range in tenths of light seconds. For short range, take the damage value at 10 tenths of a light second, and convert the value with the USD Conversion Chart. For medium range, take the value at 20 tenths of a light second, long at 40 tenths of a light second, and extreme at 80 tenths of a light second. If the longest range is less than 80 tenths of a light second, the value for the USD is 0. If the value of the damage converts to 0 for short range, then use the best damage value between 1 and 9 tenths of a light second, and all other range USD values will be 0. Once the weapon is converted to USD values, multiply the USD values by the number of weapons in the battery. Add a Rate of Fire modifier as follows: If the weapon has a Rate of Fire less than 100, no modifier. For ROF of 100, +1; for ROF of 200, +2; for ROF of 400, +3; for ROF of 800, +4. Note that the ROF bonus cannot be greater than the battery's current damage rating (i.e. a weapon that converts to 2-0-0-0, with a ROF of 800, only gets a +2 bonus at short range and no bonus beyond that: 4-0-0-0). If the ship is equipped with missiles, note the number of missiles in the battery in ready storage, and in parentheses, the number of missiles that can be controlled in flight at any one time.
Internal Structure	Ship displacement (in disp tons [T_d]) times G-rating, then use the USD Conversion chart.
Armor	Convert the armor value chosen using the USD Conversion chart below.
Notes	Note additional information about the ship here, including the hull shape, streamlining, and details of any carried

	craft.

USD Conversion Chart

Actual Value	USD Rating
1+	0
20+	1
40+	2
80+	3
120+	4
160+	5
200+	6
250+	7
300+	8
400+	9
500+	10
750+	11
1,000+	12
1,250+	13
1,500+	14
1,750+	15
2,000+	16
2,500+	17
3,000+	18
3,500+	19
4,000+	20
4,500+	21
5,000+	22
6,000+	23
7,000+	24
8,000+	25
9,000+	26
10,000+	27
11,000+	28*
13,000+	29
15,000+	30
17,000+	31
19,000+	32
21,000+	33
23,000+	34
27,000+	35
31,000+	36
35,000+	37
39,000+	38
43,000+	39
47,000+	40
55,000+	41
63,000+	42
71,000+	43
79,000+	44
87,000+	45
95,000+	46
111,000+	47
127,000+	48
143,000+	49
159,000+	50
175,000+	51
191,000+	52
223,000+	53
255,000+	54
287,000+	55
319,000+	56
351,000+	57
383,000+	58
447,000+	59
511,000+	60

Ship Design Worksheet

Component	Mass (t)	Volume (m^3)	Area (m^2)	Power (MW)	Price (MCr)	Mx	En	Gn	El	Fl
Hull Config: Size:		Streamlining:		Armor:	Max Gs:	G	Length:		m	
Internal Structure										
Armor										
Airlocks										
Drives Jump Capacity: J		Mdrive Type:		Acceleration:	G	Reaction Fuel:		hrs		
Jump Drive										
Jump Fuel										
Maneuver Drive										
Maneuver Fuel										
ContraGravity										
Weapons & Defenses										
Turret Weapons – list type of turret, and number/battery organization (i.e. 3x5 is three batteries of five each, total of 15 weapons)										
Bay Weapons										
Spinal Mount										
Defenses										
Master Fire Directors – one required per battery (weapon or sandcaster turrets)										
Controls and Electronics										
Basic Controls										
Electronics Package										
Stealth or EMM										
Life Support										
Basic or Standard Life Support										
G-Tanks										
Artificial Gravity										
Miscellaneous Features										
Power Plants										
Power Plant Fuel										

Passengers and Crew	Hp	Mp	Lp	Cm	Mn	Md	St	Tr	Mx	En	Gn	El	Fl
Total crew so far													
times Control modifier ____													
times Automation modifier ____													
Add maneuvering crew and Ship's Troops													
Add all crew so far, divide by 6 for command crew													
Choose passengers													
Assign stewards and medical													
Total crew & passengers (dropping fractions)													

Large Staterooms													
Small Staterooms													
Bunks													
Standard Low Berths													
Emergency Low Berths													