

TRAVELLER



*Special Supplement 3:
Vehicle Upgrade Manual*

SPECIAL SUPPLEMENT: 3

VEHICLE UPGRADE MANUAL

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INTRODUCTION

Kyle sighed as he pulled the broken part off the battered old G-carrier they used to make runs to the jungle ruins.

'When we was back on Santos, I told you we're gonna need a new compression coil for the primary fusion waveguide, but you just told me to "best make sure it don't break." Well, its broke now Cap'n. And I don't think we can find a replacement on this middle-o'-nowhere world you got us to.'

The ship's captain, Mel, hiked up her gunbelt. 'Can't we just take the ship downriver and load her up direct-like?'

'No can do Captain-ma'am. Downport authority has strict regs on where ships can fly on this rock. Pretty much only to and from orbit and the main port, or that big strip mine on the other continent,' the pilot, Jones, chipped in as he poured himself a cup of bitter coffee-substitute.

Jane piped up from dinner table behind them, the parts of her favourite gun, Carl, laid out in front of her.

'I know a fella on this here planet. Deals in all sorts o...'Here she waved her arms around a bit trying to indicate something,

while the others looked on uncomprehendingly. 'He can get us a real sweet deal on some old type of hovercraft or somethin' he called an ee-cran-o-plan. We'd be able to take that downriver, I reckon. O' course, he says it's cursed, but I bet we can get it mighty cheap.'

Mel played pensively with the butt of her old naval gauss pistol, while her first mate, Zac, looked on impassively.

'How cheap?'

Special Supplement 3: Vehicle Upgrade Manual adds many new design options to Supplement 5-6: Vehicle Handbook. There are three new chassis types on offer; ekranoplans, rocket planes and ornithopters.

Also in this book are rules for vehicle maintenance, design flaws, new modifications, and new weapons. A system for creating ultra-heavy vehicles is also present, suitable for making the very largest planet-bound vehicles. Finally, there is a section for making vehicular robots and drones.

Several new vehicles are also provided, making use of the new design options and rules.



NEW CHASSIS TYPES

Ekranoplans (Flarecraft)

Ekranoplans use ground effect, the increased lift and decreased drag that results when the aircraft is flying just above the ground or water. While all aircraft experience ground effect on landing and takeoff, the ekranoplan is optimised to use it constantly and effectively.

Ground effect typically occurs within a distance from the ground equal to the wingspan of the aircraft. Reduce this to half the wingspan with Atmosphere 4-6, and increase it to double the wingspan for Atmosphere 9+. Notwithstanding that, ekranoplans are subject to the same rules as other aircraft regarding world of origin, and the effects of different world sizes and atmospheres.

Ekranoplans cannot sustain flight at an altitude higher than twice the ground effect altitude for their wingspan and the world they are on. Once they leave ground effect, Speed is reduced by 25%, and Agility has a -2 penalty. Trying to fly above twice the ground effect altitude incurs a -4 penalty to Agility, and Speed is reduced by 50%. Any Flyer check with an Effect of -4 or less will result in a crash.

Most, though not all, ekranoplans are aquatic. This must still be purchased as a separate modification.

Chassis Type: Light Ekranoplan ***Light Ekranoplan Construction***

Skill	Flyer (wing)
Number of Spaces	2–20
Cost per Space	10,000
Structure	1 per 4 Spaces
Hull	1 per 4 Spaces
Agility	+1
Tech Level	5
Shipping Size	1 ton per Space

SPEED AND RANGE

Tech Level	Speed	Range	Take-off/Landing
5	150	500	3,000m/1,500m
6–8	300	700	2,500m/1,250m
9–11	450	1,400	2,000m/1,000m
12+	600	2,600	1,500m/750m

WINGSPAN

Light ekranoplans have a wingspan equal to half their Spaces, in metres (minimum 2), if designed for use on worlds with

Standard Atmospheres. For worlds with Thin Atmospheres, this is increased by 50%, and for worlds with Dense Atmospheres, reduced by 25%. Ground effect altitude is based on these wingspans.

CREW REQUIREMENTS

Same as a conventional aircraft.

Modifications

The following modifications are available for light ekranoplans.

EXTENDED OPERATIONAL ENVIRONMENT RANGE

It is possible to design aircraft with a wider operational environment range. This costs 100% of the Base Cost of the aircraft but allows it to be used within two digits of a planet's Size and Atmosphere values instead of just one. These aircraft also suffer a -1 penalty to Agility in all environments.

WATER LANDING CAPABILITY

This allows the aircraft to land and take-off from water, usually by adding floats or pontoons. This is a removable option and can be added at any time. It costs 10% of the Base Cost, reduces Speed by 10% and reduces Agility by 1. Note that this is not the same as the Aquatic Drive modification (Supplement 5-6: Vehicle Handbook, page 36), which is effectively an amphibious modification. Adding floats or pontoons is a Mechanic (Routine +2, Int) check, and takes about 2 hours.

FOLDING WINGS/ROTORS

Aircraft can be designed with folding wings and/or rotors to allow them to be stored more efficiently. The cost is 25% of the Base Cost and the Shipping Size of the aircraft is reduced by 25%.

Chassis Type: Heavy Ekranoplan

Heavy ekranoplans generally operate over water at about half the maximum altitude they can achieve in ground effect.

Skill	Flyer (wing)
Number of Spaces	20–800
Cost per Space	20,000
Structure	3 per 4 Spaces
Hull	3 per 4 Spaces
Agility	-1
Tech Level	5
Shipping Size	2 ton per Space

Tech Level	Speed	Range	Take-off/Landing
5	300	1,000	2,500m/2,000m
6–8	400	2,000	2,200m/1,700m
9–11	600	4,000	2,000m/1,500m
12+	800	6,000	1,800m/1,000m

WINGSPAN

Heavy ekranoplans have a wingspan between 10 and 50 metres, if designed for use on worlds with Standard Atmospheres. For worlds with Thin Atmospheres, this is increased by 50%, and for worlds with Dense Atmospheres, this is reduced by 25%. Ground effect altitude is based on these wingspan values.

Hull Size (Spaces)	Wingspan
20-80	10m
81-150	20m
151-300	30m
301-500	40m
501-800	50m

CREW REQUIREMENTS

Same as a conventional aircraft.

Modifications

The following modifications are available for heavy ekranoplans.

EXTENDED OPERATIONAL ENVIRONMENT RANGE

It is possible to design aircraft with a wider operational environment range. This costs 100% of the Base Cost of the aircraft but allows it to be used within two digits of a planet's Size and Atmosphere values instead of just one. These aircraft also suffer a –1 penalty to Agility in all environments.

WATER LANDING ABILITY

This allows the aircraft to land and take-off from water, usually by adding floats or pontoons. This is a removable option and can be added at any time. It costs 10% of the Base Cost, reduces Speed by 10% and reduces Agility by 1. Note that this is not the same as the Aquatic Drive modification (Supplement 5-6: Vehicle Handbook, page 36), which is effectively an amphibious modification.

Adding floats or pontoons is a Mechanic (Average +0, Int) check, and takes about 4 hours.

FOLDING WINGS/ROTORS

Aircraft can be designed with folding wings and/or rotors to allow them to be stored more efficiently. The cost is 25% of the Base Cost and the Shipping Size of the aircraft is reduced by 25%.

ROCKET PLANES

Rocket planes are designed to go really fast. Manoeuvring and stopping are not high priorities, and endurance is limited.

Chassis Type: Light Rocket Plane

Light rocket planes are often first used in a military role, as small, extremely fast interceptor aircraft. They tend to be poorly-armed, however, with a very short operational endurance. Unlike conventional aircraft, their acceleration is so high that they can become airborne from a standing start, and do not require a take-off roll. Because of this high acceleration, Light Rocket Planes give their pilots a +2 bonus to Initiative, but DM-1 to all other actions.

LIGHT ROCKET PLANE CONSTRUCTION

Skill	Flyer (wing)
Number of Spaces	2–20
Cost per Space	200,000
Structure	1 per 4 Spaces
Hull	1 per 4 Spaces
Agility	0
Tech Level	5
Shipping Size	1.5 ton per Space

SPEED AND RANGE

Tech Level	Speed	Range	Landing Roll
5	300	100	1,500m
6–8	500	500	1,250m
9–11	700	2,000	1,000m
12+	900	4,000	750m

CREW REQUIREMENTS

Same as a jet aircraft.

Modifications

The following modifications are available for light rocket planes.

FOLDING WINGS/ROTORS

Aircraft can be designed with folding wings and/or rotors to allow them to be stored more efficiently. The cost is 25% of the Base Cost and the Shipping Size of the aircraft is reduced by 25%.

Chassis Type: Heavy Rocket Plane

Heavy rocket planes are capable of flight right up to the edge of space. Unlike jet aircraft, they do not require external oxygen, just some sort of atmosphere to provide lift and control. Rocket planes are used as high-altitude interceptors, fast cargo aircraft, and all the same roles as jets in non-breathable atmospheres. The high accelerations of Heavy Rocket Planes give their pilots a +1 bonus to Initiative, but DM-1 to everything else.

HEAVY ROCKET PLANE CONSTRUCTION

Skill	Flyer (wing)
Number of Spaces	20–80
Cost per Space	400,000
Structure	3 per 4 Spaces
Hull	3 per 4 Spaces
Agility	–2
Tech Level	5
Shipping Size	2 tons per Space

SPEED AND RANGE

Tech Level	Speed	Range	Take-off Area	Landing
5	1,200	200	Size x 10m	4,000m
6–8	1,600	600	Size x 8m	3,500m
9–11	2,400	1,200	Size x 5m	3,000m
12+	3,200	2,400	Size x 3m	2,000m

Take-off Area is the diameter of clear space the aircraft needs to take off vertically, on its tail. Landing is the runway length required to stop. Final approach for rocket planes is usually a glide.

CREW REQUIREMENTS

Same as a jet aircraft.

Modifications

The following modifications are available for Heavy Rocket Planes.

FOLDING WINGS/ROTORS

Aircraft can be designed with folding wings and/or rotors to allow them to be stored more efficiently. The cost is 25% of the Base Cost and the Shipping Size of the aircraft is reduced by 25%.

Chassis Type: Ornithopter

The ornithopter flies like a bird, by flapping its wings. It is an unusual design, normally not very practical. It is most common on worlds with a dense atmosphere and lower-than-normal gravity. Ornithopters have to be very lightweight, and there are a number of trade-offs in their design that reflect this. Ornithopters cannot have any additional armour over and above the base for their Tech Level. They cannot mount any external ordnance, other than a single bomb, missile, or weapon/camera pod under the hull, and cannot mount any weapon bigger than 1 Space, no matter how much interior Space they may have available.

ORNITHOPTER CONSTRUCTION

Skill	Flyer (rotor)
Number of Spaces	1–8
Cost per Space	40,000
Structure	1 per 6 Spaces
Hull	1 per 6 Spaces
Agility	+2
Tech Level	8
Shipping Size	1/2 ton per Space

SPEED AND RANGE

Tech Level	Speed	Max Speed	Range	Take-off Radius
8–9	80	160	600	30m
10–11	120	240	1,100	26m
12–13	160	320	1,600	22m
14+	200	400	2,100	20m

TAKE-OFF RADIUS

Take-off Radius is the minimum safe clear space for an ornithopter to take-off and land. The listed Maximum Speed can never be exceeded when operating in normal mode.

CREW REQUIREMENTS

Same as a conventional helicopter.

Modifications

The following modifications are available for ornithopters.

EXTENDED OPERATIONAL ENVIRONMENT RANGE

It is possible to design aircraft with a wider operational environment range. This costs 100% of the Base Cost of the aircraft but allows it to be used within two digits of the planet's Size and Atmosphere values instead of just one. These aircraft also suffer a –1 penalty to Agility in all environments.

WATER LANDING ABILITY

This allows the aircraft to land and take-off from water, usually by adding floats or pontoons. This is a removable option and can be added at any time. It costs 10% of the Base Cost, reduces Speed by 10% and reduces Agility by 1. Note that this is not the same as the Aquatic Drive modification (Supplement 5-6: Vehicle Handbook, page 36), which is effectively an amphibious modification.

Adding floats or pontoons is a Mechanic (Routine +2, Int) check, and takes about 2 hours.

LOCKING THE WINGS

For high-speed travel, the wings of an ornithopter can be designed so they lock in place. Another source of thrust, jets, propellers, or some sort of grav drive, is then used to propel the aircraft. Use the base Speed of a Light Aircraft, Light Jet, or Light Grav Vehicle respectively, at the same Tech Level. The chassis of an ornithopter is too fragile to withstand the high acceleration inherent in a rocket. The price of the thrust agency includes the price of being able to lock the wings.

Thrust Agency	TL	Spaces	Cost
Propeller	8	1	+50%
Jet	10	2	+100%
Grav Drive	12	3	+150%

UNIVERSAL MODIFICATIONS

The following modifications are available for any vehicle.
Increased Speed (Compact)

In *Supplement 5-6: The Vehicle Handbook*, the assumption behind the Increased Speed Modification is, quite simply, a bigger engine. There are other ways to improve performance, however. This compact version is five times the price (50% of Base Vehicle Cost per 10% increase in Speed,) but only requires 1 Space for every 100% of Speed increase, rather than for every 10%.

DYNAMIC FLIGHT CONTROLS

Dynamic flight controls allow aircraft, including helicopters and grav vehicles, to alter their hull and wing shapes for optimal performance. At lower Tech Levels, this takes the form of 'swing-wing' designs, while at high Tech Levels the entire aircraft changes shape. Dynamic Flight Controls add to an aircraft's Agility, and increases their Speed. Dynamic Flight Controls also reduce a vehicle's Hull and Structure by 1 each, and use 10% of the vehicle's Spaces. The Agility bonus is only applied to the aircraft when it is flying at up to 25% of its maximum Speed.

Tech Level	Agility	Speed	Cost
6-7		+25%	+50%
8-9	+1	+50%	+100%
10-11	+1	+75%	+150%
12-13	+2	+100%	+200%

COMMAND CENTRE

A command centre is a military, police, or rescue co-ordination centre mounted in a vehicle. It includes workstations along with a large screen or holo-tank for situation monitoring. Command Centres require the vehicle to have an on-board computer and at least Standard Sensors and TL 8 Communications.

A Command Centre takes up 4 Spaces plus 1 Space per team member, and costs Cr. 50,000, plus Cr. 5,000 per team member.

WINCH

Winches are used for dragging cargo or as a means of dragging the vehicle out of impassable terrain. They are rated by Shipping Tons, and cost Cr. 500 per Shipping Ton of vehicle. Winches require no Space and can be purchased at ratings of up to 50% higher than the vehicle's Shipping Tons. Cost is per the adjusted Shipping Tons.

AIR-DROPPABLE

An air-droppable vehicle has attachment points for a crane or

parachute system. It requires the vehicle have the Off-Road Modification.

Air-droppable costs 5% of the Base Cost of the vehicle, and adds a point of Structure.

Light vehicles can use parawings, and can be effectively steered towards a target. Heavy vehicles must use parachutes, which are not steerable. Heavy Ships and Submarines cannot be Air-droppable, nor can Ultra-Heavy vehicles. Parachutes and parawings use Shipping Space on the carrying vessel or vehicle rather than Space inside the carried vehicle. They take up 5% of the Shipping Size of the carried vehicle. A parachute or parawing for the vehicle costs 25% of the Base Cost of the vehicle, and is reusable.

DRILLING GEAR

Drilling Gear is rated based on the maximum depth it can drill, which in turn is regulated by its Tech Level.

Tech Level	Maximum Depth	Spaces	Rate of Penetration (Rock)
1-3	100m	1 per 10m	1m/day
4-6	1,000m	1 per 50m	10m/day
7-9	10km	1 per 500m	100m/day
10-12	100km	1 per 5km	1,000m/day
13-15	1,000km	1 per 50km	10km/day
16+	10,000km	1 per 500km	100km/day

Maximum depth is the maximum possible for that Tech Level range.

Spaces is number required to fit the gear, based on the depth that the Drilling Gear can go.

For example, a TL 6 drill designed to go 500 metres would take 10 Spaces.

Drilling Gear costs Cr. 10 per metre of Depth the Drilling Gear can go.

As shown above, Drilling Gear takes up Space depending on the depth it can reach and its TL. However, this is just for the drill itself. The required amount of pipe takes up Space equal to twice the Space of the drill. The Rate of Penetration is the average depth drilled per day. The actual type of rock will change this rate.

Rock Type	Example	Rate of Penetration Change
Very Soft	Limestone	+100%
Soft	Soft Sandstone	+50%
Standard	Sandstone	0
Hard	Shale	-50%
Very Hard	Granite	-90%

Drill holes are 10cm in diameter at TL 1, and increase in diameter by 5cm per TL. Wider bores are possible, but greatly slow down the rate of penetration. For each increase of 25% in the diameter of the hole, increase the Spaces of the Drilling Gear by 10%, and halve the Rate of Penetration. Maximum bore diameter for this sort of equipment is 100% of the base diameter for that Tech Level.

Likewise, a narrower bore is possible. At TL 1, the minimum size is 5cm, but after that pipe size can be as small as 2.5cm. This does not change the size or cost of the Drilling Gear, but does halve the amount of Space required for pipe storage.

DRONE RACKS

Small drones, designed using Book 9:Robots, can be accommodated in racks on a vehicle. Drone Racks are available in 0.5 Space and 1 Space sizes. The following table outlines how many Drones/Robots can fit in a rack.

ROBOT SIZE

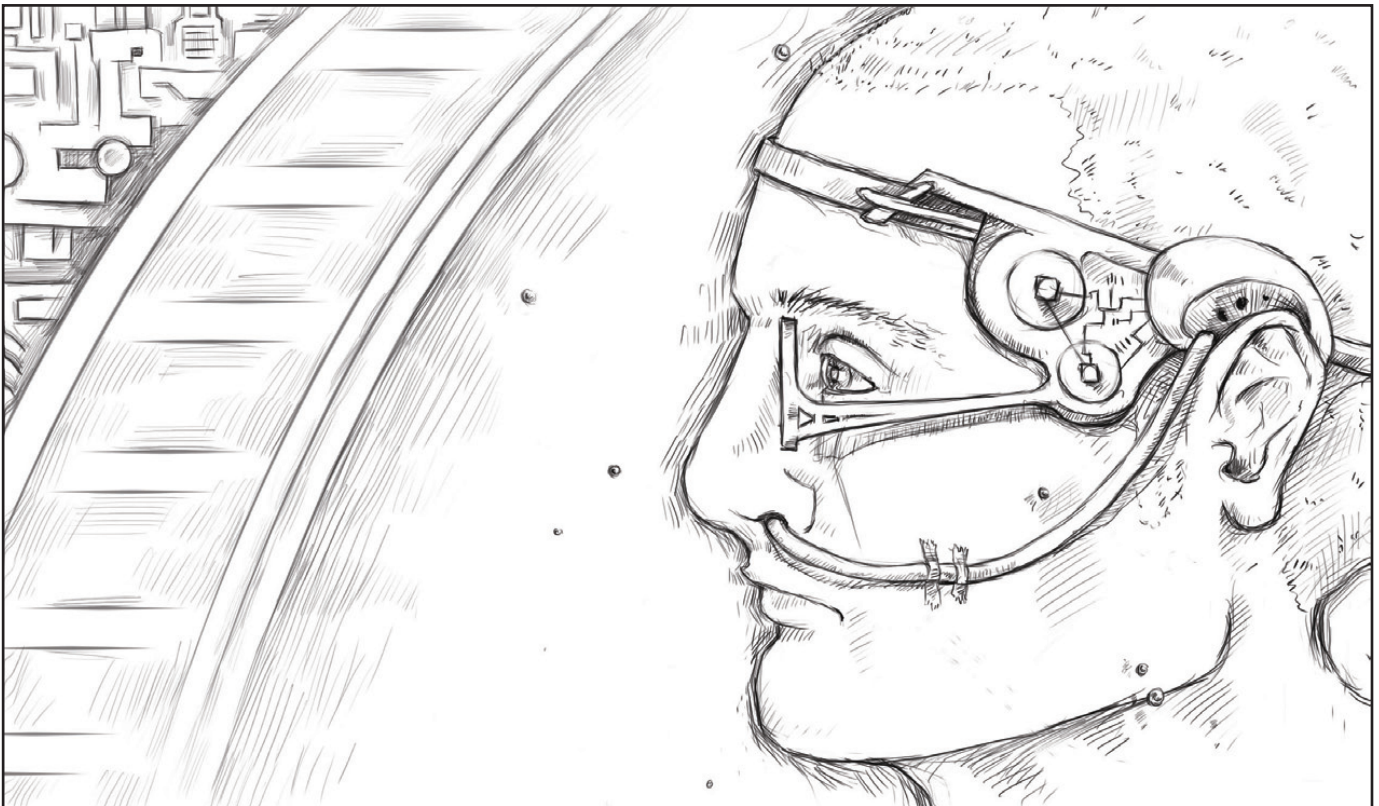
Spaces	1	2	3	4	5
0.5 Space Rack	10	8	6	4	2
1 Space Rack	20	16	12	8	4

Larger drones, built with the rules in this book, would use the rules in Supplement 5-6: The Vehicle Handbook to design storage space for larger drones.

ENERGY BANKS

For vehicles that lack fission and fusion plants, high-power weapons can still be run off an Energy Bank charged by the vehicle's conventional power plant.

An Energy Bank reduces the vehicle's Speed by 10%, but allows high-power weapons to be fired. Each Space of an Energy Bank allows a weapon to be fired at its full rate of fire for two rounds. Each Space of Energy Bank takes 5 rounds to recharge at TL 8, and one round less for every 2 TLs after that (4 rounds at TL 10, 3 rounds at TL 12, and so on). Once the charge time reaches 0, the Energy Bank can charge and fire simultaneously. Note that until the charge time reaches 0, Energy Banks must recharge consecutively. If you have two Energy Banks at TL 8, it would take 10 rounds to completely charge both. Energy Banks cost Cr. 10,000 per Space.



It is possible to install a power plant dedicated to just charging the Energy Bank. This consumes 50 Spaces, or 50% of the vehicle's Spaces, whichever is less. A dedicated power plant cuts the vehicle's Range by 25%, but Energy Banks charge in half the normal time. The mass driver tank guns in 2300AD use this technology.

EXTERNAL FUEL TANK

Any vehicle can have External Fuel Tanks. Combat vehicles will typically jettison them before entering battle. External Fuel Tanks are outside of a vehicle's armour, and very vulnerable to incoming fire. When placing an External Fuel Tank on a vehicle, it must be mounted on one of the six hull locations. Any hit to that facing will hit the tank first. Fuel tanks do not normally explode when hit, but they do catch fire and leak flaming fuel. A tank on fire will burn for 1d6 rounds before it runs out a fuel, though most vehicle crews will jettison it. It does damage to the vehicle as a flamethrower.

External Fuel Tanks are based on the size of the vehicle, in a similar fashion to the Increased Range Modification. Each 10% of the vehicle's size in Spaces used as an External Fuel Tank will add 33% to the Range.

So, a 100 Space Airplane could carry a 10-Space External Fuel Tank, which would add 33% to the aircraft's Range.

For each 10% increment, subtract 10% from the Speed of the vehicle. The vehicle can have no more than 50% of its Spaces as an External Fuel Tank. External Fuel Tanks normal cost Cr. 5,000 per Space, or Cr. 10,000 per Space for aircraft. On aircraft, this tank must go on a hardpoint.

FLUID COCKPIT

The fluid cockpit is a close-fitting armoured shell barely large enough to enclose a person. The crewman in the cockpit wears a special g-suit, and the whole cockpit filled with an oxygenated fluorocarbon. Control is via neural-link or some other hands-free technology. The cockpit adds DM+3 to all Endurance checks associated with high-gee manoeuvres. It also acts as an Ejection Cocoon (Supplement 5-6: The Vehicle Handbook, page 41).

TL 10, 3 Spaces (including crewman), and costs Cr. 100,000. This price does not include the price of any cybernetic linkage.

FOLDING CHASSIS

Some vehicle can be designed with a Folding Chassis to make them easier to store. Only Light Vehicles and Ornithopters can have a folding chassis, and even then the vehicle may not have any additional armour. The fold Folding Chassis modification reduces Hull and Structure by 1, to a minimum of 0, and reduces Armour by 2, to a minimum of 0. The vehicle then takes only half the normal Shipping Size to store. The Folding Chassis has no additional cost.

HIGH PRESSURE HULL

A High Pressure Hull is used for non-submarines that must survive extreme pressures. Such a design would be suitable for operations on Venus, for example. If added to a submarine, this modification doubles the standard Safe Diving Depth/Crush Depth, as well as the Maximum Depth, the submarine can achieve with modifications.

Safe Diving/Crush Depth is equal to a Heavy Submarine of the same Tech Level. High Pressure Hulls cost triple the Base Cost of a vehicle, and life support options must be purchased separately.

JUMP JETS

Jump Jets provide a means for ground vehicles to cross impassable terrain, like crevasses and canyons, rubble fields and similar terrain hazards. The vehicle must have the Off-road Modification, indicating the improved suspension system required.

All Jump Jets are single-use. Additional uses can be added, at a cost of 5% of the Vehicle's Spaces. Jump Jets take 10% of the vehicle's Spaces, and cost Cr. 25,000 per Space.

Jump Jet Tech Level	Horizontal Distance	Vertical Distance
8	10m	5m
10	20m	10m
12	40m	15m

LUXURY FITTINGS

Luxury Fittings do not have an in-game effect. They are simply better quality interior fittings, using natural fibre cloths, leathers, synthetic armour cloths, real woods and similar expensive features to improve the comfort and quality of the vehicle.

For any situations where the appearance of the vehicle may be important, each Cr. 1,000 per Space spent on Luxury Fittings adds +1 to reaction rolls, to a maximum DM of +3, although more money can always be spent on Luxury Fittings.

MINE SWEEPING EQUIPMENT

Mine Sweeping Equipment detects and clears emplaced explosives, including IEDs (improvised explosive devices). Finding mines to begin with is a Combat Engineering (Routine +2, Int) check (see Book 1: Mercenary, page 37, for the Combat Engineering skill). A DM is applied, equal to the difference in Tech Level between the explosive and the minesweeping equipment. So, TL 12 Mine Sweeping Equipment has DM+2 to find TL 10 explosives.

Once explosives are found, they should be marked or cleared. At lower Tech Levels, this is accomplished mechanically, with weighted drums or a series of mechanical flails to beat at the

ground to trigger them. At higher Tech Levels, Mine Sweeping Equipment can include electromagnetic pulses, focussed gravity waves, and super-hard materials.

Another method available is using explosives to detonate the weapons, with methods ranging from a bomb on a long stick, like a Bangalore torpedo, to using thermobaric bombs and massive overpressure to detonate everything within a kilometre. Disposing of a single explosive with another explosive is a Combat Engineering (Routine +2, Dex) check, but an Effect of -3 means one or the other explosive went off prematurely in the character's face.

To clear a minefield is a Combat Engineering (Difficult -2, Dex, 1-6 hours) check. The Tech Level difference between the clearing vehicles and the mines themselves is the DM to this check.

TL	Spaces	Cost
5	8	Cr. 10,000
8	7	Cr. 15,000
11	6	Cr. 25,000
14	5	Cr. 35,000

MODULAR BAYS

Modular Bays in vehicles allow mission-specific modules to be swapped out as needed. These modules are part of the

structural rigidity of the vehicle, and are required to be installed for proper operation. If such a vehicle does not have a module in place, then Agility is lowered by -2, while Structure is reduced by an amount equal to half the number of Spaces of the carried module. Up to 50% of a vehicle's Spaces can be modular.

The cost of a Modular Bay is Cr. 100 per Space of module for Light Vehicles, and Cr. 1,000 per Space of module for Heavy Vehicles. This is in addition to the cost of the equipment carried in the module.

MODULE CLAMPS

As an alternative, clamps can be used to hold external modules and cargo. Objects in clamps reduce the speed of the carrying vehicle by 1% per Space of carried object for Light Vehicles, and 1% for every 10 Spaces for Heavy Vehicles. The maximum size permissible for Module Clamps is 20% of the Spaces of the vehicle. Modules in clamps are not structural and their cost does not include the Modular Bay itself. Once the amount in the Module Clamp passes 10% of the vehicle's Spaces, reduce Agility by -2.

Module Clamps take 1 Space, and cost Cr. 50 per Space carried for Light Vehicles, and Cr. 500 per Space carried for Heavy Vehicles.



RAM PLATE

A Ram Plate is an armoured prow attached to a vehicle to both protect it during a crash, and cause additional damage to another vehicle. Ram Plates provide additional Armour to the Front of the vehicle equal to double its Base Armour. They reduce damage from crashes by 50%, and double damage to other vehicles. The addition of a Ram Plate to a Light Vehicle will slow it down by 25%, but has no effect on the speed of a Heavy Vehicle. Ram Plates cannot be added to aircraft (including aerodynes and helicopters) or airships, but can be added to grav vehicles.

Cost is equal to 50% of the Base Cost.

SEARCHLIGHTS

Headlights are a standard feature on all vehicles after TL 4. Searchlights, however, are much more powerful, and until TL 10, quite fragile. Before TL 10 they cannot be operated from a moving vehicle. Searchlights can light up an area as bright as daylight and after, TL 10, are even brighter.

Searchlights are TL 6, take up 4 Spaces, and cost Cr. 2,000.

SENSOR MAST

A Sensor Mast can be added to any sensor package, and allows a vehicle to use its sensors from behind cover. This requires extending the sensors above or around cover, where they can be targeted separately by enemies with DM-4 for vehicle weapons, and DM-2 for small arms. Sensors Masts have no Armour.

Sensor Masts use ½ Space, and cost Cr. 5,000.

SMART WHEELS

Smart Wheels use an array of short-range sensors to scan the area immediately in front of the wheel, and change shape to compensate. They are available at TL 9. One set of Smart Wheels is equally effective in rain, snow, mud and other conditions. Smart Wheels grant DM+1 for Drive checks involving adverse road or terrain conditions, but require an on-board computer.

In clear driving conditions, Smart Wheels will reshape themselves to provide lower road resistance and improved fuel economy. This translates into providing a 10% increase to the vehicle's Range.

Due to the nature of their construction, Smart Wheels are much quieter than normal tires, and have DM-1 for detection by hearing or auditory sensors.

Smart Wheels cost 25% of the Base Cost.

SMART TREADS

In a similar fashion to Smart Wheels, Smart Treads use an array of sensors to scan the terrain immediately in front of the vehicle and alter the shape of the treads in reaction. They are available at TL 10. Smart Treads grant DM+2 for Drive checks involving adverse road or terrain conditions, but require an on-board computer.

Due to the nature of their construction, Smart Treads are much quieter than normal tracks, and have DM-1 for detection by hearing or auditory sensors. Smart Treads, unlike Smart Wheels, never adapt their shape for efficiency, only for maximum traction.

Smart Treads cost 20% of the Base Cost.

SMART ROTORS

Smart Rotors are available for helicopters and tilt-rotor aircrafts at TL 9 and higher. They incorporate an array of sensors, and are tapped into the aircraft's own sensor systems as well. The system will reshape the rotors in response to environmental conditions, which grants DM+1 for Flyer checks in response to adverse weather conditions. In ideal conditions, use of Smart Rotors improves the aircraft's efficiency, improving Range by 10%.

Due to the nature of their construction, Smart Rotors are much quieter than normal rotors, and have DM-1 for detection by hearing or auditory sensors.

Smart Rotors cost 10% of the Base Cost.

ULTRA-HIGH PRESSURE HULL

Ultra-high Pressure Hulls are used for gas giant operations, and on submarines multiplies the Safe Diving Depth/Crush Depth by five. On other vehicles, Safe Diving/Crush Depth is equal to three times that of a Heavy Submarine of the same Tech Level.

Ultra-high Pressure Hulls cost five times the Base Cost, and life support options must be purchased separately.

ULTRA-HEAVY VEHICLE MODIFICATIONS

When modifications are added to an ultra-heavy vehicle, if the cost or Spaces required is a percentage of the vehicle's Base Cost or Spaces, then the modifier applies to all sections.

CARGO CRANES

Ultra-heavy vehicles can have large cranes for handling cargo and vehicles, in a variety of sizes. Cranes are rated by their capacity, up to 100,000 tons. The Spaces required by a crane can be spread over multiple hull sections.

Capacity	Spaces	Cost (Cr.)
10 tons	10	1,000
100 tons	50	10,000
1,000 tons	100	100,000
10,000 tons	500	MCr. 1
100,000 tons	1,000	MCr. 10

FACTORY/PROCESSOR

Fishing and mining vehicles often have on-board processing and storage equipment, allowing them to stay out, working longer. Designate one section of the vehicle as the Factory/Processor; that section loses 90% of its available Spaces. A Factory/Processor can process a number of tons of ore or harvested food (grain, fish, kelp, giant lizards) equal to the size of the Factory/Processor, in Spaces. More than one section can be set aside as a Factory/Processor.

Factory/Processors cost Cr. 1,000 per Space.

HANGAR

Hangars are large enclosed spaces within the hull, allowing unobstructed access to carried vehicles for maintenance purposes. A full maintenance Hangar requires a number of Spaces equal to 20 times the Shipping Size of the largest carried vehicle. Hangars cost Cr. 10,000 per Space, which includes the required maintenance equipment. Hangars can be spread across multiple hull sections. Note that the Hangar Spaces on vehicles are considerable larger than on starships.

CATAPULT

Ground, sea, and air vehicles that carry non-VTOL aircraft can be equipped with Catapults that rapidly launch the aircraft without requiring their normal take-off run. A Catapult uses a number of Spaces equal to the longest Take-off Run of any carried aircraft, divided by 50, in Spaces. This Space requirement is doubled for any Heavy Aircraft. So, an aircraft that requires a 1,200m Take-off Run would require a 24 Space Catapult, or a 48 Space Catapult if it were a Heavy Aircraft. A Catapult costs Cr. 100,000 per space.

LANDING DECK

Runways with capture nets enable non-VTOL aircraft to land on an Ultra-Heavy vehicle. Take the longest Landing Roll of any carried aircraft, and divide that by 200. This is the minimum number of maximum-sized sections the vehicle requires for a landing deck. So, an aircraft with an 1,800m Landing Roll would require a vehicle of at least 9 sections. A landing deck costs Cr. 500,000 per section required.

BULK CARGO (DRY)

Cargo bays on all ultra-heavy vehicles have a cost to reflect the shelves, bins, and racks used to hold cargo. Dry cargo can be used to haul discrete containers of liquid, like barrels and tanks. This cost is Cr.100 per Space of dry storage, and uses 1 Space per 100 Spaces of cargo.

BULK CARGO (LIQUID)

Liquid cargo requires special handling and storage equipment, including the transfer pumps to move liquid in and out of holding tanks. This requires 1 Space per 20 Spaces of liquid cargo, and costs Cr. 1,000 per Space of liquid storage. If the section of hull containing the liquid holding tank is damaged by more than 10% of both its Hull and Structure, then the tank will start to leak. A tank will leak at a rate of 1 Space per hour, from 10-50% of Hull and Structure damage, and then at 10 Spaces per hour once the tank section has lost more Hits.

STATEROOM

Similar to the Staterooms found on starships, the Stateroom provides comfortable accommodation for two, or cramped space for four. The Stateroom provides sleeping space and storage for personal items, but does not include a fresher. It is very similar to a small hotel room. A Stateroom costs Cr. 5,000, and takes 10 Spaces.

LARGE FRESHER

The Large Fresher is a full-sized washroom, typically featuring a tub, shower, vanity with sink, toilet and bidet. The more expensive version is equipped with luxury features like a jetted tub and multi-level shower heads. It costs Cr. 2,000/5,000, and takes up 6 Spaces.

CAFETERIA/RESTAURANT

A Cafeteria/Restaurant is set up to serve large numbers of people, and on many vessels it is the largest room where crew can gather. Cafeteria/Restaurant require a minimum of 6 Spaces per person being served. 1 staff is required for every 10 patrons in a restaurant, but only 1 for every 50 in a cafeteria. The cost is Cr. 2,000 per person served.

RECREATION SPACE

Recreation Space includes basic exercise equipment, including stationary bike, treadmills and weight machines. At higher Tech Levels, gravity manipulation augments the exercise experience. Recreation Space uses 10 Spaces per person capable of using it at once, and costs Cr. 500 per Space.

INFIRMARY

Though short of a hospital, an Infirmary allows wounds to be treated and stabilised. Infirmarys require 6 Spaces per patient capable of being cared for at once, and cost Cr. 2,000 per Space. An Infirmary is typically stocked with medical equipment and basic pharmaceuticals appropriate for the Tech Level.

LAB SPACE

The Lab Space in Supplement 5-6: The Vehicle Handbook, is very specialised, optimised for compactness, not capability. The more general sort of Lab Space here is designed to support all disciplines, with the equipment required to perform almost

any test. Each lab of this size can support two researchers and two assistants, and takes up 20 Spaces. Labs provide a DM to research-based checks based on their Tech Level.

Tech Level	DM	Cost
5-7	+0	100,000
8-10	+1	200,000
11-13	+2	400,000
14+	+3	600,000

WORKSHOP

Workshops are used for the repair and maintenance of a large vehicle's systems while it is underway. Workshops require General Storage rooms set aside for parts required; 20 Spaces of storage is required for each Workshop, and one Workshop is required per section of hull for all ultra-heavy vehicles except aircraft (including helicopters and aerodynes).

Workshops require 4 Spaces, plus 1 Space per Tech Level of the vehicle. They cost Cr. 2,000 per Space.

OFFICE SPACE

Office Space is similar to a Stateroom, but with fewer amenities. It has room for two desks, chairs, and appropriate office equipment, or a desk and meeting table, as desired. Office Space uses 10 Spaces and costs Cr. 1,000.

SECURE STORAGE

Secure Storage is separate from General Storage, and is used to store high-value goods and cargo. Secure Storage can use any number of Spaces, and costs Cr. 10,000 per Space. The walls of Secure Storage are Armoured (20) to prevent break-ins, and the door is locked with a Formidable (-6) mechanical or electronic lock, as appropriate to the Tech Level.

GENERAL STORAGE

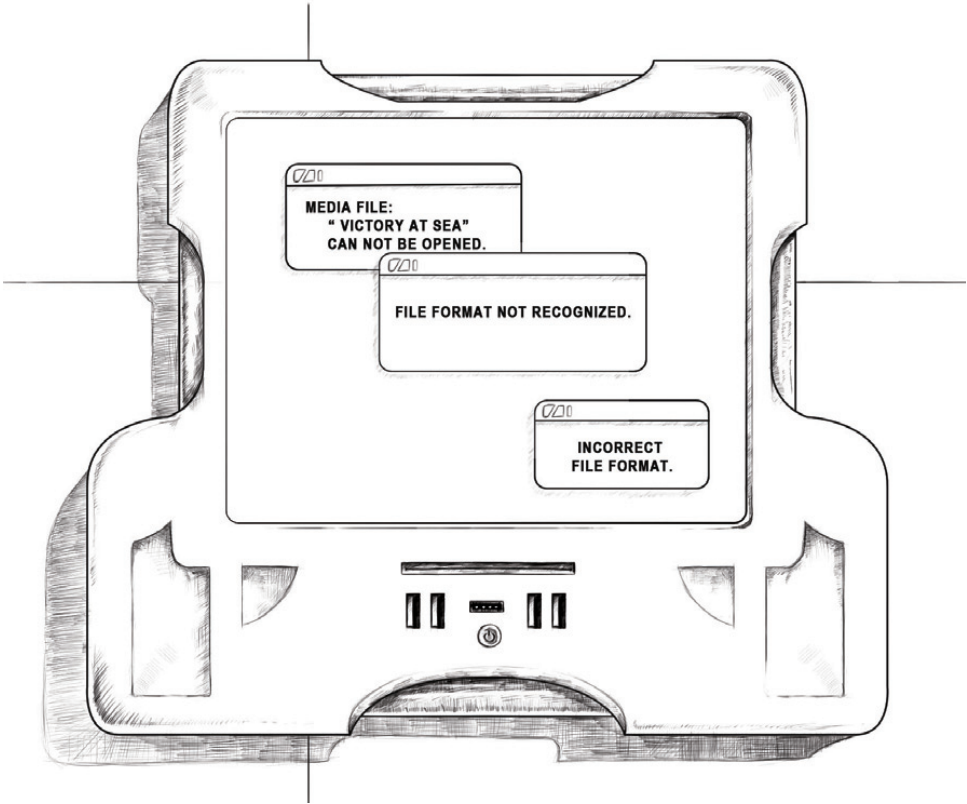
General Storage is used in vehicles to store equipment, supplies, parts, and similar items. General Storage has no cost, but the amount of Space needs to be set aside.

APARTMENT (SMALL)

A Small Apartment is suitable for two to three people, and includes two bedrooms, a full bathroom, a compact food preparation area, and a combined living/dining area. A small apartment takes 40 Spaces, and costs Cr. 30,000.

APARTMENT (LARGE)

A Large Apartment is suitable for 3-4 people, and includes three small bedrooms, a full bathroom, a half-bath, a compact food preparation area, and a slightly larger combined living/dining areas. A Large Apartment takes 60 Spaces, and costs Cr. 50,000.



QUIRKS AND FLAWS

Sometimes vehicles will develop Quirks and Flaws. They are seldom intended, but can affect an entire production run.

Roll 2d6. If the vehicle is more than 10 years old, or incorporates technology from a higher Tech Level than the rest of the vehicle, add +1 to the roll. If the entire vehicle is built at a higher Tech Level than normal for its world of origin, add +2 to the roll. If the result is 10+, the vehicle has a Quirk or Flaw of some kind.

Roll 1d6, adding +1 if the roll for the presence of a Quirk or Flaw was 12+. Subtract -1 if the vehicle is a consumer-grade civilian vehicle.

1d6 Roll	# of Quirks	# of Flaws
0 or less	-	-
1	1	-
2	1	-
3	1	-
4	2	1
5	3	1
6	3	1
7 or More	3	2

QUIRKS

Quirks tend not to have direct, in-game effects, instead giving the vehicle extra 'character.'

IRRITATING SMELL

The vehicle features a disgusting smell in its interior, impossible to pinpoint where it is coming from.

STAINED INTERIOR

The vehicle's interior has unidentifiable stains that resist all attempts to remove them.

IRRITATING NOISE

Somewhere in the bowels of the vehicle there is a bothersome noise. It sounds like something is broken, ticking, rattling, gasping or wheezing. It has no actual effect on the functioning of the vehicle, and attempts to determine where the sound is coming from will be fruitless

UGLY

Something about the vehicle just does not come together, and it looks really ugly. Pieces do not seem to fit smoothly, proportions are wrong, or it has similar issues. Note that industrial or utilitarian vehicles do not necessarily have this flaw. A vehicle with this flaw is Ugly when compared to other, similar, vehicles.

FLAKY COMM UNIT

The unit transmits fine, but reception is poor.

WRONG FORMAT ENTERTAINMENT SYSTEM

The entertainment system will not play standard recorded media (for example, PAL vs. NTSC, AAC vs. WMA, VHS vs. Betamax).

SLOW REFUELING

The vehicle has narrow fuel pipes, a slow charge battery, or some similar failing. It takes 10-20% longer to refuel than a comparable vehicle.

POORLY-POSITIONED CONTROLS

While the placement of the controls does not have an in-game effect, characters should note the controls are poorly-placed, awkward, and non-intuitive. At the discretion of the referee, a character with a level 0 vehicle skill may suffer DM-1 just due to the poor positioning of the controls.

FLAWS

Flaws are negative tendencies that have been built into the vehicle.

BAD LUCK

The vehicle seems to labour under some sort of curse. Whenever an important skill check involving manoeuvring must be made, roll twice, and take the lower of the two rolls.

DIFFICULT TO MODIFY

Any changes made to the vehicle after the initial design process have DM-2 to Mechanic checks, and cost twice as much as normal.

HANGER QUEEN

The vehicle requires three times the normal maintenance time.

HAUNTED (ULTRA-HEAVY VEHICLES ONLY)

Haunted vehicles have a bad reputation, and are very unpopular with their crews. There are areas of the vehicle they fear to go due to spooky noises, sudden drops in temperature or simply by having a bad feeling. The vehicle seems to suffer Bad Luck as well, and suffers the consequences of that Flaw too.

SLOPPY CONTROLS

The controls do not react as quickly as they should, applying DM-1 to any skill checks in combat or situations where precision is essential.

POOR FUEL ECONOMY

Vehicle Range is reduced by 10%.

FAULTY TARGETING COMPUTER

Attacks at Very Long or greater ranges suffer DM-1 to hit.

SLOW AUTOPILOT

If operating on auto-pilot, the vehicle always acts last in initiative order.

FAULTY SENSORS

The vehicle's sensors operate intermittently. Every time they are used, roll 1d6. On a 6+, they give DM-4 to Sensor checks.

MAINTENANCE

Light Vehicles require maintenance equal to 0.1% of their cost, per month. Heavy Vehicles require maintenance equal to 0.5% of their cost, per month. Ultra-heavy Vehicles require maintenance equal to 0.1% of their cost, per month.

For both Light and Heavy Vehicles, maintenance requires a number of hours per month equal to 50% of their Spaces, in hours.

This amount is doubled for hovercraft and aircraft, and tripled for jets, helicopters, aerodynes, and grav vehicles. However, it is reduced by 50% for all Boats, Ships, and Heavy Submarines. Ultra-heavy Vehicles only need to devote this maintenance time to their engineering sections and bridge sections. All other sections are covered under this maintenance time.

Maintenance requires a Mechanic (Routine +2, Edu) check per 10 hours of maintenance time. This check can be retried any number of times, each adding 10 hours to the maintenance period. An Effect of -6 indicates something has been broken beyond repair, and must be replaced at a cost of 1d6% of the vehicle's cost.

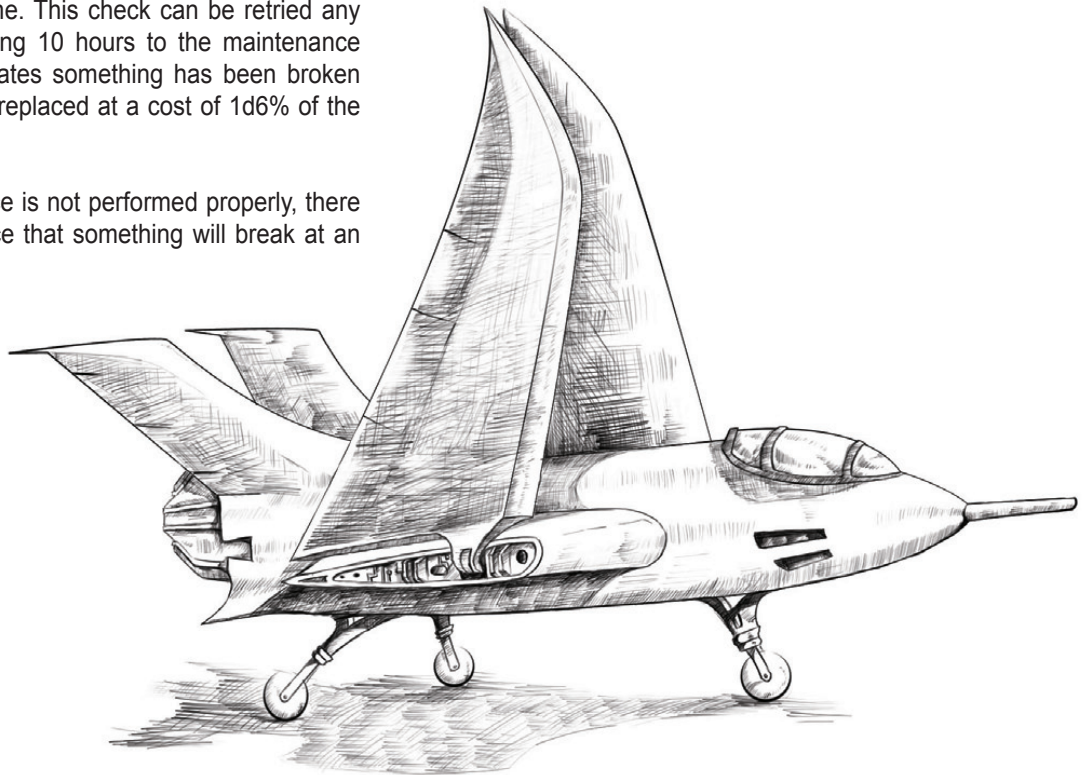
For every month maintenance is not performed properly, there is a cumulative 1 in 6 chance that something will break at an

inopportune moment, and a cumulative DM-1 for the Mechanic check for every six months the vehicle is past its normal maintenance schedule.

USED VEHICLES

Used vehicles are widely available, and always less expensive than their brand new counterparts. A used vehicle is 10-60% (1d6 x 10%) cheaper than a new one. All used vehicles require more maintenance, with an additional 1d6 hours per month for Light Vehicles, 2d6 hours per month for Heavy vehicles, and 4d6 hours per month for Ultra-heavy Vehicles.

For used Light Vehicles, check once for a Flaw. For used Heavy Vehicles, check three times for a Flaw and for used Ultra-heavy Vehicles, check five times.



DESIGNING ULTRA-HEAVY VEHICLES

The two hunter-foils raced between fountains of spray blasted up by the cannon on the Sea Harvester factory ship. Arvid armed his torpedoes, then slipped his foil beneath the churning waters while Celal continued to manoeuvre on the surface, joining the other Aramakilar foils in their attack on the factory, launching home-made missiles and torpedoes at the vast bulk of the ship. Air/rafts and G-carriers rose from the decks of the beleaguered ship to carry the battle back to the attackers, but then the bulk of the huge ship shuddered, and began a slow-motion list to one side. Arvid had broken through the ring of ogul nets to plant his warheads home.

Supplement 5-6: Vehicle Handbook was not intended to create truly enormous vehicles. It is aimed instead at vehicles that characters can interact with at a personal level. Anything larger really is a prop, and only under rare circumstances would its characteristics be required. However, sometimes players will find themselves in desperate straits, engaging the factory ship with their hunter foils, and they need to know if their torpedoes slipped past the ogul nets and struck the factory ship's hull.

Massive vessels are designed in sections. Each section should have the same number of Spaces, and total Spaces of the entire vehicle should be larger than the largest Heavy Vehicle of that type. Only Heavy Vehicles can be used to design Ultra-heavy Vehicle sections.

For aquatic vehicles, if damage to the Hull of a section reaches 50%, it starts to leak. Each section is compartmented from the rest of the ship. A leaking section will completely flood in a number of minutes equal to the number of Spaces in the section, and all equipment in a flooded section is effectively unusable. If more than 25% of an aquatic vessel's sections flood, it will start to sink.

In combat, each section of an Ultra-heavy Vehicle can be targeted separately. All damage suffered by a section is confined to that section until it reaches Structure 0. At that point, the section is effectively destroyed, and Speed drops by 25%. If the vehicle is an aircraft, it will also start to lose altitude rapidly, and if it is a watercraft, it starts to sink.

Ultra-heavy aircraft lose altitude at a rate of World Size x 100m per round. Landing the aircraft successfully is a Flyer (Difficult -2, Dex) check, with DM-2 per section destroyed.

Watercraft will sink after 25% or more of their sections have been destroyed. They will sink at a rate of 1 section every 10 minutes, for every section destroyed. So, if two sections are destroyed, two sections of the vessel will sink every ten minutes.

CHASSIS TYPES

Ultra-heavy Vehicles can be made from any Heavy chassis type, as well as airships. The following limitations on size apply.

Chassis Type	Number of Sections	Number of sections at TL 13+
Aerodyne	2	4
Aeroplane	2	4
Airship	4	8
Ekranoplan	2	4
Grav Vehicle	20	40
Ground Vehicle	3	6
Hovercraft	2	4
Jet	2	4
Rocket Plane	2	4
Ship	20	60
Submarine	20	80
Walker	2	6

CREW REQUIREMENTS

For all sections except cargo, treat each as if it were a Heavy Vehicle of the same type. For cargo sections, halve this crew requirement.

A vehicle can operate with a skeleton crew of just the number required for a single section, but this crew cannot perform routine maintenance or any repairs beyond dire emergencies.

SPEED AND RANGE

Speed is reduced by 5% for every 10 sections added, or fraction thereof. Range of an Ultra-heavy Vehicle is increased by 5% for each section added.

SECTIONS

Each section has the same Hull and Structure scores, and the same price as a Heavy Vehicle chassis of the same size. Each section can be targeted independently by attackers.

Modifications that affect the entire hull base their cost on the Base Cost of all sections added together.

ENGINEERING

If the Ultra-heavy Vehicle has three or more sections, at least one must be designated as an engineering section. That section loses 75% of its Spaces. In return, the other sections gain 50%

more Spaces. One-quarter of all sections must be designated as engineering spaces, rounding down to a minimum of 1.

If there is only one engineering section, the vehicle loses all propulsive ability. If there are two, and one is destroyed, then it loses 50% of its Speed and so on, losing a fraction of Speed related to the number of engineering sections destroyed.

BRIDGE

Ultra-heavy Vehicles have bridges. Each crew position on a bridge requires 4 Spaces and half of all the crew required for sections must be stationed in or around the Bridge. The section that contains the bridge is designated the bridge section, and often contains crew quarters as well. A Bridge and engineering can be placed in the same section, but it is important to keep the bridge in the 25% of the section's space left over after engineering has been designated. A bridge costs Cr. 1,000 per Space.

AGILITY

Ultra-heavy Vehicles at all sizes reduce their Agility by -3, to a minimum of -6.

ARMOUR

Each additional sections after the first increases the maximum amount of Armour that can be carried by 25%. So an Ultra-heavy Vehicle that has three sections can carry 150% more Armour than a standard Heavy Vehicle. Ultra-heavy Vehicles cannot be designed as AFVs.

FISSION AND FUSION PLANTS

When fission and fusion plants are added to an Ultra-heavy Vehicle, they require most of the Spaces available in the engineering sections. Fission plants require 90% of available space, while fusion plants require 25%. This is over and above the Space allocations required to create the engineering section.

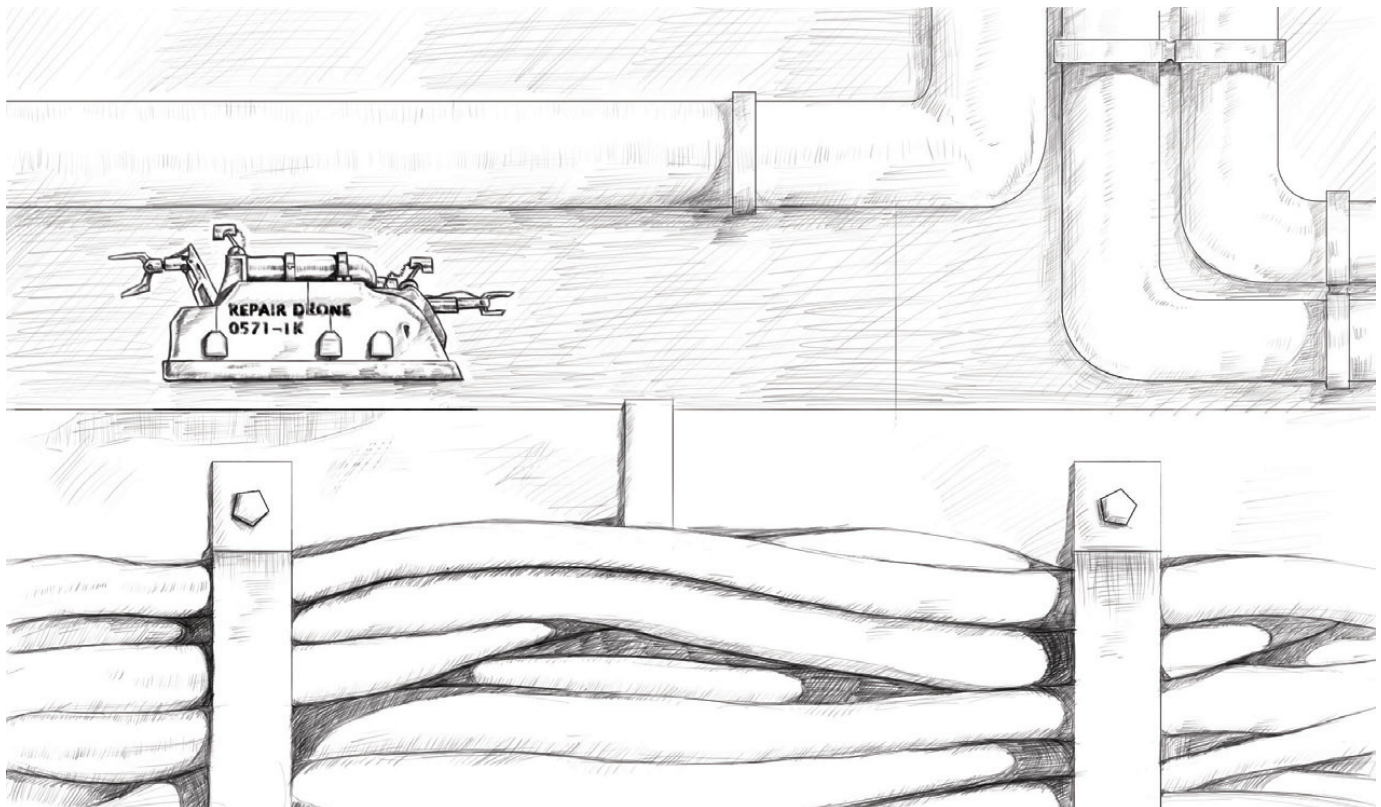
Fission plants double the cost of each engineering section, while fusion plants multiply the cost by four. On Ultra-heavy Vehicles, fusion plants need to be refuelled every five years, while fission plants need to be refuelled every 2 years.

Fusion and fission plants are necessary to power hyper-velocity guns, high-energy weapons and aerospace-defence lasers, unless an Energy Bank is installed.

ULTRA-HEAVY VEHICLES AS ROBOTS OR DRONES.

Each section of an Ultra-heavy Vehicle intended as a robot or drone requires its own controller, either a drone controller or robotic brain. One section is designated the primary section, and it houses the dominant controller. In the event that the dominant controller is damaged, the role passes to another drone controller or robot brain in another section.

The price of robot brains and drone controllers intended for Ultra-heavy Vehicles is doubled, and Space requirements are multiplied by 5. Robotic Ultra-heavy Vehicles will often have an assortment of smaller robots for maintenance, repair, and interior defence.



WEAPONS

A wide range of weapons can be mounted on vehicles, and additional possibilities are presented here.

CANNON

In addition to the cannon found in *Supplement 5-6: The Vehicle Handbook*, a wide variety of other heavy guns are available.

DEMOLITION CANNON

This large bore (180mm), short-barrelled, low-pressure gun is used to lob a large, high explosive round at a static target. In addition to the standard high explosive round, a HESH (High Explosive Squashed Head) round can be used, which produces a shock wave after detonation that disrupts a building's structural integrity, making it easier to demolish. It is highly-effective against bunkers and other hardened buildings.

50MM ROTARY AUTOCANNON

This heavy rotary gun is often used as an anti-aircraft weapon, and sometimes for anti-tank duties when loaded with the right ammunition. However, like all rotary guns, it goes through shells at a prodigious rate, limiting the combat endurance of vehicles equipped with it. As a static emplacement, this limitation is minimised, but even then it remains an expensive weapon to operate. However, it is perfectly capable of sawing through a building to get at a target behind.

75MM ROTARY AUTOCANNON

Pushing the envelope on slugthrower design, the 75mm rotary autocannon is barely practical at TL 9. It was developed largely as a counter to the heavily-armoured grav vehicles that start to appear at that Tech Level. The three barrels take a moment to spin up, with the result that a vehicle equipped with this weapon suffers DM-2 to initiative in the first round of combat.

120MM ROTARY AUTOCANNON

This enormous weapon can lay down a devastating barrage of heavy shells, but consumes ammo at an incredible rate. While impressive, it is not a practical weapon. Spinning the three barrels up to speed takes a full round, during which it cannot fire. The barrels can be kept spinning, but the power required to do so will reduce the vehicle's Speed by 10%. A single Space holds enough ammunition for just one burst.

HOWITZERS

Howitzers are indirect fire weapons designed to lob shells over long ranges. There are three general class of howitzer, ranging from light to medium, to heavy.

LIGHT HOWITZER

These weapons are approximately 50-80mm in calibre, and are often found in towed or even animal-packed varieties. Also known as a mountain howitzers when not part of a vehicle's armament, they cost Cr. 5,000, and take up 2 Spaces.

MEDIUM HOWITZER

The medium howitzer is found in 90-120mm variants.

HEAVY HOWITZER

The heavy howitzer is available in 150-200mm sizes.

NAVAL CANNON

From Tech Levels 4-8, some truly monstrous guns are developed for use on armoured warships. These immense guns cannot normally be mounted on conventional vehicles, and require Ultra-heavy hulls.

200MM GUN

This is a common naval weapon, and can also be found on some ground vehicles. It is 5 metres long, and weighs about 15 tons.

300MM GUN

A common heavy weapon on some ocean-going vessels, the 300mm gun can also occasionally be found in ultra-heavy ground vehicles. The 300mm gun is just over 12 metres long, and weighs 40 tons.

400MM GUN

The largest commonly seen naval gun is the 400mm cannon. At 20 metres long and 120 tons in weight, this weapon is usually only seen on sea-going warships, though the pirate-king of Ambula had one mounted on his anti-grav command ship. He only ever fired it once, and the resultant recoil flipped his command ship.

500MM GUN

The biggest chemically-propelled gun built, the 500 mm gun is 30 metres long, and weighs about 150 tons.

HIGH ENERGY WEAPONS

High energy weapons are plasma and fusion guns that, for a brief moment, harness energy similar to that of a star in order to produce extreme destructive power on the battlefield.

HIGH ENERGY WEAPONS

High energy weapons are listed as Destructive or Ultra-Destructive. These weapons tend to liberate most of their energy on the surface of targets, rather than penetrating deeply inside. This results in the following effects.

Destructive: Destructive weapons damage the Armour of the facing they hit. They permanently reduce the Armour value by one point per die of damage. So, a plasma gun that does 10d6 damage would remove 10 points of Armour on the facing it struck.

Ultra-Destructive: Ultra-Destructive weapons damage the armour of the facing they hit. They permanently reduce the Armour value by two points per die of damage. So, a fusion gun that does 10d6 damage would remove 20 points of Armour on the facing it struck.

PLASMA AND FUSION WEAPONS

Plasma and fusion weapons in science fiction tend to use one of two quite different technologies. Either they use power drawn from a high-density source like a reactor, or they use cartridges that contain some sort of single-use power cell, along with the fuel pellet for the reaction. The net effects are the same. Ammunition costs and Space scores listed assume weapons that use cartridge ammunition.

PLASMA DEMOLITION GUN

In a similar fashion to the projectile demolition cannon, the plasma version fires an over-powered blast of plasma, but the short barrel and limited beam confinement give it a short range. It is used to blast away debris and rubble, but can also be used in mining and road construction, blasting rock and rubble. On low-powered settings, it produces long bursts of hot plasma, perfect for melting rock and aggregate into roads, or clearing forests.

ROTARY PLASMA CANNON

This 3-barrel weapon allows a more rapid fire/cooling cycle than a normal plasma weapon. There are two different variants, available at TL 11 and TL 13. It is a voracious consumer of power or ammunition, depending on the technology behind the plasma gun.

PLASMA A GUN TL 10

The plasma A gun is one of the first high-energy weapons to appear on vehicles. Though large and bulky, they are very hard-hitting weapons, able to punch most armoured vehicles of their Tech Level or lower. At TL 11, the weapon becomes lighter and available in a rapid-pulse mode.

PLASMA B GUN TL 11

The more powerful plasma B gun is available as a heavy vehicle weapon at TL 11, and a lighter rapid-pulse model at TL 12.

PLASMA C GUN, TL 12

Following the same pattern as the A and B guns, the C is first available at TL 12, and is the most powerful plasma weapon built. At TL 13, a lighter, rapid-pulse model is available.

FUSION X GUN TL13

The bulky fusion X gun is the first of the fusion weapons to be used on the battlefield. It is capable of burning through almost all armour materials available when it is introduced, and spurred the development of advanced, gravitically-aligned materials. A lighter, rapid-pulse model becomes available at TL 14.

FUSION Y GUN TL14

The fusion Y gun channels the power of a nuclear explosion into a fearsome weapon. The rapid-pulse variant available at TL 15 can cover an entire battlefield in hot fusion destruction.

FUSION Z GUN TL15

The fusion Z gun is so powerful that the beam will penetrate deeply into normal matter before it starts to interact with it, liberating vast amounts of heat and radiation inside armour, destroying it from within.

2CM NUCLEAR CANNON

This weapon uses nuclear damper technology to hold a number of highly-unstable isotopes, like californium, in a stable state as autocannon shells. Each round is hollow and collapses on impact and, having sufficient mass to go critical, causes a small nuclear explosion. Even with damper boxes, these are notoriously unreliable, and any failure of the damper box will result in serious radiation exposure to anyone nearby at best, and a small atomic explosion at worst.

As these weapons are ineffective against opponents with nuclear dampers, they are more likely to be used against lower technology forces. In the Third Imperium setting, use of the nuclear cannons by non-Imperial forces is a violation of the Imperial Rules of War, and will likely merit an intervention by Imperial Marines.

LASERS

SUB-LAUNCHED AEROSPACE DEFENCE LASER BUOY.

The laser buoy is an aerospace defence laser mounted in a stabilised buoy that can be launched from a submarine at depths of up to 500 metres. It must remain connected to the launching submarine via a power and data tether. A vehicle mounting these buoys must have either a fission or fusion plant to deliver the power required to use them.

GRENADE LAUNCHERS

Grenade launchers fire a small, low-pressure round, typically containing an explosive payload. Grenades are effective against infantry and light vehicles, but generally ineffective against true combat vehicles.

AUTOMATIC GRENADE LAUNCHER

Grenade launchers are widely employed as defensive anti-infantry weapons on many vehicles, and as the primary weapon on small ones. Available in standard 30mm and 40mm designs, the launcher is able to fire in fully-automatic mode, laying down 2 grenades per second.

RAM AUTO GRENADE LAUNCHER

RAM (Rocket-Assisted Munition) grenades, as the name suggests, use a rocket motor to give the rounds extended range and a flatter trajectory. The effect of the payload is the same as a round from a standard automatic grenade launcher.

VRF GRENADE LAUNCHER

Based on designs reaching back to TL 8, the VRF grenade launcher packs the several barrels with twelve 40mm electronically-fired grenades, loaded nose to tail. An individual weapon will have between 4 to 20 barrels, and can empty all of them within 2 seconds, completely saturating an area with high-explosives. Once fired, the barrels have to be reloaded at a factory or depot. This weapon is often used by ships to obliterate small attack craft and attack drones that might otherwise be able to avoid more conventional weaponry.

MICROWAVE AREA DENIAL (MAD) PROJECTOR

The MAD projector is a less-lethal weapon that uses microwaves to stimulate the pain sensors in the skin, causing an intense desire to move as far away from the projector as possible, as fast as possible. While MAD projectors do not do any permanent damage, it certainly feels like they do to those on the receiving end. Targets of the weapon must make an Endurance (Very Difficult -4) check to stay in the area where a MAD projector is being used. If the check is failed, the target will move away from the MAD projector as fast as possible.

ARTILLERY MISSILES

Artillery missiles are long-range missiles usually intended for static targets, though they do have some ability to strike a large, slow target like a surface or land ship. As the design advances, these weapons become smaller, faster, and more accurate.

LIGHT ARTILLERY MISSILE

The light artillery missile is typically about 220mm in diameter, and is roughly the same size as a standard starship missile.

MEDIUM ARTILLERY MISSILE

The medium artillery missile is a two-stage design, with a range of 300 km.

HEAVY ARTILLERY MISSILE

The heavy artillery missile is a larger two-stage design, with a range of 600 km.

SUPER-HEAVY ARTILLERY MISSILE

The super-heavy missile design is three stages, with a range of nearly 2,000 km.

MASS DRIVERS

Mass driver artillery pieces are large-bore magnetic accelerator guns, designed to land a significant payload on a distant target. They are different from gauss cannons or hyperkinetic guns in their use of large-calibre rounds, where payload is more important than the kinetic punch of the round itself. These weapons are indirect-fire, though they can engage targets directly with DM-4 to their attack rolls.

LIGHT MASS DRIVER

The light mass driver fires a 120mm artillery shell up to 40 kilometres.

MEDIUM MASS DRIVER

The medium mass driver fires a 180mm shell at ranges of up to 80 kilometres.

HEAVY MASS DRIVER

The heavy mass driver is a monster of a weapon, firing a 250mm shell up to 120 kilometres away.

Weapon	TL	Cost	Damage	Auto	Spaces	Range	Ammo/ Space
Demolition Cannon	8	Cr. 38,000	16d6 (HE)	No	10	Very Long	20
50mm Rotary Cannon	9	Cr. 200,000	8d6 SAP	8	8	Distant	300
75mm Rotary Cannon	10	Cr. 250,000	8d6 Super-AP	6	12	Distant	40
120mm Rotary Cannon	10	Cr. 900,000	10d6 Super-AP	4	20	Distant	30
Light Howitzer	5	Cr. 5,000	9d6 (HE)	No	2	Very Distant	20
Medium Howitzer	6	Cr. 20,000	12d6 (HE)	No	6	Extreme	10
Heavy Howitzer	6	Cr. 40,000	14d6 (HE)	No	10	Extreme	6
2cm Nuclear Cannon	13	MCr. 1	30d6	2	6	Very Long	6
200mm naval gun	5	Cr. 900,000	16d6 (HE)	No	14	Continental	3
300mm naval gun	5	MCr. 2	20d6 (HE)	No	40	Continental	1/round
400mm naval gun	6	MCr. 4	24d6 (HE)	No	120	Continental	4.5/round
500mm naval gun	6	MCr. 8	28d6 (HE)	No	150	Continental	6/round
Plasma Demolition Cannon	11	MCr. 1.2	28d6 Destructive	No	12	Long	10
Rotary Plasma Gun	12	MCr. 2.5	14d6 Destructive	6	20	Distant	20
Plasma A Gun	10	MCr. 1	14d6 Destructive	No	16	Very Long	20
Plasma A Gun, RF	11	MCr. 1	14d6 Destructive	2	16	Very Long	20
Plasma B Gun	11	MCr. 1.5	16d6 Ultra- Destructive	No	16	Distant	15
Plasma B Gun, RF	12	MCr. 1.5	16d6 Ultra- Destructive	4	16	Distant	15
Plasma C Gun	12	MCr. 2	18d6 Destructive	No	16	Very Distant	10
Plasma C Gun, RF	13	MCr. 2	18d6 Destructive	4	16	Very Distant	10
Fusion X Gun	13	MCr. 3	24d6 Ultra-Destructive	No	16	Extreme	5
Fusion X Gun , RF	14	MCr. 3	24d6 Ultra-Destructive	4	16	Extreme	5
Fusion Y Gun TL14	14	MCr. 5	26d6 Ultra-Destructive	No	18	Extreme	3
Fusion Y Gun, RF	15	MCr. 5	26d6 Ultra-Destructive	4	20	Extreme	3
Fusion Z Gun	15	MCr. 10	28D6 Ultra-Destructive	No	22	Extreme	1
Aerospace Defence Laser Bouy	12	MCr. 6.5	16d6	10	60	Orbital	N/A
Light Artillery Missile	9	Cr. 100,000	20d6 (HE)	No	2	Extreme	N/A
LAM, Advanced	12	Cr. 150,000	24d6 (HE)	No	2	Continental	N/A
Medium Artillery Missile	8	Cr. 500,000	26d6 (HE)	No	4	Continental	N/A
MAM, Advanced	11	Cr. 750,000	30d6 (HE)	No	4	Continental	N/A
Heavy Artillery Missile	7	MCr. 2	34d6 (HE)	No	8	Planetary	N/A
HAM, Advanced	10	MCr. 3	38d6 (HE)	No	8	Planetary	N/A
Super Heavy Artillery Missile	10	MCr. 6	40d6 (HE)	No	14	Orbital	N/A
SHAM, Advanced	13	MCr. 9	44d6 (HE)	No	14	Orbital	N/A
Microwave Area Denial Projector	8	Cr. 250,000	Special	8	4	Long	N/A
Auto Grenade Launcher	6	Cr. 25,000	6d6 (HE)	4	1	Very Long	2,000
VRF Grenade Launcher	9	Cr. 100,000	6d6 (HE)	10	2	Very Long	N/A
RAM Grenade Launcher	10	Cr. 5,000	6d6 (HE)	No	1/2	Distant	2,000
Light Mass Driver Artillery	9	Cr. 500,000	9d6	No	14	Extreme	20
Medium Mass Driver Artillery	10	MCr. 1.5	10d6	No	20	Continental	15
Heavy Mass Driver Artillery	12	MCr. 4	12d6	No	26	Continental	10

VEHICLES AS ROBOTS AND DRONES

'What the frack is that?' Emerson stared in horror at the three-story tall, multi-tracked tank lumbering across the torn landscape towards their location. Sparks danced around the massive armoured mountain as normal matter interacted with the meson screen that protected it.

Starliss held an odd-shaped multiviewer to its array of eyes, then squealed in fear.

'By the Makers! An Orvid autotank!'

Emerson watched as one of the two hypervelocity guns on the sensor tower swivelled towards them. That gun could down spacecraft in orbit. He lowered his omnoculars.

'Goodbye old friend.'

The distant gun sparked, and the world vanished in a deafening roar.

Remote control devices and robot brains can be added to many vehicles at or above a suitable Tech Level, turning them into large drones or robots. In addition to their combat potential, robots and drones are used in hazardous and or repetitive tasks such as industrial operations, construction, waste handling, mining, and many other activities. The system here is designed to pick up where Book 9: Robots left off, and is streamlined from that version, though it remains compatible.

Drone controllers are available in four grades, from Primitive to Neural-linked. Each type of drone controller requires the appropriate level of vehicle controls installed. Primitive drone controllers require primitive controls, standard controllers require standard controls, and so on.

Drone controllers are equipped with built-in communicators. These communicators are not encrypted as standard, though they can be. Drone controllers can be modified in the same fashion as communicators, and for the same price.

	TL	Spaces	Control Mod	Range	Cost
Primitive	5	2	-3	Long	Cr. 10,000
Standard	7	1	-2	Very Long	Cr. 50,000
Advanced	9	0	-1	Distant	Cr. 200,000
Neural-linked	11	0	0	Very Distant	Cr. 500,000

TL: This is the level at which that type of drone controller is first available.

Spaces: Includes additional controller hardware, on top of what is included under the required controls type.

Control Mod: The DM added to the DM from the controls installed.

Range: Taken from the vehicle fire control table range. It can be increased in the same way as conventional communicators.

Cost: The cost of the entire system, including controllers. If a drone vehicle ever has its communications jammed, it will lose contact with its controller and continue to move on the last heading before it lost communications. It will not fire weapons or undertake any other action other than to continue to move. It will maintain this heading until control is regained, it runs out of fuel, or crashes into something.

ROBOT BRAINS

Robot brains can be added to any vehicle with Advanced Controls (or better). A robot brain allows the vehicle to operate without a human controller at all, though the two systems can be easily combined. Indeed, the first independent robots all had drone controllers as well, just in case there were any problems with the early robot brains. Robots use the sensor systems of the vehicle.

			Max Skill Level	INT	EDU	Cost
CPU	Spaces	TL				
Linear	3	8	1	2	6	Cr. 2,500
Parallel	2	10	2	6	8	Cr. 10,000
Synaptic	1	12	3	12	10	Cr. 50,000

The following skills are available for robotic vehicles, at a cost of Cr. 10,000 + 10,000 per level; Drive (any), Heavy Weapons (any), Recon, Gun Combat (any), Trade (civil engineering, farming), Flyer (any), Seafarer (any), Navigation, Sensors, Language (any).

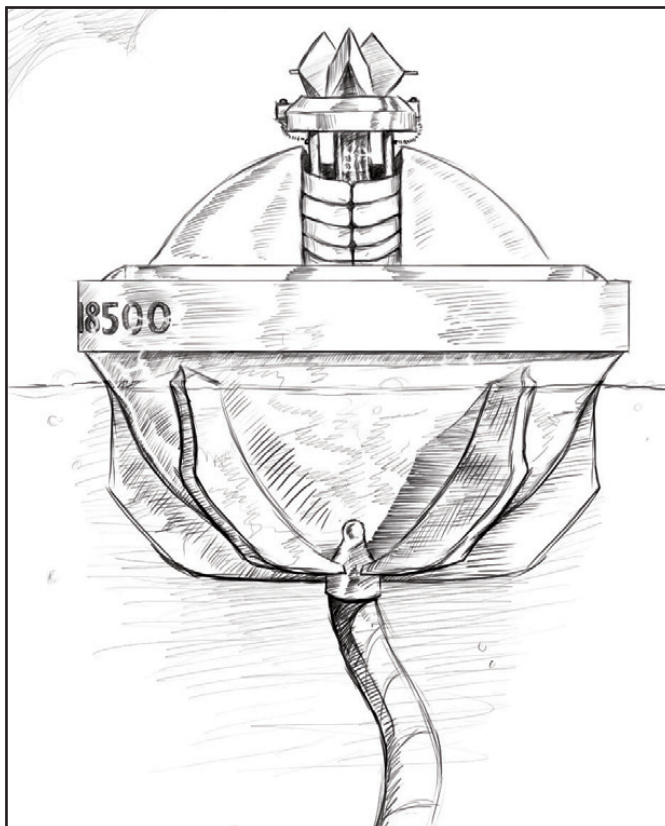
CYBORG VEHICLES

Sometimes referred to as 'organic cores,' the use of human (or non-human, even animal) brains to control a vehicle is possible at TL 12 and higher. The organic brain and its support systems take up one Space in the vehicle, and require neural-linked controls. The use of an organic core gives DM+1 to all physical and combat skill checks performed by the cyborg vehicle, in addition to the benefits of a neural link. This costs Cr. 250,000 + the cost of neural-linked controls.

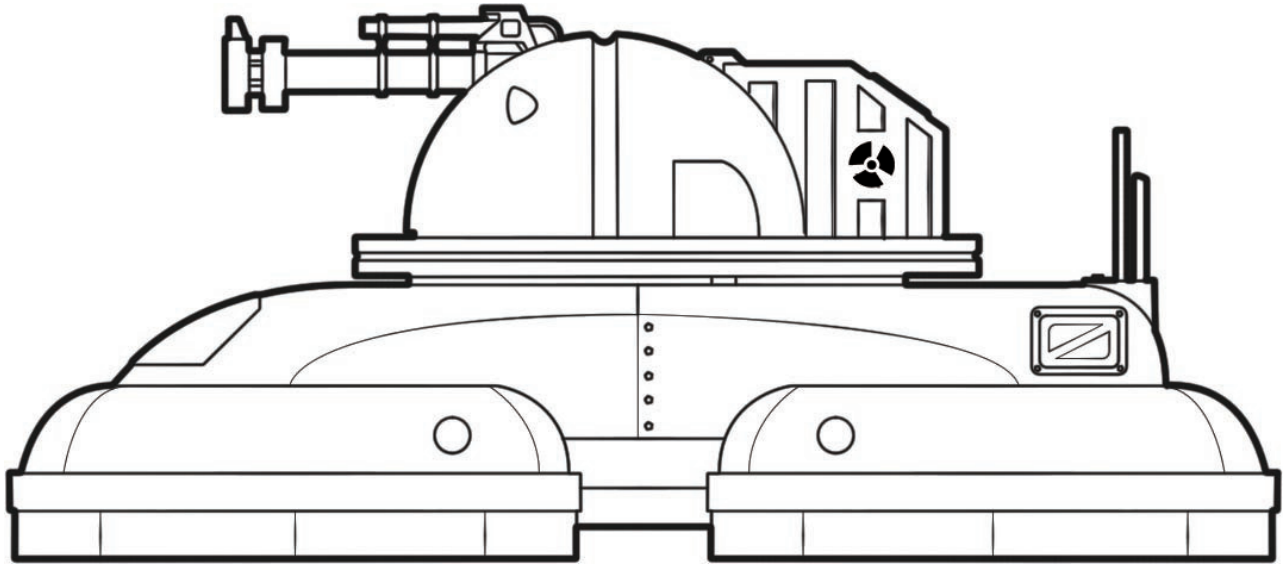
Note that under Imperial Laws, a cyborg vehicle is not considered a person, but property. Extreme cyborgs of this nature have no rights under Imperial law.

EXTENDED LIFE SUPPORT FOR ORGANIC CORES

An extended life support system for an organic core provides 1 year's worth of nutrients and filtration for the organic brain and its biological support systems. It is available at TL 13, takes 5 Spaces, and costs Cr. 250,000.



VEHICLES



VALKYR NUCLEAR GUN DRONE

The Valkyr contains a 2 cm autocannon firing californium rounds, along with a damper box holding 20 rounds of ammunition. It is a remotely-operated grav vehicle, with a frequency-agile communications link back to the controller. It has a limited sensor capability, and instead relies on data relayed through the comm link for long-range sensors and precise targeting.

The Valkyr is only effective against combatants of a lower Tech Level, as nuclear-damper technology available at TL 13 renders them obsolete. However, against lower-tech opponents, it is truly terrifying, with each 2cm round having an effective yield of approximately 1 kiloton.

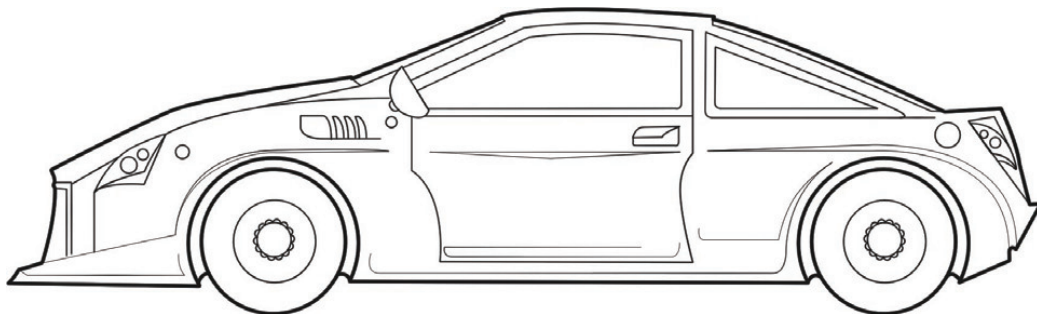
Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Valkyr	13	Flyer (grav)	+2	200 km/h	500 km	15	1 operator	0	No	5	5	4.015	5 tons

Modifications: Drone (encrypted), Basic Sensors, Standard Navigation, Improved Fire Control (+2), Explosive Belt Anti-Missile System, Advanced Controls

Weapons: 2cm Nuclear Autocannon

VOLKER MOTORS TEMPEST SUPER CAR

The Tempest is a high-tech sports car equipped with the latest technology to enhance performance and comfort. These expensive vehicles are more common as status symbols than actual racing cars, though the Sleipner 5000 City Rally on the world city of Vost sees several of these cars entered.



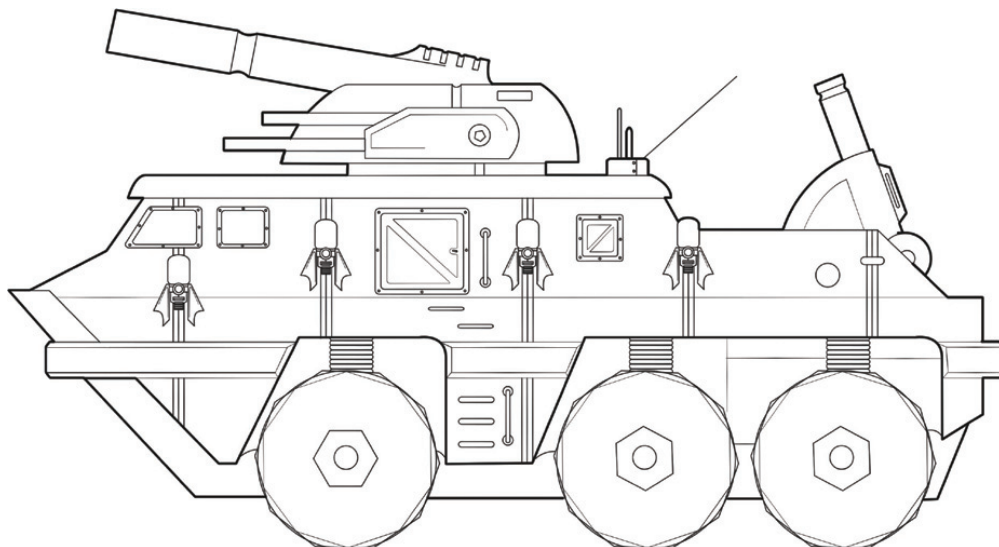
Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Tempest	11	Drive (wheeled)	+3	500 km/h	600 km	4	1 + 1	No	No	2	2	87,400	2 tons

Modifications: Entertainment System, Improved Speed, Improved Agility, Smart Wheels, Luxury Features, Basic Sensors, Basic Navigation

M-90 URBAN TANK

The urban tank was created as a high-survivability vehicle for city-fighting, and includes multiple anti-personnel explosive belts to handle close infantry assaults. A 50mm rotary cannon is the primary weapon, along with a missile launcher and four automatic RAM grenade launchers. A gun-based anti-missile system supplements the explosive belts to deal with close-range rocket and missile attacks.

The M-90 features very heavy armour on the ventral facing to protect it from mines and improvised explosive devices, while the armour on other facings is sufficient to protect against small arm fires, entrusting the point defence systems to take down rockets and missiles.



Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
M-90	11	Drive (wheeled)	0	140 km/h	600 km	40	4	2.5 Spaces	No	15	15	1.56	15 tons

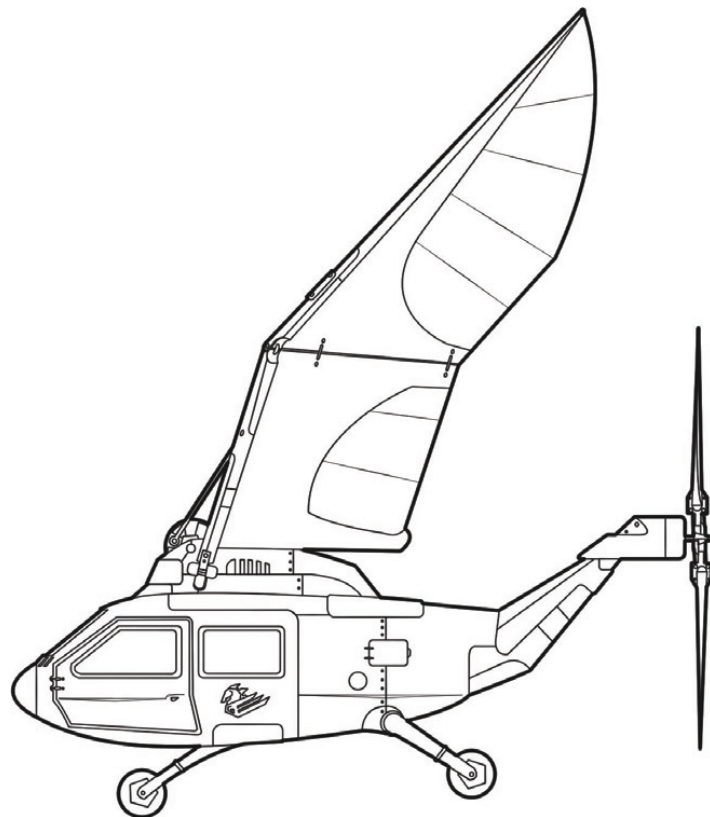
Armour Facing	Armour Value	ERA
Front	50	+11
Right Side	30	+11
Left Side	30	+11
Rear	30	+11
Top	40	
Bottom	60	
Turret Front	50	+11
Turret Other	30	+11

Modifications: AFV, Advanced Controls, Reactive Armour (Type III), 6 Wheels, Gun-based Anti-missile System, Explosive Belt Anti-Missile System, Increased Agility, Standard Sensors, Basic Navigation, TL 10 Communications with Encryption, IR Masking (Type I), Hostile Environment Protection, Entertainment System

Weapons: Small Turret with 50mm Rotary Cannon, 4-shot Tac Missile Launcher, 4 RAM Autogrenade Launchers (one firing into each facing)

PEGASUS PERSONAL ORNITHOPTER

The Pegasus is a luxury craft designed to operate from rooftop to rooftop in dense urban settings. For longer-range travel, it can lock its wings and engage the tail-mounted conventional prop-fan. It is of very light-weight construction, and can fold down for storage purposes.

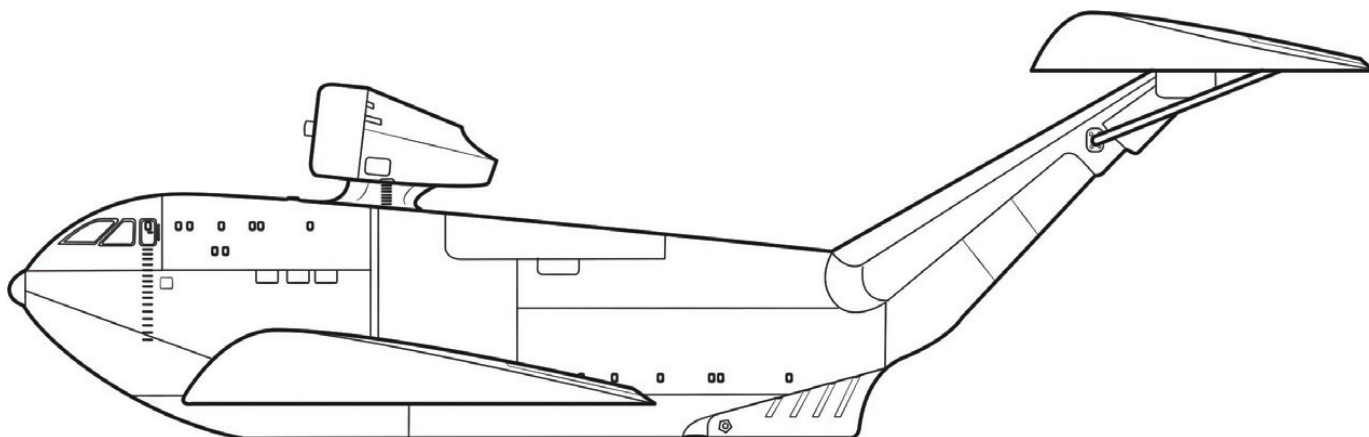


Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Pegasus	12	Flyer (wing)	+2	160/550 km/h	1,600 km	1	2	0	No	0	0	185,000	1.5 tons

Modifications: Folding Chassis, Locking Wings w/Propfan, Entertainment System, TL 6 Communications, Basic Sensors, Basic Navigation, Autopilot (flyer-wing/1)

VUN EKRANOPLAN

The Vun is a long-range survey and exploratory craft designed for operations on newly-opened worlds. Its ability to crack fuel for itself from available water supplies gives it almost unlimited range. The included hovercraft allows it to land on water, and use smaller vehicles to conduct surveys of nearby land areas.



Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Vun	9	Flyer (wing)	-1	600 km/h	4,000 km	3	5+10	49/5 Spaces	No	150	150	13.39	400 tons

Modifications: Aquatic Drive, Autopilot (flyer-wing/2), Standard Sensors, Standard Navigation, Mini-Galley, 6 Bunks, 2 Freshers, Vehicle Storage, Lab, Autodoc, Hostile Environment Protection, Refuelling Station, Entertainment System, Fire Extinguishers

Wing Span: 30m

Ground Effect Altitude: 15-30m

Landing/Takeoff: 2,000m/1,500m

Base Environment: 87

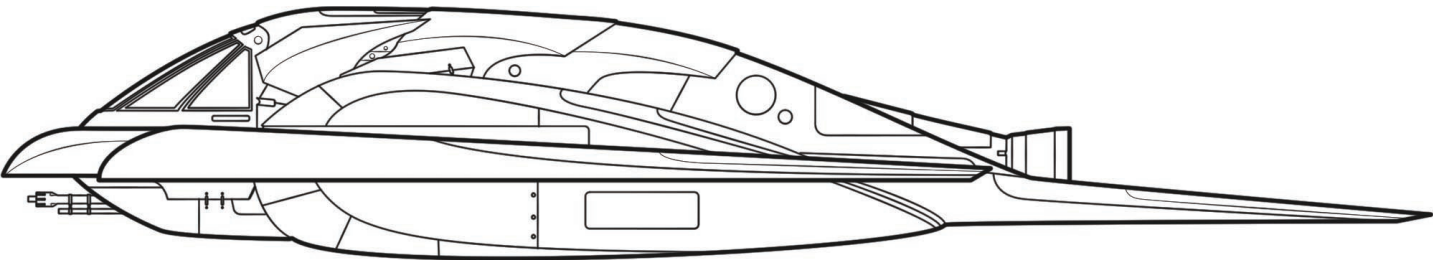
F-600 Corsair Dynamic Air Superiority Fighter

The Corsair is an air-superiority fighter that can operate from land or sea vessels with equal ease. It is an advanced design with a dynamic fuselage that changes shape according to the speed regime it is operating under. In intercept mode, the wings are folded forward against the hull, and all control surfaces are retracted to minimise drag. In dogfighting mode, the wings are partially extended but swept forward, giving the aircraft maximum agility. In ground support roles, the wings are fully extended, giving maximum lift for lower speed and higher ordnance load.

The Corsair is a small, exceptionally fast and manoeuvrable plane with advanced stealth capabilities. Without the fluid cockpit and cybernetic controls, it would be impossible for a human to fly it. The pilot of the Corsair is seated in a fluid-filled cockpit, his lungs likewise cushioned with oxygenated fluorocarbons. Most of the functions of the aircraft are controlled by a neural link.

The Corsair's main weapon is a VRF gauss gun powered by rapid-pulse capacitors coupled to a turbogenerator powered from the engines. The energy bank stores enough power for 5 bursts, which must then be recharged at the rate of one burst per combat round by the generator. Ordnance is carried in an internal bay. Due to the dynamic wings and fuselage, the Corsair cannot carry any external ordnance or stores.

Aircraft like the Corsair were predicted to become obsolete in the face of increasingly-effective drone and robotic weapons. However, drones are highly vulnerable to electronic warfare, and robots tend to lack effective decision-making skills required for high-speed combat. In addition, very few governments or militaries are comfortable with taking humans out of the decision-making loop in life-or-death situations, leaving the door open for cyber-assisted aerospace fighters like the Corsair.



Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Corsair	12	Flyer (wing)	+7	5,040 km/h	5,600 km	4	1	No	No	4	5	13.868	18 tons

Modifications: Dynamic Flight Surfaces, Supersonic, VTOL, Autopilot (flyer-wing/2), Neural Link, Fluid Cockpit, Advanced Sensors, Advanced Navigation, TL 12 EW, Stealth II, Visual Camouflage II, TL 10 Continental Range Communications with Encryption, 5 Energy Banks

Weapons: VRF Gauss Gun with 20,000 rounds, 7.5 Spaces in Ordnance Bay

Base Environment: 77

ULTRA-HEAVY VEHICLES

KOBA MARU-CLASS CARGO SHIP TL 8

The Koba Maru-class is a large, no-frills bulk carrier typical of designs that can be found throughout human space, as shipping by deep-draught conventional hull is still viable even in civilisations with grav technology.

The cargo ship consists of ten 1,000 Space sections. Hull sections 3 and 7 are engineering sections, with 250 Spaces available, mostly devoted to workspaces and part storage. The other sections have 1,500 Spaces available. Section 1 contains the bridge, passenger, and crew accommodation, along with the ship's secure storage and other amenities. Sections 2, 4, 5, 6, 8, 9 and 10 each have 1,300 Spaces worth of cargo, along with maintenance spaces and the odd storeroom. Sections 4, 6 and 9 each also have a 10-ton cargo crane.

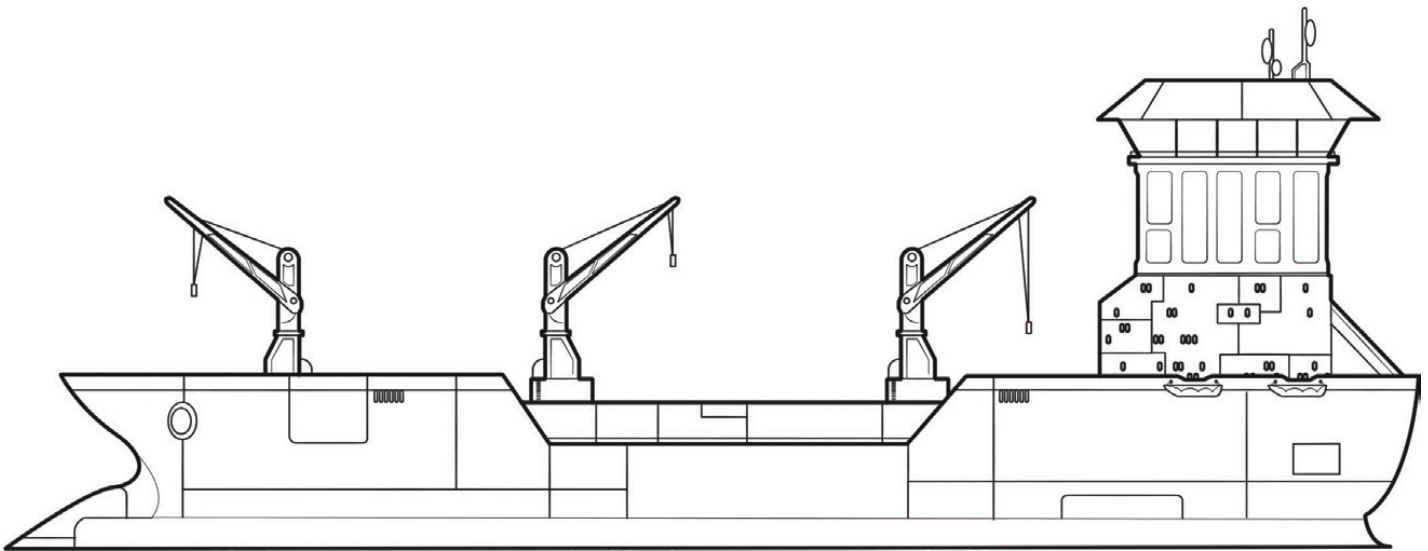
Four utility boats and ten inflatable exposure-rated life rafts comprise the vessel's safety equipment. The bulk carrier normally does not carry passengers, but it usually retains a few cabins available for basic passage.

Total Crew: 60

Total Cost: MCr. 73.37

Total Shipping Size: 10,000 tons

Agility: -6



Section 1 – Bridge Section

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Koba Maru	8	Seafarer (ocean ships)	-4	55 km/h	4,500 km	3	20	250 kg	No	500	500	8.63	1,000 tons

Modifications: 60 Staterooms, 20 Freshers, Bridge (30), Cafeteria (30), Secure Storage (10), Infirmary (6), Standard Sensors (Increased Range), Standard Navigation, Autopilot (seafarer-ocean ships/2), Recreation Space (20), 2 Workboats

Sections 2, 5, 10 – Cargo Sections

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Koba Maru	8	Seafarer (ocean ships)	-7	55 km/h	4,500 km	3	-	250 kg	No	500	500	8.02	1,000 tons

Modifications: Dry Cargo Storage (1125), 2 Staterooms, 2 Freshers, 4 General Storage Rooms (20 Spaces each), Life Raft

Sections 3, 7 – Engineering Sections

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Koba maru	8	Seafarer (ocean ships)	-7	55 km/h	4,500 km	3	20	250 kg	No	500	500	8.061	1,000 tons

Modifications: 2 Workshops, 4 Storage Rooms (20 Spaces each), Life Raft, Work Boat, Light Crane

Sections 4, 6, 9 – Cargo Sections with Crane

Vehicle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Koba Maru	8	Seafarer (ocean ships)	-7	55 km/h	4,500 km	3	-	1200	No	500	500	8.12	1,000 tons

Modifications: Dry Cargo Storage (1,125), 100 ton Crane, 3 General Storage Rooms (20 Spaces each)

ORION-CLASS BALLISTIC MISSILE SUBMERSIBLE

Many worlds have ballistic missile submersibles for defence against space attack. The submersibles are largely undetectable underwater and if an opponent enters orbit, the submersible can use its silos of heavy artillery missiles to fire anti-starship torpedoes into orbit. The Orion-class also mounts starship-grade lasers on buoys that can be floated to the surface to engage targets in orbit.

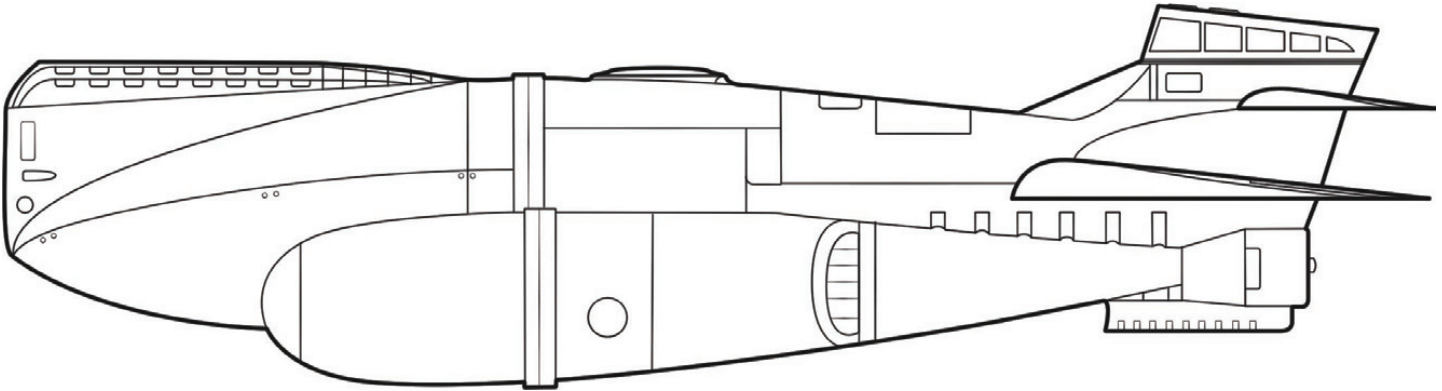
The Orion consists of four 400 Space sections. Sections 1 and 2 mount the submarine's long-range artillery missiles and other weapons, while section 3 is the engineering section holding the fusion reactor and support systems. The final section holds the bridge, sensors and all crew quarters.

Total Crew: 140

Total Cost: MCr. 448.92

Total Shipping Size: 6,000 tons

Agility: -8



Sections 1, 2 – Weapons

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Orion	12	Seafarer (submarine)	-8	65 km/h	2,400 km	4	-	2	No	400	400	102.25	1,200 tons

Modifications: 2 Offices, Workshop, Fresher, Secure Storage

Weapons: 18 Advanced Heavy Artillery Missiles, 10 Heavy Torpedoes, 2 Aerospace Defence Laser Buoys, Blue-Green Laser Cannon in Small Turret.

Section 3 – Engineering

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Orion	12	Seafarer (submarine)	0	65 km/h	2,400 km	4	-	13	No	400	400	164.05	1,200 tons

Modifications: Fusion Reactor, 4 offices, 1 workshop, 2 storage rooms

Section 4 – Bridge and Crew

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Orion	12	Seafarer (submarine)	0	65 km/h	2,400 km	4	20	13	No	400	400	40.32	1,200 tons

Modifications: Advanced Underwater Sensors, TL 10 Encrypted Communications, Airlock, Advanced Navigation, Advanced Sensors, Sensor Mast, 20 Staterooms, Cafeteria (10), Bridge (10 crew), Computer

Section 5 Crew

Veh icle	TL	Skill	Agi lity	Speed	Range	Arm our	Crew and Passengers	Cargo	Open?	Hull	Struc ture	Cost (MCr.)	Shipping Size
Orion	12	Seafarer (submarine)	0	65 km/h	2,400 km	4	120	6	No	400	400	40.07	1,200 tons

Modifications: 100 Bunks, 10 Staterooms, 10 Freshers, 5 Large Freshers, Infirmary (4), Cafeteria (20), Recreation (10), General Storage, 8 Heavy Torpedoes

Safe Depth: 2,000 metres

Dive Depth: 6,000 metres