TRAVELLER'S AIDE #8

Based on the award winning TRAVELLER science fiction universe by Marc Miller

Through the Waves: Traveller's Aide #8

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Approved for use with Classic Traveller

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2 3 4 5 6 7 8 9 10

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8

ABOUT THIS SUPPLEMENT

This book is intended for use with Classic ***Traveller*** (CT) and T20 – ***Traveller*** for the D20 system. Background material is of course also fully compatible with other versions of ***Traveller***.

This volume is the third in a series dealing with vehicles in use in the Traveller universe. It details the range of waterborne vehicles available to travellers at various tech levels.

To produce this volume, QuikLink Interactive, LIC has joined forces with the well-respected Yiarn Caardee Design Bureau and a team of freelance experts of interstellar renown. However, inaccuracies are possible, and QI LIC cannot accept responsibility for any harm or injury incurred due to use or misuse of the vehicles described herein. Additionally, opinions expressed in the text are those of contributors, and are not those of the editors or publishers.

YIARN CAARDEE DESIGN BUREAU

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WATERCRAFT: TECHNOLOGY DISCUSSION

After walking, boats are one of the first modes of transportation developed. In every single human culture, and most alien cultures, development of watercraft occurs before written history. Boats transport huge loads both faster and more easily than ground transport. In many cases the construction of river or seaworthy craft are the impetus for the creation of the first empires.

Despite the seemingly archaic nature of watercraft in this age of fast grav vehicles, ships of all sizes still perform vital duties, from recreation to research to cargo hauling on worlds throughout the Imperium.

YIARN CAARDEE DESIGNERS TIP: HULL SHAPES

The shape or design of the hull of a boat is more important to determining performance characteristics than the construction materials. Hull design has three broad classifications; displacement hulls, planing hulls, and multi-hulls. Each shape has advantages and disadvantages, and frequently hull builders combine types in an effort to get the best elements of both designs.

Flat bottomed hulls are the earliest designs for boat hulls and as their name implies, the hull has a flat bottom. These hulls are very stable in calm water and have the shallowest draft. With very little of the boat sitting in the water, flat hulls also maneuver easily at low speed. These factors make the flat hulls ideal for river transport, canals, harbor duties, and other places where very shallow draft is beneficial. On the down side, flat hulls don't handle well on rougher waters or at higher speeds. The flat hull absorbs the pounding of waves and boat motion, transmitting them to passengers and cargo giving a rough ride.

The next development for boat hulls is the round bottom or vee bottom hulls. The keel provided by the bottom of the hull gives these boats more stability at higher speeds. The deeper draft of the "V" hulls and smaller area in the water gives them a smoother ride in rough waters or at higher speeds. Most boat and ship hulls have a round or vee bottom hull as they offer the best performance and maneuverability under many conditions.

The flat bottom and vee bottom hulls are displacement hulls, called so because they push the water aside, displacing it. In contrast, performance boats use a planing hull, where the motion of the boat lifts the hull partly out of the water and skims on the surface. The planing hull has a keel like a vee hull does for better stability and handling at low speeds, but adds a flat section on the bottom for the boat to skim on the water at speed.

The ultimate development of the planing hull includes both hydrodynamic and aerodynamic streamlining. These hulls, called hydroplane (water flier) or tunnel hulls, work by trapping a layer of air in a tunnel under the boat. Some jet-powered hydroplanes can achieve speeds in excess of 450kph. Hydroplanes are very sensitive to environmental conditions and an unexpected wave or gust of wind can send the speeding boat flying out of control.

Ships can be constructed by attaching multiple hulls, like the two hulled catamarans or the three hulled trimarans. Catamarans are a very early development for sailing and paddled vessels. Until boat builders have the tools and skills to perform large-scale joinery, ships are limited to the size of the natural flora, usually the largest tree trunks. The general design consists of a raft or bridge lashed between the two tree trunks. In some ships the hulls hold cargo or crew, in others the hulls only provide flotation.

The wide base of a catamaran makes it stable, and the smaller hulls with less surface area in the water make it exceptionally fast. The downside of the catamaran is its lower cargo capacity, as the smaller hulls cannot support as much weight as a larger hull. After the development of the larger single hull design, shipbuilders continue to construct catamarans because the two smaller hulls are faster, stable, and require fewer resources to construct.

The development of hydrofoils comes from an understanding of airfoils and aircraft, where the concept of a wing providing lift works better in water than in air. Hydrofoils are normal watercraft with the addition of a set of two to four wings mounted on struts attached to the underside of the boat. Once the boat achieves "liftoff," the entire boat lifts from the water, supported by the submerged wings. The drag produced by the large area of the boat hull is reduced to the smaller area of the wings and struts, allowing for high-speed travel. The size of a hydrofoil craft is limited by the ability of the engine to get the hydrofoil up to the takeoff speed, generally between 20 and 50 kph.

YIARN CAARDEE DESIGNERS TIP: WATERCRAFT

PROPULSION TECHNOLOGY

The first source of power for boats is the paddle. In its most basic form, a paddle is a stick with a wide area to move more water backwards with each stroke. An oar is a paddle attached to side of the boat, giving the rower better leverage and more power for each stroke. The suggestion of rowers and paddlers to customers new to the human powered boats was to learn the skill of feathering. Feathering involves tilting the paddle blade on the return stroke so it travels edge on through the air rather than on the flat side. For every hundred strokes, feathering saves you one more.

Referee's Note: Feathering is part of the Sailor or Vehicle (Watercraft) skill and not a separate skill.

The development of sail technology occurs very early in the development of watercraft. Wind as a source of power is free and almost constantly available. The many hundreds of sail and rigging combinations can be divided into three categories; square sails, triangular sails and wing sails. The core of sail rigging is a vertical beam called a mast. Small sailboats have only one mast but the largest commercial and military sailboats may have as many as five masts. Square sails are a square piece of cloth hung from a horizontal beam, called a yardarm, tied to the top of the mast. The bottom of the square sail attaches to a second yardarm or tied to the ship's hull. A triangular sail rigging has a horizontal beam, called a boom, attached to the base of the mast and the sail fills the space between the mast and the boom. Sailboats with more than one mast use a combination of square and triangular sails to maximize the area of sails presented to the wind. There are many variations of sails within these three broad categories and if you have an interest in sailing vessels, we suggest consulting a specialist.

The final development of sails comes with an understanding of aerodynamics. By mounting an airfoil on the mast of a ship, the same force that provides lift to an airplane provides thrust to a sailboat. The wing shape allows the motion of the boat to add to the airflow and under the right circumstances, the wing sail powered boats can sail faster than the wind, something not possible with conventional sails. The usual form of a wing sail is a single large airfoil but larger ships the "sail" is a deck covered with hundreds of 10 cm wide airfoils standing between two and ten meters tall.

Despite their archaic nature, worlds throughout the Imperium still use a variety of sail craft. Simple to understand, requiring little maintenance and no fuel or high-tech parts, sailing vessels are for recreation, commercial transport and even a few training warships.

Modern aquatic propulsion systems follow the design of modern aeronautical ones. The most common propulsion system uses one or more propellers. The size and number of propellers varies with the anticipated function of the vessel. Larger propellers offer more push for a given engine size, but the ship then requires more draft to accommodate the larger circle cut by the propeller.

The aquatic equivalent of the jet engine is the hydrojet. A hydrojet uses a pump or turbine to place water under pressure then ejected, moving the boat forward. Hydrojets are smaller and have fewer moving parts than a propeller drive train, but require more precise engineering and are more vulnerable to damage.

In any field of engineering there are exotic technologies that seem promising, but have various technological limitations, usually that they cost more with no greater benefit than existing technology. The Magnohydrodynamic drive uses a very strong magnetic field and the electrical conductivity of water to accelerate the water out the stern of the ship. In theory, this is an ideal propulsion system as it requires no moving parts and is completely silent. Unfortunately, the conductivity of water, at least water not considered poisonous, is too low to make an efficient drive system. The MHD drive can still work and with impressive results, but requires generating an intense magnetic field. With the modern power sources and superconducting materials available generating magnetic fields of the strength required is not difficult, but the drive system is still less efficient than existing alternatives.

YIARN CAARDEE DESIGNERS TIP: SUPERCAVITATION SUBMARINES

Submarines seem forever labeled as the slowest moving of all craft, because of the drag induced by water. However, an understanding of the physics of water under pressure can allow a submarine to travel at enormous speeds, flying through an air bubble generated by the ship's motion through the water.

Water, like all liquids, is incompressible which means it cannot expand either. Low-pressure conditions that in air would form a partial vacuum, in water cause the formation of bubbles filled with water vapor. The formation of these bubbles, called cavitation, is a problem that has vexed engineers since the first motorized boats were tested. The problem is once the water pressure returns to normal, the cavitation bubbles violently implode creating small shock waves. At close range the shock wave cause damage, pitting or cracking propellers, boat hulls, and other equipment. At longer ranges sonar equipment can detect the shock waves as a loud pop. Under the proper conditions, like a propeller spinning too fast, the cavitation bubble completely covers the low-pressure side of the propeller in a condition known as supercavitation. The extreme pressure differentials produced by the supercavitation, in addition to the problems of cavitation, can break propellers or rupture hulls.

It is possible to design a hull that deliberately produces a supercavitation bubble over most, or all, of the submarine. Because the boat's hull is flying through air (more accurately, water vapor) rather than water, drag on the hull is dramatically reduced and the boat can achieve impressive speeds. There are some engineering challenges in building the nose cone of the submarine to withstand the pressures of moving at high speed under water and designing propulsion systems that work in both water and air. Supercavitating vessels are as loud as they are fast and the design is limited to applications where performance considerations far outweigh stealth requirements. In most cases, supercavitation is for torpedoes or the first stage of submarine launched missiles. The primary use for crewed supercavitating submarines is search and rescue vessels.

SENSORS

Many people are familiar with the manner in which light sensors work. Infrared, microwaves and visible light generated by a source are gathered and analyzed. Radar bounces a beam

8

of radio waves off potential targets to get information about them. Water absorbs radio and light waves, which renders the traditional radar and passive sensor/targeting systems almost useless. However, water is an excellent medium for sound and for underwater vessels, sound replaces many of the uses of radio waves, for both sensors and communications.

In the simplest terms, passive sonar is simply a microphone on the hull of the ship through which the sensor operator listens. More sophisticated passive sensor systems use a series of microphones and a computerized filter to determine distance and direction to the source of sound. The array of sensors are either mounted along the hull or attached to a wire and towed behind the ship. The towed sensors can be reeled back into the vessel to protect the sensors and the operator from damage during combat.

Most sensor operators are listening to the vibrations caused by engines, crew, passengers, and shifting cargo on the target vessel. Complicating the sensor operators task is the confusion of noise produced by their ship, other vessels, and other life forms in the water. Many aquatic animals can produce a range of sounds and listening to them can be a fascinating experience, except when you are trying to listen to something else. In addition, the speed of sound in water varies with depth, temperature, and composition. This can cause sounds to distort or reflect in strange ways and requires an experienced operator to sort out.

Active sensor systems take the power of the passive sensors and add a transducer to produce specific sound waves. These signals reflect off objects in the water and return to the array of microphones, processed and used to determine range and bearing to targets. Like the passive sensors, the composition of the water and other sounds may render active sonar confused or blocked.

YIARN CAARDEE DESIGNERS TIP: UNDERWATER HABITATS

If you have an interest in submarines and underwater environments one of the more fascinating places to visit are the underwater habitats that occur on almost every world with a hydrosphere. In terms of life support systems, underwater habitats and submarines are similar to space habitats. Where space habitats need to supply artificial gravity, light, and heat, the underwater habitats need to supply only light and heat.

One engineering problem for underwater habitats not shared by space habitats is the enormous pressure generated by the depth of the water. An elemental manner of dealing with the pressure is to pressurize the habitat to match the external water pressure. Pressurized habitats are constructed of lightweight materials, as the habitat doesn't have to support the water pressure. However, atmosphere under pressure has strange and detrimental effects upon both human and alien races. Nitrogen in a pressurized atmosphere acts as a narcotic, an effect called nitrogen narcosis, which causes feelings of giddiness, drunken behavior and finally unconsciousness. The severity of the nitrogen narcosis effect depends upon both general racial and the specific individual physiology. Oxygen under pressure is both toxic and a fire hazard, so the pressurized atmosphere must have the percentage of oxygen reduced to avoid the harmful effects. At depths over 50 meters the effects of nitrogen narcosis are so severe the nitrogen must be replaced with other inert gases, usually helium, which do not have the narcotic effect. Balancing the atmospheric pressure and percentages of oxygen, nitrogen, helium and other trace gases is a straightforward engineering problem but the high pressure and different atmospheric gasses can magnify minor racial and personal atmospheric tolerances, restricting pressurized habitats to short term projects and trained personnel only.

The alternative is a pressure hull, a reinforced hull capable of withstanding the external pressure and leaving the air inside at comfortable atmospheric pressures. The drawback of pressure hulls is they must be strong enough to resist the external pressure, and the strength requirement increases with both the depth of the habitat and its size. In addition, entering and exiting the habitat requires passing through a series of airlocks.

Submarines and similar sized habitats use a single walled reinforced hull, frequently internally divided with bulkheads. Larger habitats use a spaced armor construction, where a gap separates layers of reinforced hull. The spaces, typically between 10cm and 1m, are filled with either water (for ballast) or air (as a life support reserve) under pressure. The spacers act as a safety mechanism for when the walls crack and leak, the small pressure differential restricts the influx of external water long enough to effect repairs.

NEW DESIGN FEATURES

HOW BIG IS MY VEHICLE?

The volumes (vls) used by the T20 vehicle design system represent both weight and volume. This is an abstraction to make the vehicle design process easier and faster. You can calculate the real world sizes for vehicles by doing the following. Calculate a vehicle's volume by multiplying the vls by 5 to get the size in liters, then divide by 1000 to get cubic meters, and again by 14 to get starship tons. A vehicle's loaded weight in kg is equal to its size in vls. To get an empty weight, subtract 100kg for each passenger and 1kg for each 1vl of cargo.

A common size measurement for ships and submarines is displacement tons, a measure of the amount of water displaced (in metric tons) by the ship while floating under full load. Because water occupies about one cubic meter per metric ton, the displacement tonnage also defines the volume of the ship below the waterline. Most ships have about 2/3rds of their structure above the waterline, with some heavily armored ships leaving only about half their structure above the waterline. You can estimate the size of a ship in vl by multiplying the rated displacement tons by 600. For example, a 100-ton ship would be about 60,000vl.

Submarines, in order to sink and rise, are much closer in volume to their tonnage. Estimate the size of a submarine by multiplying its rated displacement tons by 200. For example, a 100-ton submarine would be about 20,000vl.

CHASSIS FOR WATERCRAFT

The Chassis configuration for watercraft provides different top speed than chassis configuration for ground, grav or air vehicles because of the higher drag water has on the vehicle. A

standard configuration, which includes everything from barges to most normal watercraft hull shapes, has a maximum safe speed of 65 kph. The standard configuration includes both flat bottom hulls and vee bottom hulls. The Partly streamlined configuration represents the planing hull or catamaran designs for high-speed water travel. Partly streamlined hulls have a maximum safe speed of 150 kph. Streamlined hulls, using hydrofoil technology, have a maximum safe speed of 275kph. Airframe chassis represents a hydroplane skipping across the top of the water with a maximum safe speed of 500kph. For all watercraft hulls the operator suffers a –1 to control checks for every 5kph over their maximum safe speed.

CHASSIS FOR SUBMARINES

For submarines, the underwater environment is even more restrictive. Standard streamlined chassis has a maximum safe speed of 50kph underwater. A Partly Streamlined hull has a maximum safe speed of 70kph. The Streamlined hull has maximum safe speed of 85 kph. The Airframe chassis has a maximum safe speed of 100kph. For all submarine hulls, the operator suffers a –1 to control checks for every 5kph over their maximum safe speed.

In addition to building the submarine chassis for speed, you can apply a chassis configuration (which increases cost) to allow the submarine to submerge deeper. These chassis configurations alter the shape of the pressure hull, which contains the life support equipment, passengers and delicate equipment, to resist the forces deep underwater better than a standard hull. If you want a submarine which can both dive deep and move quickly, you will need to buy both options for the vehicle. For example, if you want a partly streamlined and reinforced deep water hull, the hull cost is (2 x 3) or six times the Basic Chassis cost.

Deep water hull: A deep water hull doubles the cost of the chassis and allows the craft to safely dive to one and a half times the depth of a standard submersible hull.

Reinforced deep water hull: This options triples the cost of the basic chassis cost and allows the submarine to dive two times deeper than a standard submarine.

Bathyscaphe: A bathyscaphe hull quadruples the cost of the basic chassis and allows the submarine to dive safely five times deeper than a standard submarine. The crew compartment on a bathyscaphe hull consists of a single large sphere with the remaining equipment outside in a separate compartment.

Supercavitating Submarines: Supercavitation hulls require a specially designed and constructed hull. The supercavitation hull costs eight times the Basic Chassis cost. Like a streamlined chassis, the craft gains a +1 to maximum agility and a +10% to maximum speed and cruising range. The maximum safe speed for the supercavitating hull is 85 kph. However, once the craft accelerates past 80kph the supercavitation effect begins. When the vessel is supercavitating the engines provide three times their normal submarine thrust and the maximum safe speed for the submarine becomes 800kph.

RAM PLATE

Ram plates are a reinforced front (or rear) mounting designed to absorb impacts, allowing the vehicle to do more damage in a collision without suffering additional damage itself. Low-tech ship builders mount rams on their ships to assault other vessels. With the development of gunpowder weapons, rams lose importance as ship weapons. On mid-tech and high-tech worlds, a specialized icebreaker ship mount rams to clear passages through ice-covered waterways.

Ram plates take space and cost as much as two points of armor, multiply the chassis armor factor by the Tech Level modifier and then by two to get the vl, Cost is Cr3,000 + Cr9 per vl. The ram plate adds 25% to the vehicles SI for collisions (THB p.174), both for calculating damage done and taken by the vehicle. If the damage taken in the collision does not exceed the additional SI given by the ram plate, the vehicle takes no damage at all. Ram plates do not add to the AR or AC of the vehicle and adding a ram plate does not affect how much armor may be mounted.

ADDITIONAL DRIVE TRAINS FOR WATERCRAFT

- The surface water drive train represents a set of oars, paddles, or most frequently, one or more underwater propellers.
- The Hydrojet is first available at TL-5, each DTU generates 20 TH for each EP applied, takes up 10vl and costs Cr800 per unit.
- The MHD Drive is first available at TL-8, each DTU generates 5 TH for each EP applied, takes 25vl and costs Cr1000 per unit.
- Grav Drive trains installed in a watercraft are a much more efficient drivetrain than either the propeller or hydrojets. Aquatic Grav drive trains do not allow the watercraft to fly; they produce thrust only. Aquatic Grav drive trains are available at TL-9, each DTU generates 100 TH per EP applied, occupies 4vl and costs Cr46, 000 per unit. Maximum Agility for all watercraft is 2.

ADDITIONAL DRIVE TRAINS FOR SUBMARINES

- Because of the enormous additional drag produced by the underwater environment all surface watercraft drive trains used on underwater craft produce only 1/5 of the thrust for each EP applied. Maximum agility for all submarines is 1.
- The Underwater Hydrojet is first available at TL-5, each DTU generates 5 TH for each EP applied, takes up 10vl and costs Cr800 per unit.
- The Underwater MHD Drive is first available at TL-8, each DTU generates 1 TH for each EP applied, takes 25vl and costs Cr1000 per unit.
- Underwater aquatic grav drive trains are available at TL-9, each DTU generates 25TH per EP applied, occupies 4vl and costs Cr46, 000 per unit.

SAILS

Sails are a large area of cloth, or a similar material, suspended from a mast and using wind power to propel a vessel through the water or across land. Sails replace both the drive train and power plant onboard a craft. While watercraft are the most frequent user of sails, they can also be used on

8

wheeled vehicles. If the vehicle is going to include other power consuming items like communicators or sensors, you will need to mount a separate power system, which will not add to the propulsion of the craft.

The top speed of a sailing craft is based upon the percentage of the vehicle devoted to the mast, booms, sails, and rigging. Select a percentage between a minimum of 5% and a maximum of 60%. All sails cost Cr5 per vl.

Sail %	Top Speed	Sail Volume (Vls)	Sail Cost (Cr)
5	1	5	25
10	2	10	50
20	4	20	100
30	6	30	150
40	8	40	200
50	10	50	250
60	12	60	300

Sail %: is the percentage of the craft's vls devoted to sails

Top Speed: is the top speed movement (in kph) for ships in a light wind (See Wind Effect table, THB p385). In a Moderate wind, ships can make twice the listed speed and in a Strong wind three times the listed speed. In Severe winds, the boat travels at only twice the listed speed as the crew must take in most of the sails to avoid the wind damaging the sails and rigging. In stronger winds, the ship is in danger of being destroyed and cannot be safely powered by sails. Ships can travel slower than the listed speeds by not deploying all their sails, but not faster.

Sail Volume: is the vls required for the sails for each 100 vl of vehicle volume.

Sail Cost: is the cost in Cr for each 100vl of vehicle size.

Wing sails, available at TL-7, allow ships to travel at twice the speed listed. Wing sails cost five times what regular sails cost or Cr25 per vl of sail.

MUSCLE ENGINES

A muscle power plant, available at TL-0, allows one or more creatures provide power for a vehicle and its components through a series of levers, gears, or harnesses. The characters or creatures powering the muscle engine are either inside or outside the vehicle. In either case, the Muscle power plant takes 10vl and costs Cr10 for each EP it can produce, though the actual output of the engine depends upon the strength of the creatures driving the engine.

Creature Strength	EP Output	EP Output
10	0.05	0.75
11	0.065	0.085
12	0.08	0.10
13	0.095	0.12
14	0.11	0.13
15	0.125	0.15
16	0.14	0.17
17	0.155	0.20
18	0.17	0.23
19	0.185	0.27
20	0.20	0.30

If there are multiple creatures, add the EP output for each creature to get a total EP output. If a creature is stronger than strength 20, for each +10 Strength, multiply the EP output by 4. For creatures weaker than strength 10, divide the EP output by 4. If the creature is larger or smaller than medium size, multiply the EP output by the multiplier shown.

Creature Size	EP Multiplier	Creature Size	EP Multiplier
Small	X 3/4	Large	X2
Tiny	X 1/2	Huge	X4
Diminutive	X 1/4	Gargantuan	X8
Fine	X 1/8	Colossal	X16

Creatures or characters can sustain working a muscle engine for up to eight hours before having to use the Forced March rules (Core Rules p. 143). Creatures are capable of generating double the EP output by using the Hustle rules (Core rules p. 143) or three times the EP by using the Run rules (Core rules p. 143 and p. 127).

DRAFT

Draft is the distance on a watercraft between the waterline and the bottom of the keel, defining how deep the water must be for safe passage. The draft of a ship depends upon its size and shape of the hull. Check the size of the hull against the table, and select a draft in the range given. A flat hull has a shallower draft than a vee hull or planing hull and is one category smaller. For example, the Steamship, a gargantuan vehicle, has a draft between 2 and 4 meters but because it has a flat bottom hull has a draft between one and two meters. The hydrofoil hulls add between one and three meters to their draft for the foils, but only if the ship is traveling at less than hydrofoil lift speed.

Ship Size	Minimum Draft (meters)	Maximum Draft (meters)
Small	0.125	0.25
Medium	0.25	0.5
Large	0.5	1
Huge	1	2
Gargantuan	2	4
Colossal	4	8
Enormous	8	Cube Root (vl) / 12.8

MAXIMUM SAFE DEPTH

The maximum safe depth for a submarine to depends upon the strength, size, and shape of the hull. Calculate the maximum safe depth for a submarine by adding the armor factor of the hull and the AC Modifier due to size (THB p.148).

Then look up the sum on the table below:

Armor Factor + AC Modifier	Maximum Depth (meters)	Range Band (meters)
+1 or more	250 x (AF + AC Mod)	15 x (AF + AC Mod)
+0	125	8
-1	60	4
-2	30	2
-3	15	1
-4 or worse	Can not submerge safely	n/a

If your vehicle has the deep water hull or bathyscaphe hulls, multiply both the depth in meters and the range band in meters by the chassis multiplier. The submerging hull modifiers are times 1.5 for deep water hulls, times 2 for reinforced deep water hulls, or times 5 for a bathyscaphe hull.

Exceeding the maximum safe depth is possible in a submarine, but as the name implies, it may not be safe. Once a vessel has gone below maximum safe depth, it must make a save vs. DC1, +1 for each range band below the maximum safe depth. If the save is failed, make a roll on the vehicle internal damage table (THB p164), as the enormous pressure causes failures on already stressed components. The vehicle must make this roll if the depth increases to the next range band, once an hour if the craft remains at depth, or when the pilot tries violent or stressful maneuvers (Avoid Collision or Evade Attack maneuvers).

For example, our adventurers have taken a Seahorse shallow water explorer to investigate an underwater archeology site as a commission for their patron when they discover unfriendly agents in another submarine are pursuing them. To avoid being spotted, the pilot dives into a nearby canyon, and sits the submarine on the bottom, some 50 meters from the surface. The submarine must make a check at [[50 (current depth) – 30 (max. safe depth)] / 2 (range bands)] DC10 or suffer an internal failure.

The Maximum safe depth also applies to characters diving using SCUBA gear, artificial or natural gills, or simply holding their breath. Recreational diving equipment has a maximum safe diving depth of 30m with a range band of 2m. Trained free divers, diving using artificial gills or simply holding their breath, may dive up to 125m with a danger range of 8m. Diving using gear for deep diving, pressurized atmosphere tanks with air mixtures for the depths, can achieve a safe depth of 250m with a danger band of 15m. Luriani may also dive to 250m with a danger band of 15m. Characters diving beyond their safe depth and fail their check take 1d6 points damage for each failure.

As an optional extra step, if you are operating the submarine on a world where the gravity is different from the 1G normal, divide the maximum safe depth and range bands by the gravity force in Gs. Submarines diving on low gravity worlds can go 1.5 times as deep. Submarines diving on very low gravity worlds can go four times as deep. Submarines diving on heavy gravity worlds can only go 3/4 as deep.

(For CT: Roll above the number of danger bands on 3D or the vehicle suffers a failure. Characters failing their check take 1D hits.)

COMPANIES

Ling-Standard Products, an Imperial megacorporation with offices throughout Ley sector and the entire Imperium. LSP manufactures electronic equipment of all sorts, ground and air vehicles, starships and starship armaments systems, drive systems, power systems, computer systems and software, small arms, and a variety of other items.

TransInnovations, founded during the Sylean Federation, was one of the first pure design bureau firms in the Imperium. Since its founding, the company has moved into vehicle manufacture, primarily in the Imperial core. The firm supports one of the largest databases of vehicle designs in the Imperium.

Halcom Alien: A small manufacture of vehicles for “Alien Environments”, which includes vacuum, underwater and exotic atmospheres. Halcom Alien focuses on scientific research vessels. Many of the universities in Ley sector which have students and staff performing field research use the Halcom Alien vehicles.

Makhuniim Gisham: The largest and oldest watercraft manufacturer based on Daramm (Ley 0812 A76AA76-E). Recorded corporate history dates back to the First Imperium, making Makhuniim one of the oldest companies in the Imperium. They manufacture a variety of surface and subsurface craft, with subsidiaries located throughout Ley sector.

Luur Ghisabzu: A watercraft manufacturer from the water world of Luur (Ley 0811 A56A770-C). Luur Gishabzu ocean ship building yards construct large cargo ships, fishing vessels and the occasional wet navy warship. Luur Ghisabzu exports many of their fishing vessels and is one of the largest sponsors of racing boats on Luur.

Kuchenwald Water Boat Works is a consortium of companies located on Kuchenwald (Ley 1830 E757887-2). On Kuchenwald the companies compete fiercely with each other, producing sailing cargo vessels, fishing boats and river barges. For export, the consortium produces luxurious boats and yachts of various sizes, all handcrafted from local materials.

Sauma Forain Recreational Watercraft is a large-scale manufacturer and distributor of watercraft and boat supplies throughout the Guadix Drift and Spearhead subsectors. SFRW aggressively pursues the entry level market with an array of low cost and low maintenance products.

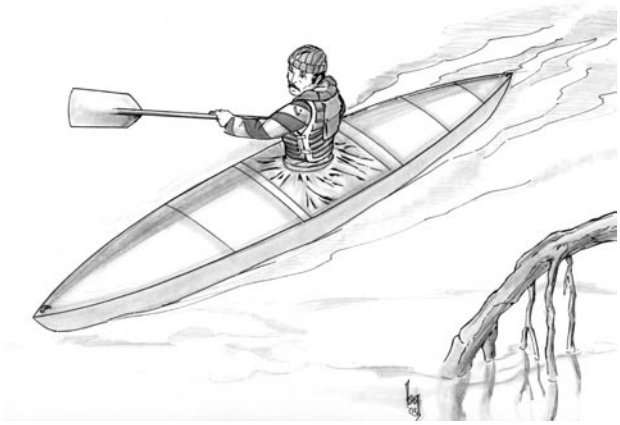
Island Gypsy Watercraft is a subsidiary of the megacorporation Naasirka with a concentration on mid-tech and high-tech recreational watercraft. Island Gypsy concentrates on a higher end market than Sauma Forain, with more powerboats and luxury craft.

Greenwater Farsails is a design firm specializing in watercraft, particularly low-tech designs like sailboats and oared crafts. The designs are aimed at the personal hobbyist, to be built either from a supplied kit of materials or allowing the builder to supply their own. Builders throughout the spinward side of Ley sector enjoy Greenwater’s designs though some of their designs stretch the definition of personal hobbyist. Greenwater

Farsails has seen a surge in the past two years for some of their historic designs and is expanding their markets to take advantage.

Blohm und Voss AG is a large commercial ship builder headquartered in the Glimmerdrift Reaches. BuVAG uses a modular design system to build a ship, take it apart for transport, and reassemble it on the market world. The process allows low-tech worlds to purchase very high tech designs without having to import an entire manufacturing plant.

The Yiarn Caardee Design Bureau catalog presents a collection of watercraft to demonstrate the variety of available designs. This is merely a teaser to spark interest. Specialized catalogs for each category of watercraft are available if the example design presented doesn't quite meet your requirements



CANOE

TL-6, Cr275, 150vl. A small person- powered boat with a capacity for one or two passengers or up to 200 kg of cargo. The open top makes the canoe suited only for calm water. At 15kg, the boat is lightweight enough a single person can carry it though at 4.5 meters it is unwieldy. Unless heavily loaded the flat-bottomed canoe has a draft of only a few centimeters, making it suited for boating in very shallow waters. The paddle is a single blade similar to a short oar but not attached to the boat. The shallow bottom and detached oar make the canoe very maneuverable.

The canoe is an ancient design, constructed by primitive peoples on many worlds. The primitive design consists of animal skins, tree bark or other flexible raw material stretched over a frame. Examples available on the open market use everything from animal skins and wood to plastics and other modern materials in their construction. Our example, the Froove designed by Greenwater Farsails, uses riveted aluminum making it more resistant to damage caused by rough handling. Ideal for recreational purposes, the Froove carries two people and several days worth of gear. Greenwater also supplies plans for Cannop, a wooden canoe for the home builder to construct.

In addition to the various construction materials and slight variations in length and cargo capacity, another favorite variation is the sea canoe. The larger size and sealed top of the sea canoe allows carrying more cargo through rougher waters without getting the cargo wet.

DESIGN SPECIFICATIONS

Installed Components	*Size*	*Cost*	*EP*
Chassis	150	150	-
Controls	15	74	-
Crew: 2 Saddles	20	50	
Cargo	115	-	
Subtotals	Cr 275 (Cr 220 with 20% production model discount)		

KAYAK

TL-2, Cr110, 75vl. A small self powered boat with a crew of one and a cargo capacity of 55kg. The kayak is covered and the paddler wears a flexible skirt that seals the seating opening. The kayakers use a double-ended paddle, a pole with a paddle blade at either end. The other distinguishing characteristic between a kayak and canoe is the position of the paddlers. In a kayak, the paddler sits with their legs out in front of them, whereas in a canoe the paddler kneels in the bottom of the boat.

Like canoes, kayaks are an old design watercraft and found on a number of worlds throughout the Imperium. A primitive Kayak consists of animal skins, tree bark or other flexible material stretched over a lashed frame. Because of their covered design with the sealed opening, people use kayaks more frequently on rough water rivers, the open ocean or in colder environments. Modern Kayak construction uses fiberglass or plastics to save weight. Like the canoe, most kayaks are used for recreation or sporting events.

Kuchenwald Water Boat Works provides our example of this type of craft. The Kuchenwald kayak is constructed of laminated wood glued and nailed onto a sagraan bone frame, then sanded and lacquered to a mirror finish. More of a showpiece, the Kuchenwald kayak still is a lightweight and very functional boat.

DESIGN SPECIFICATIONS

Installed Components	*Size*	*Cost*	*EP*
Chassis	75	75	-
Controls	7.5	37.5	-
Crew: 1 Saddles	10	25	
Cargo	57.5	-	
Subtotals	Cr 137.5 (Cr 110 with 20% production model discount)		

DINGHY

TL-7, Cr918, 680vl. A small watercraft capable of being propelled by a single person. The Dinghy can carry up to three passengers or up to 500kg of cargo. The aft of the Dinghy has a reinforced mounting for an outboard motor. An outboard motor rated for this boat would be 30vl, cost Cr140, and be able to propel the boat at up to 30kph. The motor requires an external fuel tank; the standard design is a 30 liter tank which would supply fuel for 14 hours.

The WaveMaster 4500 is a sturdy formed plastic hull manufactured by Sauma Forain Recreational Watercraft. Separating the double layer hull is helium aerogel making the boat very lightweight and serving as a nearly indestructible flotation layer. The metal-ceramic oarlocks are impervious to most corrosion. The oars are the same aerogel filled plastic as the boat hull, making them sturdy and lightweight. Our only complaint about this boat was the plastic in the hull becomes brittle in water temperatures below 10°C.

The WaveMaster 4500 is an average size for a dinghy, most hold between two and six passengers. Dinghies are the smallest of the rowboats, boats propelled by oars rather than paddles or sails. The largest rowboats can reach 20 meters and require a crew of six oarsmen plus a tiller operator.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	680	680	-
Controls	136	340	-
Muscle Engine	2	2	+0.2
Watercraft Drivetrain	5	25	0.2
Crew: 4 Saddles	40	100	
Cargo	500	-	
Subtotals	Cr1,147 (Cr918 with 20% production model discount)		

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INFLATABLE DINGHY

TL-7, Cr1, 788, 1100vl. An eight person watercraft capable of being rowed or propelled by a small engine. Construction of these boats is of reinforced cloth and inflated with pressurized air. The design makes them very lightweight and the deflated boats store easily. The inflatable dinghy can carry up to eight people or up to 800kg of cargo. The externally mounted motor can propel the craft at speeds of up to 40kph, and the 30-liter fuel tank provides a range of 100km. Because of the flexible materials used in the design, the Zodiac handles rough water better than most flat-bottomed boats. Many Solomani firms refer to this type of craft as a Zodiac.

The Island Gypsy Watercraft inflatable dinghy uses QuadraTex, a reinforced ballistic cloth with a self-sealing layer, rendering the hull virtually impervious to cuts and scrapes. The quick release valve system allows deflation and storage of the boat in 5 minutes and the entire boat, minus the engine and fuel tank, stores into 110vl. The manufacturer provides a storage bag for the deflated boat and one or two people can easily handle it. Inflating the boat with the supplied electric air pump takes 20 minutes.

Larger Zodiac style boats feature either an attachable hard keel or an extra inflatable chamber to create a keel to allow the larger boat more stability at higher speeds.

Island Gypsy Watercraft manufactures several sizes of these inflatable dinghies, from the two person harbor runabout to a 24 man party boat. In addition to their use as recreational or minimum storage emergency boats, mid-tech armed forces frequently use them as low profile watercraft for amphibious assaults or covert operations.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	1100	1100	-
Controls	220	550	-
Internal Combustion	11	110	+2.2
Watercraft Drivetrain	55	275	2.2
Crew: 8 Saddles	40	200	
Cargo	768	-	
Subtotals	Cr2,235 (Cr1,788 with 20% production model discount)		

PERSONAL WATERCRAFT

TL-6, Cr604, 200vl. A powered, sport watercraft, the water rider's equivalent of a motorcycle. Many Solomani firms refer to this craft as a jet ski, thought the name is something of a misnomer as there is no jet engine, but the fast and agile craft moves as if it is jet powered. The craft holds one person, the pilot and a small sealed compartment can hold up to 8 kg. With a top speed of 60kph, the three-hour fuel tank gives it a range of 90km.

Sauma Forain manufactures this example, the Daramm Special. This craft is typical of the type, designed for a single person to enjoy themselves with others outside on the water. The smaller engine makes it not as quick off the starting line. The control stick not only changes the rudder, but also adjusts the angle of the keel making the Daramm special much more agile than other models. The FlexKeel system, adapted from designs used in the professional circuit, has become a favorite with enthusiasts. The Daramm special has features found on most watercraft, including an automatic seal for the engine air intake in case the craft gets submerged, electric engine start, and the electronic fuel and velocity gauges.

These watercraft range in power from the beginner models with a top speed of 30kph to the professional racing models with a top speed of 90kph or more. All hold one or two passengers and a few kilos of cargo.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	200	200	-
Controls	20	100	
Configuration- Partly SL	-	200	
Drivetrain- Watercraft	15	75	-0.6
Power Plant- IC	13	130	+2.6
Fuel	4	-	
Crew- 2 Saddle	20	50	
Cargo	108	-	
Subtotals	Cr755 (Cr604 with 20% production model discount)		

SMALL SAILBOAT

TL-2, Cr1, 282, 500vl. A small recreational sailboat capable of carrying only one, the pilot with a small additional cargo space. The large sail area provides speeds up to 6kph in light winds and 18kph in strong winds. Oarlocks for rowing the small boat or a reinforced stern for mounting a small engine are provided but rarely used. The boat accommodates the pilot, one passenger, and 100kg of cargo

The Affallian, manufactured by Kuchenwald Water Boat Works, is a pure pleasure craft. This craft and the larger four person Destllian can be found flitting about the many small lakes and rivers so common to Kuchenwald. The Affallian provides water taxi service for Kuchenwald's many harbors. Several of the companies in the Kuchenwald consortium sell the design of the Affallian and the Destllian. The boats are simple to construct and maintain, and even easier to handle in the water.

Variations on these small boats are endless. The distinction between the Dinghy and a sailboat is the addition of the sail. Many dinghies contain the mounting for a triangular sail and mast, and you can oar most sailboats of this size when the wind is not being co-operative.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	500	500	-
Controls	110	250	
Sails Drivetrain (30%)	150	750	-
Muscle Engine	2	2	0.2
Crew: 1 Seat	110	100	-
Cargo	128	-	-
Subtotals	Cr1, 602 (Cr1282 with 20% production model discount)		

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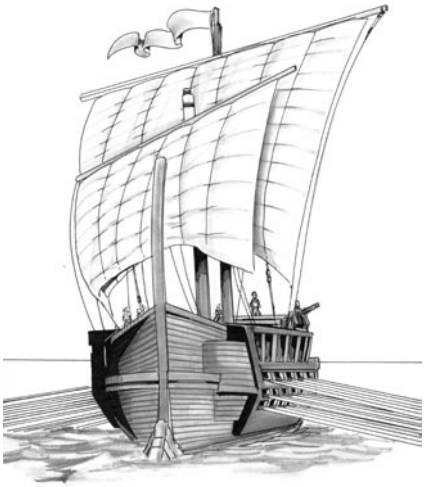

LUXURY SAILBOAT

TL-9, Cr43, 410, 7,000vl. A modernized sailboat used for purely recreational purposes. The ship accommodates six passengers with personal effects, but is not other wise designed for hauling cargo. The fore and aft rigged sails move the boat at 5kph in a light wind and 15kph in a strong wind. An onboard fuel cell and watercraft drivetrain moves the boat at 15kph with a range of 360km. The ship requires a single pilot to handle both navigation and man the sails, though the usual crew compliment is three, plus three passengers.

The Island Gypsy Flotilla 15 is a 15-meter luxury sailboat designed to be cruised comfortably or raced successfully. The hull is a corrosion proof reinforced aluminum-ceramic, allowing the Flotilla 15 to be lightweight and durable. The onboard computer control system can handle managing the sails, the liquid high-density ballast, navigation, and has an excellent library of culinary dishes suited for the small galley space. The forward cabin has two stacked bunks for sleeping four passengers or use as cargo storage. An onboard water reclamation and purification system means the Flotilla 15 requires no sewage hookup. Overall, the interior is very well laid out and available in a variety of finishes depending upon the owners preferences.

Using the Flotilla 15 for racing depends upon the world. Sailboat racing clubs are found on almost every world with a hydrosphere capable of supporting sailboats. These associations vary from gentlemen's meeting clubs to serious racing organizations with strict rules about boat and sail design to keep races competitive. Sailboat dealers have contact information for the local racing associations.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	7, 000	7, 000	
Controls	1, 400	3, 500	
Drivetrain- Sails (25%)	1, 750	8, 750	
Watercraft Drivetrain	262.5	1, 312.5	-10.5
Power Plant - Fuel Cell	21	3150	+10.5
Fuel	37.8	-	-
Environmental Controls			
Cubical (6)	3, 000	24, 000	-
Galley	250	1, 000	
Fresher	200	750	
Radio, 2-way	2	300	-0.08
Navi-computer	12.15	4, 500	-0.27
Cargo	64.55		
Subtotals	Cr54, 262 (Cr43, 410 with 20% production model discount)		

LONGBOAT

TL-1, Cr86, 912, 32Kvl. An archaic boat powered by a combination of sails and oars. Under sail and a strong wind, the longboat can make 21kph. Under oar power by a crew of 32 skilled rowers the ship can maintain a steady 4kph. The ship has little dedicated cargo space, requiring crew to store cargo, personal effects and supplies in space allocated for them. This makes the longboat crowded when sailing with a full cargo load. These light, narrow boats are quick in the water and smaller ones can be ported overland.

The 32-man, 24m Longboat is one of the largest designs supplied by Greenwater Farsails. A wooden boat of this size makes an ambitious construction project for its full crew complement. The design costs Cr250 and Greenwater Farsails can supply a kit for Cr18, 000 shipped from one of several manufacturing partners. Greenwater also supplies plans for a smaller 8-man, 5.3m longboat with similar performance characteristics. The smaller boat does not have the accommodations the larger longboat does, suitable only for day travel, but makes a more manageable project for a small crew to build and enjoy.

Greenwater claims the designs are from pre-space flight Terran designs, and the designs share some characteristic design elements with historically documented Longboats from Terra. Our research has shown the combination of sail and oared open galley has been independently designed on many worlds throughout Charted Space.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	32, 000	32, 000	
Controls	6, 400	16, 000	
Drivetrain: Sails (35%)	11,200	56,000	
Muscle Engine	64	64	+6.4
Watercraft Drivetrain	160	800	-6.4
Crew: 32 seats	3, 520	3, 200	-
Cargo	10, 656	-	
Subtotals	Cr 108, 064 (Cr 86, 451 with 20% production model discount)		

TRIREME

TL-1, Cr275, 992, 70Kvl. The Trireme, named for its three banks of rowers stacked within, is an ancient ship design combining rowers and sails. The earliest Trireme designs from the TransInnovations vehicle database date from the Rule of Man and reference documents from pre-spaceflight Terra and several other worlds. The Trireme is a warship, very cramped and built around the large ram on the front. Under combat conditions, the 170 oarsmen are the sole power source, and tactics revolve around trying to ram and board an enemy vessel. Triremes are not designed for long operations at sea, the ship must land each night to allow the crew space to rest and recuperate. Still, at ramming speed a trireme can make 18kph and under sail in a strong wind can make a similar speed. In addition to the oarsmen, the Trireme carries a crew of 30, consisting of command crew, sailors, and a contingent of armed fighting men to supplement the rowers during boarding actions.

Overall an impressive ship and still in demand on some low tech worlds outside the Imperium. Despite the tri-vid makers showing these types of ships being rowed by slaves, our research, both historical and on several worlds, has shown the only place where slave rowed galley exists is in the tri-vids. In order to row a ship of this type effectively, the oarsmen require strength, training and coordination. On worlds where we have found the Triremes and other oared ships in active use, the rowers are highly paid professionals.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	70, 000	70, 000	
Controls	14, 000	35, 000	-
Ram	5, 600	53, 400	
Drivetrain - Watercraft	850	4, 250	-34
Power Plant-Muscle	340	340	+34
Sails (30%)	21, 000	105, 000	-
Crew - 170 rowers	18, 700	17, 000	-
Crew - 30 (x2)	6, 600	60, 000	-
Cargo	2, 910	-	-
Subtotals	Cr 344, 980 (Cr 275, 992 with 20% production model discount)		

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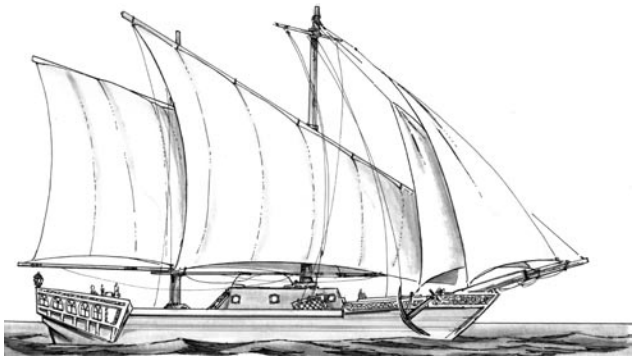
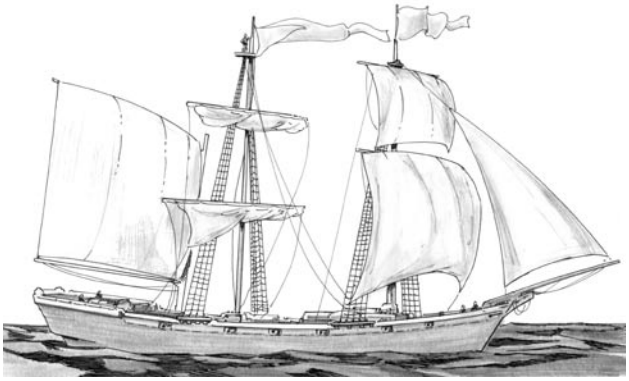


COASTER

TL-2, Cr270, 600, 120Kvl. An early example of a sail powered ship designed for hauling cargo. With two masts, the ship uses an array of natural cloth sails and can reach sustained speeds of 8kph. There are accommodations for 24 sailors in bunks plus five commanders sharing three cabins. The ship can be sailed for short periods with half crew, but the crew will be overworked and generally unable to handle unexpected situations. Coasters are only rarely armed, unable to outrun or outgun other sailed ships.

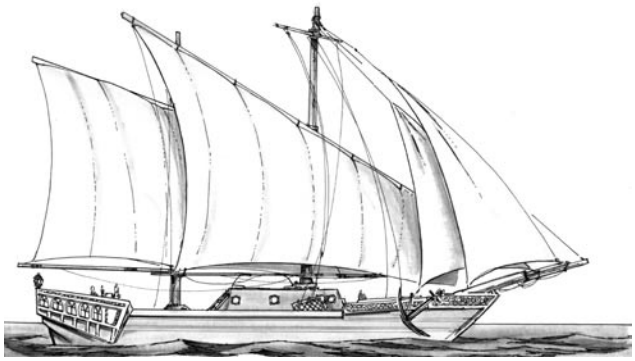
The Coaster, as the name implies, works the coastline of an ocean and rarely ventures out of sight of land. The wide bottom produces a shallow draft, making Coasters ideal for hauling cargo to underdeveloped ports. This same flat bottom makes the craft unstable in the rougher seas further from land. The Kuchenwald consortium produces between two and twenty of these vessels a year for internal use, each handcrafted from local materials. As with all hand-crafted items, no two ships are exactly alike and each is custom constructed to exact client needs.

In addition to the local construction on low-tech worlds, cargo sail craft are on several worlds in the early stages of terraforming and colonization. A sail powered cargo hauler, which requires only a few crewmembers and no fuel or advanced manufacturing for spare parts, is an advantage on a world lacking support infrastructure for more advanced vehicles.



DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	120, 000	120, 000	
Controls	24, 000	60, 000	
Drivetrain - Sails (20%)	24, 000	120, 000	
Crew - Bunks (25)	3, 750	6, 250	
Cabins (3)	6, 000	24, 000	
Galley (8)	1, 600	8, 000	
Cargo	60, 650	-	-
Subtotals	Cr338, 250 (Cr270, 600 with 20% production model discount)		



SCHOONER

TL-3, Cr173, 520, 43Kvl. A light sailed powered ship designed for armed conflict. In wet navy sail terminology Schooners occupy about the same position as a patrol cruiser or small escort starship. Schooners discourage the lightly armed merchants from harassing other merchant vessels and patrol the shallow coastal waters and rivers for untoward activity. Commanded by six officers and operated by a crew of 16 sailors, the archaic muzzle loading artillery pieces require an additional crew of 5 each and a minute or more to reload after each shot. Below decks are cramped, with guns mounted amidships, the crew quarters split between the bow and aft spaces. The command cabins are within the aft superstructure and can be isolated in case of a crew mutiny. Schooners carry supplies for a month a sea.

The Schooner is from the TransInnovations vehicle database, and several (wet) naval forces on worlds within the Gateway domain use these ships. Most working examples replace traditional muzzle loading cannon with modern breech loading artillery. The smaller crew requirements for the guns give the ships complement more room.

Sailing warships have their own classifications, primarily based upon the number of guns mounted on the ship. Schooners mount six to 12 guns. The smaller Sloops mount two to eight guns. The larger Corvettes mount as many as thirty guns and a frigate may mount up to 50. In addition to their larger gun complement, Frigates and Corvettes carry additional supplies sometimes as much as three years worth, to project naval strength around the world. The largest warships, called ships of the line for their ability to stand in the line of battle, mount as many as 120 guns, and have crews of 800 or more.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	43, 000	43, 000	
Controls	8, 600	21, 500	
Drivetrain - Sails (20%)	8, 600	43, 000	
Crew - Bunks (56)	8, 400	14, 000	
Small Cabin (4)	8, 000	32, 000	
Galley (15)	3, 750	15, 000	
Light Artillery (8)	4, 000	40, 000	
Fixed Mounts	400	400	
Ammunition	96	8000	
Cargo	290	-	
Subtotals	Cr216900 (Cr 173520 with 20% production model discount)		

CLIPPER SHIP

TL-9, Mcr8.8, 840Kvl. A large, very fast cargo vessel, built to compete with steam powered ocean liners. Hauling a cargo of 360 tons and capable of a sustained speed of 36kph, clippers are designed for long distance hauling. The historical design of a clipper ship has four or five masts with the goal to put out as many square meters of sail as possible. Even the lower tech designs are capable of sustained speeds of 30kph or more. Crewed by a force of 50 sailors and 6 commanders, the cramped accommodations and dangerous working conditions can discourage hiring new crew.

Clippers, like most hand crafted vessels, have as almost as many variations as examples. Our example, The Star of the East is the flagship of the Luur Ghisbzu fleet on Luur. The Star of the East uses a set of three large wingsails for propulsion giving the ship a larger cargo capacity and allows for fewer crew. The upgraded ship's systems include modern navigation, communications, and sensor gear. A small fuel cell supplies the power required by the electronics.

Every two years the Luur sailing club holds a race for sailboats around Luur. The Star of the East competes in every race and holds the record in this intensely competitive race. When not sailing around the world, Luur Ghisabzu uses the ship for hauling cargo and important guests between the Luur starport and the corporate shipyard. Luur is home to twelve clipper ships, a source of pride for the shipbuilders.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	840, 000	840, 000	
Controls	168, 000	420, 000	
Drivetrain- Wingsail (30%)	252, 000	6, 300, 000	
Power Plant- Fuel Cell	172	25, 800	+86
Fuel (10 days)	3, 096	-	-
Climate Control	8, 400	420, 000	84
Cubicles (50)	25, 000	200, 000	
Cabins (4)	8, 000	32, 000	
Passengers- Cabins (7)	14, 000	56, 000	
Galley (16)	4, 000	16, 000	
Radio 2-Way	3	45	1.2
Radar (Medium)	10	500, 000	-0.5
Lights (1.5m area x10)	2	50	-0.1
Cargo	357, 317	-	-
Subtotals	Cr8, 809, 895 (7,047,916 with 20% production model discount)		

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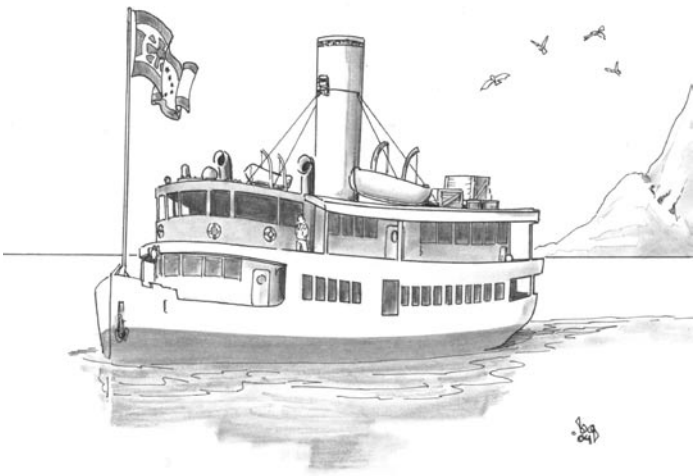
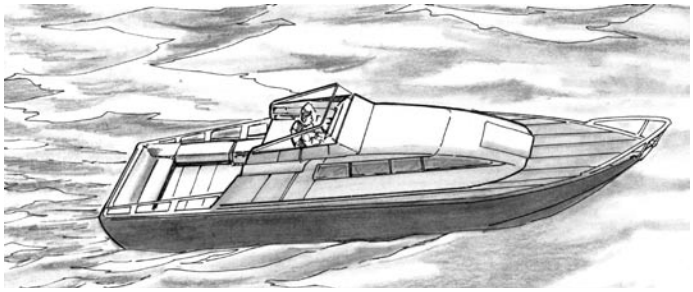


STEAM BOAT

TL-4, KCr178, 100Kvl. An early example of a steam powered cargo ship. A pocket passenger ship designed for a fixed route on a navigable river or lake. Eighty passengers are afforded room to move about, but the ship is not designed for overnight travelers. The steam engine requires a crew of 16, plus the captain, first mate, pilot and three steersmen. The fuel bunker holds 10 days worth of coal, giving a range of 3, 840km.

Blohm und Voss AG builds and sells this modular design steam boat, the River Prince. Almost any fuel can power the external combustion engine and BuVAG sells these ships with an installed fuel conversion system. The triple-expansion steam engine powers a feathering stern wheel and a simple induction generator on the main piston provides electrical power for the instruments and onboard lighting. The flat-bottomed hull with less than a two-meter draft is perfect for river travel. A short-range sonar system helps avoid the dangerous sand bars and snags common to many rivers. The engine and cargo storage are on the first deck, with a loading ramp at the bow for quick access to the cargo area. Second deck is passenger space, a large open space used as a dining hall, casino, theater, show hall, or (rarely) simply passenger seating. The roof is re-enforced for passengers, with an enclosed pilothouse for the captain, pilot, and navigation equipment.

A common variation is the addition of passenger cabins, like the BuVAG Tzar (THB p307). The largest river ships accommodate several hundred passengers with entertainment facilities for journeys, which may take a week or more.



DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	100, 000	100, 000	
Controls	20, 000	50, 000	
Drivetrain- Watercraft	4, 000	20, 000	-160
Steam Engine	4, 000	4, 000	+160
Fuel	9, 600	-	-
Crew Seats (22 x2)	4, 840	4, 400	
Freshers (4)	1, 000	3, 000	
Galley (6)	1, 500	6, 000	
Passengers seats (80 x4)	35, 200	32, 000	
Sonar (0.2km)	2	2, 500	-0.05
Radio, 2-way (50km)	1	150	-0.04
Lights (1.5m area x10)	2	50	-0.1
Cargo	20, 000	-	
Subtotals	Cr222, 100 (Cr177, 680 with 20% production model discount)		

LUXURY POWERBOAT

TL-8, Cr40, 180, 7,000vl. A larger watercraft, primarily used for pleasure cruising. The ship has a crew of two; pilot and navigator control the craft from a flying bridge, and can carry two passengers. The ship carries 504vl of fuel and has a cruising speed of 60kph giving the boat a range of 1,400km.

Our example craft is the Salamah 9500, built by Sauma Forain Recreational Watercraft, is an excellent example of the pleasure cruising craft. The internal combustion engine is easily maintained but noisy and fuel hungry. The larger than normal aft cockpit has reinforced mountings for fishing equipment, diving support equipment, or simply extra space for more guests. Internally the layout is spartan and with an overhead clearance 5cm lower than on other similar models, it feels cramped as well. SFRW hulls, constructed of a lightweight aerogel between two layers of fiber-reinforced plastic, are nearly unsinkable even when holed. Because the Salamah is for a lower cost market, SFRW has put some attention into details, like an induction bilge pump and an air-cooled engine that requires fewer maintenance checks, which a less experienced boat handler may overlook.

In markets where luxury powerboats are sold widely, dealers compete by adding details like fancy wood interiors, better sound systems, custom exterior paint jobs, or additions like deep sea fishing or diving equipment. Boat sizes vary from a day cruiser like the Salamah at about 10m, to huge yachts at 80m or more in length.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	7, 000	7, 000	
Controls	1, 400	3, 500	
Configuration: Partial	-	7, 000	
Drivetrain- Watercraft	1, 050	5, 250	-42
Power Plant- Internal Com	210	2, 100	+42
Fuel	504		
Crew (4)	440	200	-
Cubical (4)	2, 000	16, 000	
Galley	250	1, 000	
Fresher/Shower	350	850	
Lights (1.5m area x5)	1	25	-0.05
Radio, 2-way	2	300	-0.08
Sonar (0.2km)	2	2, 500	-0.05
Navi-computer	12.15	4, 500	-0.27
Cargo	778.85		
Subtotals	Cr50, 225 (Cr 40, 180 with 20% production model discount)		

PERFORMANCE POWERBOAT

TL-9, Cr58, 020, 4000vl. A medium sized powerboat designed for pure speed. The boat has room only for the two crew plus bunk space for brief stopovers. The top speed of 200kph exceeds the safe operating limits of the craft, requiring an experienced pilot at the helm. An oversized 1300vl fuel tank gives an impressive 16, 800km range.

Luur Ghisabzu sponsors boats in every class of watercraft racing on Luur, the Luur Windsong is a deep ocean racer, designed for the circumnavigation races. The commercially available Wingsong replaces all but two days worth of fuel with a shower for the fresher, a small galley and enlarges the bunks giving a roomier and more comfortable below deck space. The boat loses none of its impressive performance, and the elegant, sweeping lines of the Luriani designs turn heads at every marina.

The difference between the performance powerboats and luxury boats depends upon who is doing the selling. In general, performance boats have smaller accommodations for a similar sized boat. In theory, the smaller passenger space leaves more room for the engine, but with the variety of power plants available, this is only a rough guide. Another indicator would be engine power; generally, boats with a top speed over 120kph are performance boats. As with many vehicles designed for speed, planetary governmental regulators frown on importing these boats, particularly if the boat or engine construction TL exceeds the local TL.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	4000	4, 000	
Controls	800	2, 000	
Configuration: Partial	-	4000	
Drivetrain: Hydrojet	400	32, 000	-40
Power Plant: Fuel Cell	145	21, 750	+72.5
Fuel	1827	-	
Crew (2)	220	200	
Freshers	200	750	
Bunks (2)	300	500	
Lights (1.5m area x5)	1	25	-0.05
Radio 2-way	2	300	-0.08
Sonar (0.2km)	2	2, 500	-0.05
Navi-computer	12.15	4, 500	-0.27
Cargo	90.85		
Subtotals	Cr72, 525 (Cr58, 020 with 20% production model discount)		

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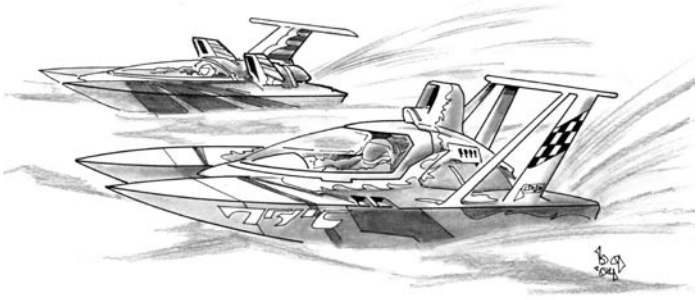
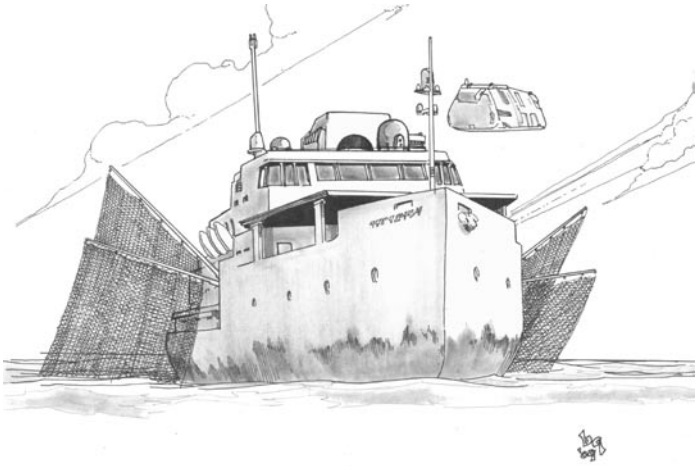


RACING HYDROPLANE

TL-8, Cr5971, 486vl. A one man high speed racing boat, little more than a seat and a turbine strapped to a hydroplane hull. A top speed of 540kph exceeds safe driving limits, requiring a well-trained pilot for the craft. A tiny 5vl fuel tank gives only one hour of driving time, which is usually sufficient for most racing conditions.

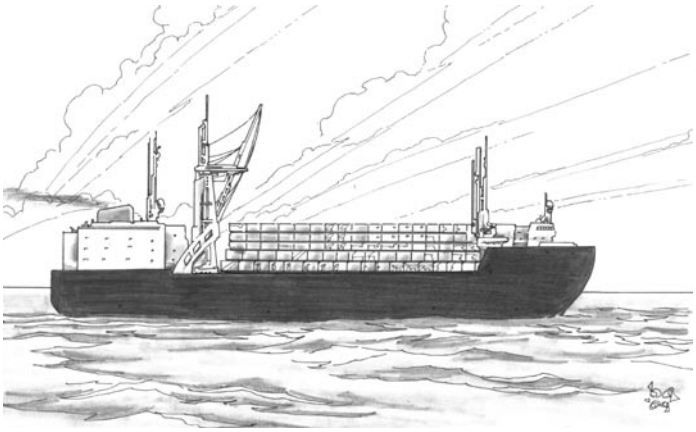
Ling Standard products racing team has named their craft the LSP Aeronautica. Last season the Aeronautica tied the record of four first place finishes and was the leader in the point count on the liruuer circuit, the light racing division. Like most racing vehicles, the engineers have tuned the frame, engine, and control systems to a fine edge, the boat running barely controlled. The Grav thrusters mounted within the craft are a required safety feature. If the onboard, dedicated computer system detects the craft has gone out of control, the grav thrusters are engaged automatically to slow and stabilize the boat, preventing the wildly careening craft from killing the driver or any of the spectators.

LSP, like many vehicle manufacturers, sponsors and builds racing craft as a part of their marketing system, a way to keep their name in the minds of the buying public. The other reason for these craft, a test bed for new technologies, is not seen as frequently in the Imperium but is common on worlds outside the Imperium.



DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	486	486	
Controls	110	275	
Configuration: Airframe	-	1458	
Drivetrain- Watercraft	328.05	1604.25	-13.122
Grav Drivetrain	0.1944	2, 236	-0.05
Power Plant: Turbine	42.244	2, 112.2	+21.122
Fuel	5.28		
Cargo	0.2311	-	
Subtotals	Cr5, 971.45 (Cr4,777 with 20% production model discount)		



FISHING BOAT

TL-14, Mcr4.9, 1.44 Mvl. A large sized, deep-sea, commercial fishing boat. Utilizing a large net sized for specific marine fauna, the trawler scoops up a large catch, and then processes it in an onboard factory and flash freezes for transport to market. These floating factories are manned by a crew of 50, consisting of six command staff to run the vessel, six engineers to keep the onboard system running for the extended duration at sea, and a working staff of 38. The working staff is divided into three shifts of 12 plus two shift managers. The 100, 000vl fuel tank can keep the onboard fusion power plant running for three months.

Makhuniim Gisham manufactures the Sea Harvester, one of the larger commercial fishing vessels the firm produces. As much as possible about the ship's operation has been automated, a number of robotic assembly lines performing all of the packaging and final product handing duties. The working staff is required to handle the nets and perform initial catch sorting. The cargo is divided into 150, 000vl of water tanks for keeping catch live, and 750, 000vl quick freeze storage space. The bow of the ship contains a grav vehicle landing pad plus a lift system from the freezer space for quick loading of processed catch. With the optional fuel processor and a regular delivery of supplies, the Sea Harvester can remain at sea almost indefinitely.

Makhuniim custom configures these vessels for the expected catch, from long boom trawlers with an automated line retrieval system, to a purse seine net system for surface fish, to a 5km drift net for wide scale catches.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	1, 440,000	1, 440,000	
Controls	288, 000	720, 000	
Drivetrain: Watercraft	54, 000	270, 000	-2160
Power Plant: Mod Fusion	6, 930	1, 524,600	+2310
Fuel (3 months)	103, 950		
Environmental Controls: C	14, 400	720, 000	-144
Cubicals (38)	19, 000	152, 000	
Cabins (12)	24, 000	96, 000	
Galley (13)	2, 600	13, 000	-
Fresher/Shower (5)	1, 750	4, 250	-
Factory Space (12)	12, 000	120, 000	-
Lights (51m beam x6)	20.4	510	-1.02
Lights (6m area x10)	8	200	-4
Sonar (50km x2)	8	10, 000	-0.1
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way, 500km x2	4	600	-0.16
Cargo	913, 310	-	
Subtotals	MCr6.1 (MCr4.9 with 20% production model discount)		

LARGE CARGO SHIP

TL-14, Mcr82.11, 33Mvl. A large sea going cargo hauler, with a cargo capacity of 8, 312 starship tons and designed to haul the modular containers from a starport loading facility to a seaport. A crew of 40, 8 command officers and 32 engineers, operates the large cargo ship. The ship contains a one-year fuel supply for the large fusion plant, after which time the fusion plant needs an overhaul. With a top speed of 40kph, the ship isn't as fast as other forms of cargo transportation, but few are as inexpensive per ton.

The Kriemhild class modular container cargo ship is the flagship design of Blohm und Voss AG. BuVAG builds the Kriemhild in sections, ships the pieces and then assembles it at the wharf on the delivery world. BuVAG employs a custom designed starship to haul the 3, 400 tons of material for building the ship, which also forms the base of operations and works as the lifting crane. BuVAG construction uses a magnetic induction welding technique on a metal-ceramic compound to form a single seamless hull. This metal fiber reinforced hull is corrosion-proof, lightweight, and flexible enough to resist the damage caused by rough seas. With proper maintenance, the hulls can last indefinitely.

Modular container ships, which haul the same modular containers (THB p. 351) used in starships, vary in size. Our example is the largest of the container ships. BuVAG can build the Kriemhild as much as half this size without compromising seaworthiness. The smallest container ships are one tenth this size, with a crew of 12. The Helchen class modular ships are bulk liquid carriers, designed and built in a similar manner to the Kriemhild class ships, but can be up to ten times larger.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	33, 000,000	33, 000,000	
Controls	6, 600,000	16, 500,000	
Drivetrain- Watercraft	1, 650,000	8, 250,000	-66, 000
Power Plant- Mod Fusion	198, 000	43, 560,000	+66, 000
Fuel	1, 188,000		
Small Cabin (40)	80, 000	320, 000	
Galley (10)	2, 500	10, 000	-
Lights (6m area x20)	16	400	-0.8
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way (500km x2)	4	600	-0.16
Cargo	23, 281,000	-	
Subtotals	MCr102.6 (MCr82.1 with 20% production model discount)		

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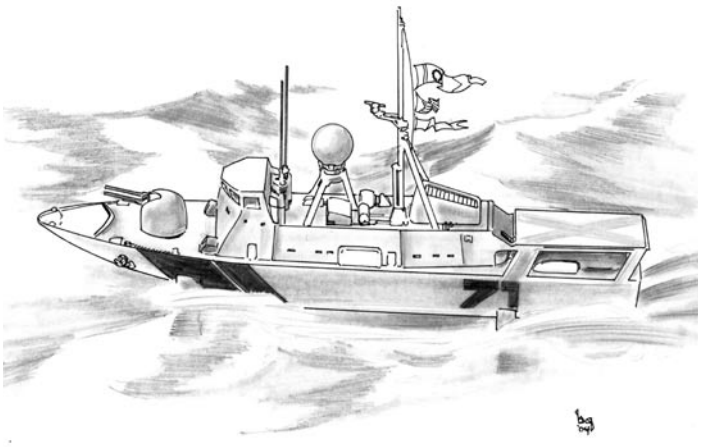

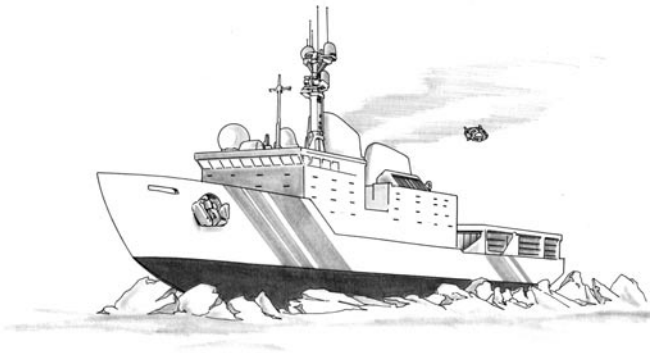

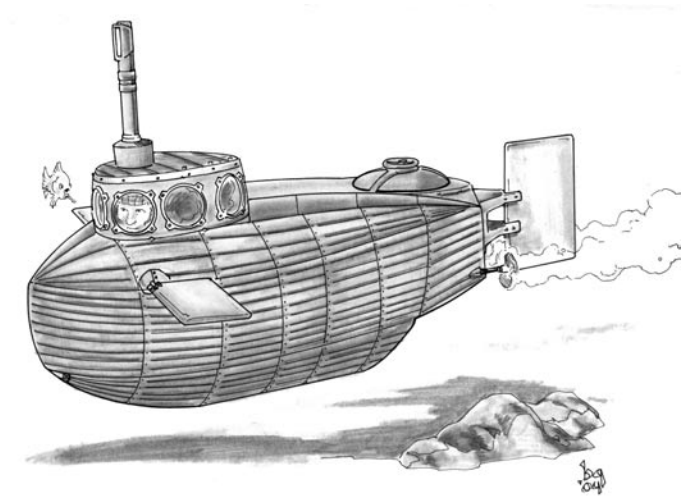

SHORE PATROL SHIP

TL-12, Mcr5.32, 600Kvl. The shore patrol ship is a lightly armed ship used for search and rescue efforts, civilian interdictions, and medium range patrols. The four variable pitch propellers can drive the craft on the hydrofoils at 220kph and the onboard fuel supply provides for more than 15 days duration at top speed. The ship has a crew of 37 consisting of eight command officers, three gunners, 20 engineering staff, four medics, and two specialists. The rear deck contains a landing pad and storage space for a helicopter, VTOL jet, or grav vehicle of up to 10, 000vl. The ship also contains an onboard medical suite for emergency victims and a compact machine shop for at sea repairs.

Our example is the Daak Garadanak (Near Sea Defender) produced by Luur Ghisabzu. Originally produced for the Luur search and rescue services, these multi-role sea-going ships are sold to worlds throughout Ley sector. Reports from crews find the Daak Garadanaks are spacious, easy to maintain, and a useful addition to many fleets. While the ship can move at 220kph, the usual mission profile keeps the craft at a more respectable 40kph, which extends its duration at sea to more than 100 days.

The forward turret mounted VRF gauss guns provide a respectable firepower for interdiction and customs work. When clients use the Daak Garadanak for search and rescue work, Luur removes the turreted VRF gauss guns and replaces them with an upgraded sensor and communications suite with a holo-display. Another unarmed variation uses the forward deck for an additional half-sized landing pad.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	600, 000	600, 000	
Controls	120, 000	300, 000	
Armor: AR3	48, 000	435, 000	
Configuration: Streamlined	-	1, 200,000	
Drivetrain: Watercraft	150, 000	750, 000	-6000
Power Plant: Adv Fuel Cell	12, 750	850, 000	+8,500
Fuel	153, 475		
Environmental Controls: C	6, 000	300, 000	-60
Small Cabin (37)	74, 000	296, 000	
Galley (10)	2, 500	10, 000	
Sickbay (4)	4, 000	400, 000	
Vehicle Shop (4)	4, 000	40, 000	
Turret	5, 112	51, 120	-
VRF Gauss Gun x2	(4, 000)	400, 000	
Ammo (6,000 round)	(60)	1, 200	
Gunner Seat	(200)	100	
Landing Pad	10, 000	-	
Lights (6m Area x10)	8	200	-0.4
Lights (51m beam x6)	20.4	510	-1.02
Sonar (50km x2)	8	10, 000	-0.1
Radar (50km x2)	20	1, 000,000	-1
Radio 2-way (500km x2)	4	600	-0.16
Cargo	10, 103	-	
Subtotals	Cr 6, 644,730 (Cr5, 315,784 with 20% production model discount)		

ICEBREAKER

TL-14, Mcr25.55, 1.8Mvl. A large ship designed to keep shipping lanes for watercraft, particularly cargo vessels, free of ice by breaking a path. The ship employs a reinforced bow and a system of grav drive thrusters to shatter the ice. The ship is capable of 60kph on open ocean. The speed through ice depends upon the thickness and composition of the ice and usually rates between 6kph and 10kph. The onboard fusion plant has a one year fuel supply along with the cargo space to haul supplies for the crew. Crew requirements are the 4 command officers, 10 engineers, with additional space for 10 mission specialists.

Our catalog vessel is the Maritime Angel, manufactured by Makhuniim. The use of a set of grav thrusters allows the Maritime Angel to omit the usual ballast tanks used in icebreakers. In thinner or fresh ice, the ship runs up to speed and smashed through the ice layer. On thicker ice, the ship bow of the ship runs onto the ice and the ballast shifted forward to use the weight to crack the ice. This process repeats as often as required. The Maritime Angel, using the grav thrusters, can shift the ship's center of gravity in 1/10 the time it takes for moving liquid ballast, giving a much higher rate of travel through an ice field.

Makhuniim manufactures these vessels in two variations, a pure cargo ship and a research vessel. The cargo ship has a large loading crane and a cargo hold capable of hauling 700, 000vl of cargo to remote outposts. The ocean research vessel converts most of the cargo space into laboratory space and additional cabins for the scientific crew.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	1, 800,000	1, 800,000	
Controls	360, 000	900, 000	
Armor: AR 3	72, 000	651, 000	
Ram Plate	36, 000	327, 000	
Drivetrain: Hydrojet	54, 000	4, 320,000	-5,400
Drivetrain: Grav	720	8, 280,000	-180
Power Plant: Mod. Fusion	60, 480	13, 305,600	+20,160
Fuel	362, 880		
Environmental Controls:C	18, 000	900, 000	-180
Small Cabin (24)	48, 000	192, 000	-
Galley (6)	1, 200	6, 000	-
Sickbay (2)	2, 000	200, 000	-
Vehicle Shop (4)	4, 000	40, 000	-
Lights (6m area x10)	8	200	-0.4
Lights (50m beam x6)	20.4	510	1.02
Sonar (50km x2)	8	10, 000	-0.1
Radar (50km x2)	20	1, 000,000	-1
Radio, 2-way (500km x2)	4	600	-0.16
Hangar Bay	26, 000	0	
Cargo	754, 660	-	-
Subtotals	MCr31.93 (MCr25.55 with 20% production model discount)		

EARLY SUBMARINE

TL-4, Cr1195, 760vl. An archaic design for a muscle powered submarine. Two crew; using hand-cranks attached to a propeller, power the craft. A third person acts as pilot and captain. The construction makes the vehicle as close to neutral buoyancy as possible with depth controlled by mechanical dive planes operated by the pilot. The detail drawing and parts list are available from Greenwater Farsails for Cr60, or as a complete kit for Cr300.

The historically accurate version of the craft uses a wooden hull sealed with wax or petroleum distillates and stone ballast. The captain has a limited view through eight small view ports in the bow. Air supply is limited to the empty spaces within the vehicle, and underwater operations to a few minutes at most. A snorkel allows extended operation at a meter or so of depth. In the historical period, this depth is more than sufficient for a sneak attack or slipping by a blockade under cover of darkness.

The updated design uses glass or other transparent material to replace some or all of the wood, allowing the crew to enjoy the view as well as the captain. The addition of a modern rebreather and oxygen supply extends the underwater duration. The modern version is an ideal transport for viewing sites in shallow water.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	760	760	
Controls	152	380	
Drivetrain: Subsurface	4	50	-0.4
Power Plant: 2 Muscle	4	4	+0.4
Crew: 3 seats	600	300	
Subtotals	Cr 1494 (Cr 1195 with 20% production model discount)		

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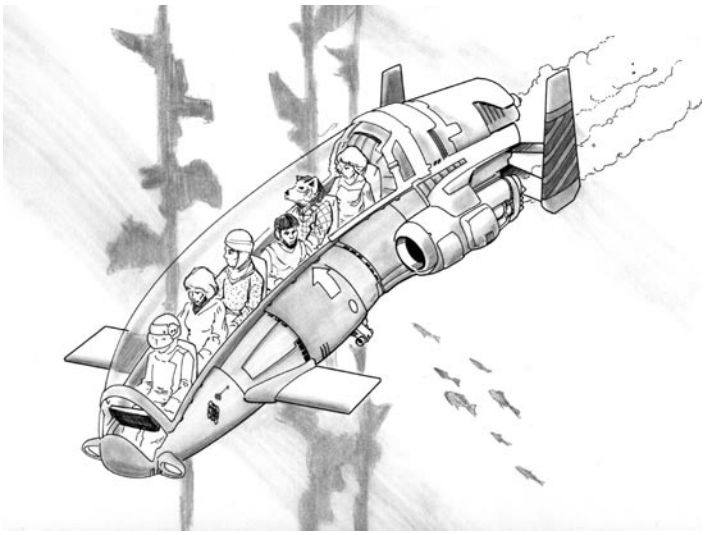
HAND SUB

TL-11, Cr71, 2.7vl. The Hand Sub is a powered propulsion unit for scuba divers or free divers. It provides a battery powered tow at a reasonable speed. Handgrips contain a throttle control, with steering provided by the operator. The onboard battery provides power for eight to ten hours, depending upon use of the headlight. The induction motor hydrojet drive system has only one moving part, making the entire craft extremely reliable.

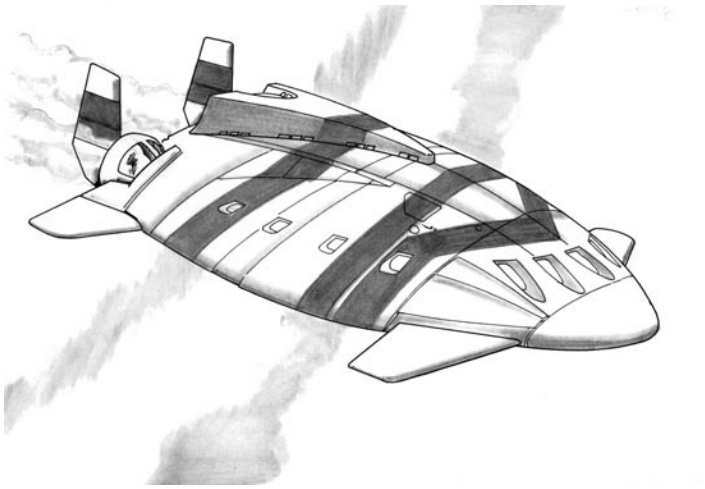
Built and distributed by Halcom Alien, these small units include a digital readout displaying battery power, dive time, depth, and rise time calculation. Halcom provides an emergency inflation bubble in the craft, capable of hauling two people to the surface and supporting them there. Removing the system leaves a small, sealed, cargo area for samples.

Our favorite variation is a slightly smaller version, sold as children's pool toys, and produced in a variety of bright colors.

DESIGN SPECIFICATIONS



Installed Components	Size	Cost	EP
Chassis	2.7	2.7	
Controls	0.26	1.3	
Armor			
Configuration			
Drivetrain: Subsurface	1	80	-0.1
Power Plant: Battery	0.04	0.3	+1
Light, 6m beam	0.4	5	-0.02
Cargo	1	-	
Subtotals	Cr 89.3 (Cr 71 with 20% production model discount)		



SHALLOW WATER EXPLORER

TL-9, Cr8, 088, 2100vl .This small craft is for underwater touring. The six passengers sit inline behind the pilot, and a glass canopy covers everyone. The canopy provides excellent viewing for all the passengers while the sealed interior provides a dry and comfortable ride. The submarine runs entirely on battery power, capable of reaching 8kph while submerged and maintaining that speed for up to 10 hours. The ship is capable of dives up to 30 meters.

Halcom Alien manufactures the Seahorse. The extremely simple drive-by-wire controls can be explained in a few minutes and have anyone operating it in under half an hour. The Seahorse automatically maintains positive buoyancy; if the engine ever stops, it immediately floats to the surface. In addition, the control system monitors the air quality, battery power remaining and depth, alerting the pilot when conditions go beyond pre-determined limits. The combination of simple controls, comfortable passenger area with high visibility, and minimal operating costs earns the Seahorse high praise from both designers and the tourism industry experts.

A common variant is an unsealed version, which requires the passengers to carry their own air supply. Underwater work crews use these wet crew submarines to extend their working time by letting the move further without tiring.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	2100	2100	
Controls	420	1050	
Drivetrain: Underwater	33.6	420	-3.36
Power Plant; Battery 10h	6	15	+60.55
Environmental Controls: S	105	2625	-2.625
Crew: 1	110	100	
Passengers: 6 Roomy	1320	1200	
Sonar (0.2km)	2	2500	0.025
Lights, 5x 1.5m area	1	25	-0.05
Radio 2-way	0.3	75	-0.02
Cargo	102	-	
Subtotals	Cr10,110 (Cr 8, 088 with 20% production model discount)		

LUXURY SUBMARINE

TL-12, Cr194, 229, 14,400vl, A large submarine designed for personal use. Two crew, the pilot and engineer, control the craft while underway. The pressure hull holds accommodations for twelve passengers in comfort, including a galley, full bath, sleeping areas and dining area. Powered by a closed environment fuel cell, the craft can make 10kph underwater with a range of 625 km.

Our example of a broad category is the Island Gypsy Neritic 20. Outfitted for 12 passengers with an executive lounge, the Neritic serves as sea-going transport in privacy and isolation. The broad sweeping views from the forward lounge offer impressive views of the surrounding seascape. Each of the passenger cabins has a large window with an equally impressive external view. The large bank of external lights illuminates the sea for better viewing. Island Gypsy prides itself on their ability to custom outfit their vessels to exacting specifications.

Island Gypsy also produces the Neritic 19, replacing the passenger cabins and lounge with passenger seating for 24, perfect for undersea commuting or short tourist explorations. While surfaced, the Neritic 20 has a configuration similar to surface craft of the same size and can use the same berth and docking facilities. Underwater, the rear docking hatch has a variable adaptation ring for attachment to most habitats.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	14, 400	14, 400	
Controls	2, 880	7, 200	
Armor: AR2	864	10, 776	
Configuration: R. Deep	-	28, 800	
Drivetrain: Underwater	288	3, 600	-28.8
Power Plant: Adv Fuel Cell	61.5	4, 100	+41
Fuel: 2.05vl/hr	256.25	-	
Environmental Controls: S	720	18, 000	-18
Crew x2	220	200	
Galley x4	800	4, 000	
Fresher/Shower	350	850	
Cubicle x12	6,000	48, 000	
Common Area	1,600	100, 000	
Lights 12x area	2.4	60	-0.12
Sonar (0.2km)	2	2500	-0.025
Radio 2-way (500km)	2	300	-0.08
Cargo	353.85	-	
Subtotals	Cr 242, 786 (Cr 194, 229 with 20% production model discount)		

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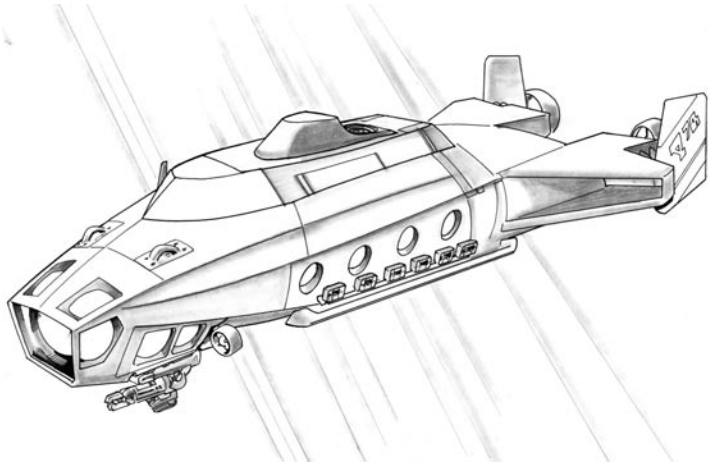
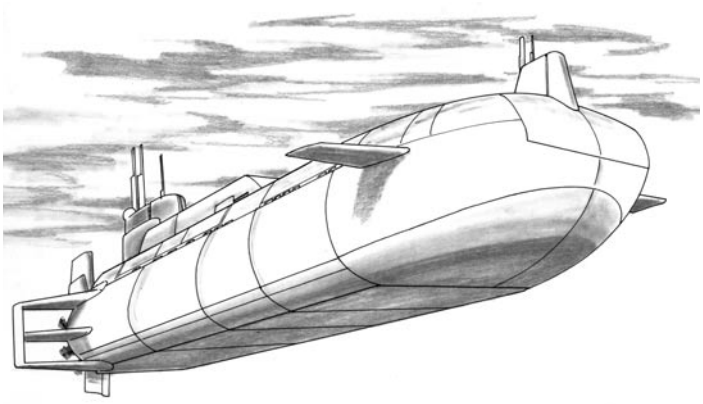


DEEP WATER EXPLORER

TL-14, Cr602, 230, 8,000vl. A deep diving submarine for exploration and scientific study. The craft holds a crew of three, plus an extensive laboratory for on site testing. The fusion plant provides power for three months, and allows for entirely independent operation. A modest top speed of 30kph still allows the craft to chase down most marine life. The craft has a safe diving depth of 15,000 meters, deeper than the oceans on most worlds.

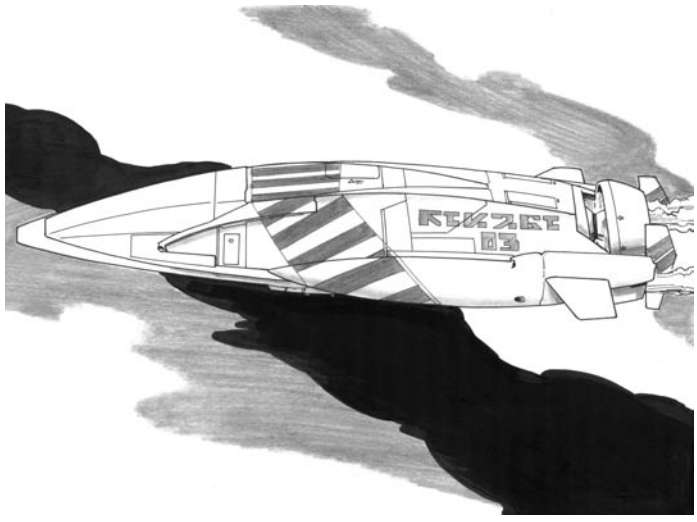
Halcom Alien's Benthic Explorer is an old, well-established design, proven over a hundred years and on worlds throughout the Gateway domain. The four-layer pressure hull isolates components, providing an extra layer of safety. The exterior all-around holo-imaging system and powerful array of lights capture the entire seascape. The sampling basket includes highly dexterous external arms, plus a dedicated holo-imaging and lighting unit.

There are not many variations on the Benthic Explorer, being very specialized type of vehicle, each one is custom built to the requirements of the owner. A frequently seen variation is a deepwater repair sub, used to find and repair broken undersea communication lines.



DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	8, 000	8, 000	
Controls	1, 600	4, 000	
Armor- AR14	1, 200	13, 800	
Configuration-bathyscaphe	-	24, 000	
Drivetrain- Underwater	480	6, 000	-48
Power Plant- Fusion	186	40, 920	62
Fuel	279	-	
Environmental Controls- P	400	10, 000	-10
Crew: 3	330	300	
Cubical x3	1, 500	12, 000	
Fresher/Shower	350	850	
Galley	200	1000	
Laboratory	800	50, 000	
HoloVideo+IR+LI x8	21.6	32, 000	-1.12
Holodisplay x2	0.2	4, 000	-0.1
Sonar (1km)	4	5000	-0.05
Densitometer	0.5	375, 000	-0.2
Lights x12	2.4	60	-0.12
Radio 2-way (5000km)	2	300	-0.08
Arms, STR10, DEX10 x2	10	20, 000	-2
Cargo	634.3	-	
Subtotals	Cr 602, 230 (Cr481,784 with 20% production model discount)		



CARGO SUBMARINE

TL-13, MCr19.41, 2 Mvl. Vualdetruda, depth 200m, 40kph. Crew of 26 Engineers, 7 command crew. Cargo space holds 320 starships tons.

Our example is the Vualdetruda class cargo submarine, manufactured by Blohm und Voss AG. BuVAG manufactures the Vualdetruda using their signature modular technique, hauling a partly constructed ship to the customer port and finishing it onsite.

The cargo submarine is a specialized vehicle, attempting to fill the same role as the surface cargo ships like the Kriemhild. What the Vualdetruda class submarines loose in cargo capacity and extra cost, they make up in their transit ability. Where shipping routes pass through ice packs, the submarine can pass under the ice rather than requiring the use of an icebreaker. Another benefit is the ability to through large storms, a significant impediment on some worlds, the cargo protected underwater. Reports from BuVAG indicate a few worlds have converted their entire ocean shipping fleet to submarine vessels, avoiding the problems of surface shipping.

Variations on the cargo submarine include use as an underwater drilling rig or mining operations center. Access to mineral resources on worlds with significant water coverage (90% or more) is a challenge. A large mobile platform providing a normal atmosphere environment is an ideal solution.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	2, 000,000	2, 000,000	
Controls	400, 000	1, 000,000	
Armor: AR 6	280, 000	2, 523,000	
Configuration: Reinforced	-	4, 000,000	
Drivetrain: Underwater	160, 000	2, 000,000	-16, 000
Power Plant: Mod Fusion	55, 500	12, 210,000	+18, 500
Fuel	83, 250	-	
Environmental Controls: P	100, 000	250, 000	-2, 500
Privacy Cubicles (28)	14, 000	112, 000	
Cabin (5)	10, 000	40, 000	
Galley (13)	2, 600	13, 000	
Sickbay	1, 000	100, 000	
Sonar (50km)	8	10, 000	-0.1
Radio, 2-way (500km)	2	300	-0.2
Cargo	893,640	-	
Subtotals	MCr24,26 (MCr19.41 with 20% production model discount)		

SUPERCAVITATION SUBMARINE

TL11, Mcr3.31, 12,000vl. The ship is capable of 440kph top speed, and an operational duration of over 24 hours. Manned by a crew of 6 (Captain, 2 sensor operators, 2 engineers, and a medical technician), the vehicle has just enough space remaining after propulsion and other essential systems to carry sufficient supplies to support the crew while on station at sea.

The Makhuniim SAR Guardian is a purpose built submarine for search and rescue work. The high speed craft is capable of responding to an emergency faster than surface ships and as fast as most grav rescue vehicles. The original SAR Guardian class worked as part of the Daramm starport emergency services. Since that time, Makhuniim has updated the design slightly and it is now found on worlds throughout Ley sector.

The addition of the starship airlock docking ring and the large cutting torch make the vessel ideal for downed starship rescue operations. The onboard vehicle shop allows the crew to assist in repairs to the downed vehicle. If repairs are not forthcoming, the SAR Guardian carries up to 17 rescued people. The SAR Guardian has amenities for short term station keeping only, limiting its range for close to home.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	12, 000	12, 000	
Controls	2, 400	6, 000	
Armor: AR 3	1, 440	15, 960	
Configuration: Supercav		84, 000	
Drivetrain: Grav Drive	256	3, 072,000	-64
Power Plant: Fuel Cells	256	38, 400	+128
Fuel (19.2/hr)	691.2	-	
Environmental Controls: P	600	15, 000	-15
Seats 6 x2	1,320	1, 200	
Fresher	200	750	
Passenger bunks x16	2, 400	4, 000	
Sickbay (x1)	1, 000	100, 000	
Vehicle Shop x1	1, 000	20, 000	
Video+IR+LR x 6	9.6	15, 600	-0.42
Video Monitorx6	3	600	-0.12
Sonar (50km)	8	10, 000	-0.1
Densitometer	1	750, 000	-0.4
Radio, 2-way (500km)	2	300	-0.08
Misc. Equipment			
Cargo	413.2		
Subtotals	MCr4.13 (MCr3.31 with 20% production model discount)		

8

LAND SAILER

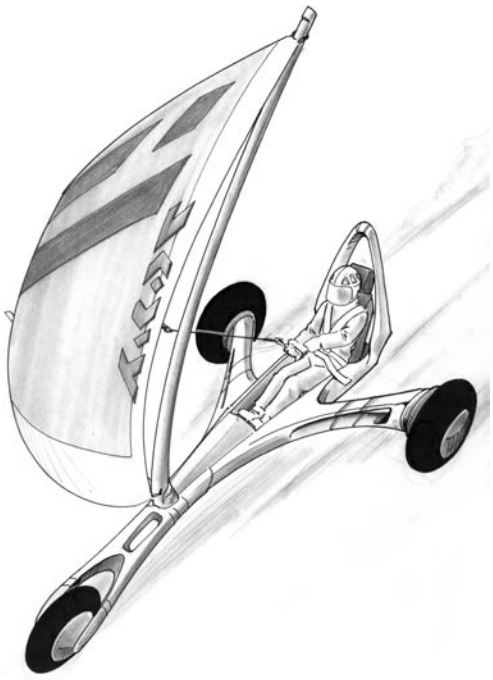
TL-6, Cr188, 45vl. A one person sail driven land vehicle used for recreation and racing. The craft is capable of reaching speeds of over 35kph over good surfaces.

The land sailer is an odd vehicle we see from time to time. It is a marriage of the sea going Yacht and a lightweight ground vehicle. Our example is a light, one person pleasure vehicle. The large tires and suspension system give a smooth ride over open park or open desert. The Transinnovations design permits replacing the wheels with skids, for travel over open ice. The design calls for an aluminum frame and inflated tires, though more modern materials can be substituted.

A variation on the theme is seen by the natives of Gimram (Ley 1215 E542653-1), who use larger vehicles powered by wind for crossing the desert expanses between watering holes. These bus sized vehicles carry the entire tribe and their belongings.

DESIGN SPECIFICATIONS

Installed Components	Size	Cost	EP
Chassis	45	45	
Controls	4.5	22.5	
Drivetrain Sails 60%	27	135	
Wheels (3)	3.3	7.5	
Crew: Saddle	10	25	
Crew	100	-	
Cargo			
Subtotals		Cr235 (Cr188 with 20% production model discount)	



CANOE

Class: Watercraft	**EP Output:** 0	
Cost: Cr220	**Agility:** 0	
Tech Level: 6	**Initiative: +0**	
Size: Medium (150 vl)	**AC:** 10	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 18	
Climate Control? No	**Visual:**	
Drive Train: None		
Crew: 1		
Passengers: 1	**Sensors:**	
Cargo Space: 115vl		
Fuel:		
Range: n/a	**Comm:**	
Speeds:		
Acceleration = 0.6 kph		
Off Road =	Very Slow = 0.6kph	Slow = 1.5kph
Cruising = 3koh	Fast = 4.5kph	Maximum = 6kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

KAYAK

Class: Watercraft	**EP Output:** 0	
Cost: Cr110	**Agility:** 0	
Tech Level: 2	**Initiative:** +0	
Size: Medium (75vl)	**AC:** 10	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 13	
Climate Control? No	**Visual:**	
Drive Train: None		
Crew: 1		
Passengers: 0	**Sensors:**	
Cargo Space: 75vl		
Fuel: 0		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.6kph		
Off Road =	Very Slow = 0.6kph	Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph	Maximum = 6kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

8

DINGHY

Class: Watercraft		**EP Output:** 0
Cost: Cr918		**Agility:** 0
Tech Level: 7		**Initiative:** 0
Size: Large (680vl)		**AC:** 9
Streamlining: Standard		**AR:** 0
Pressurized? No		**SI:** 31
Climate Control? No		**Visual:**
Drive Train: Watercraft		
Crew: 1		
Passengers: 3		**Sensors:**
Cargo Space: 500vl		
Fuel: 0		
Range:		**Comm:**
Speeds:		
Acceleration = 0.2kph		
Off Road = n/a	Very Slow = 0.2kph	Slow = 0.5kph
Cruising = 1kph	Fast = 1.5kph	Maximum = 2kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

INFLATABLE DINGHY

Class: Watercraft		**EP Output:** 2.2
Cost: Cr1, 788		**Agility:** 0
Tech Level: 7		**Initiative:** 0
Size: Large (1100vl)		**AC:** 9
Streamlining: Standard		**AR:** 0
Pressurized? No		**SI:** 26
Climate Control? No		**Visual:**
Drive Train: Watercraft		
Crew: 1		
Passengers: 3		**Sensors:**
Cargo Space: 768vl		
Fuel: 6vl		
Range: 5.4 hours		**Comm:**
Speeds:		
Acceleration = 4kph		
Off Road = n/a	Very Slow = 4kph	Slow = 10kph
Cruising = 20kph	Fast = 30kph	Maximum = 40kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

PERSONAL WATERCRAFT

Class: Watercraft	**EP Output:** 2.6 (2 excess)	
Cost: Cr604	**Agility:** 2	
Tech Level: 6	**Initiative:** +2	
Size: Medium (200vl)	**AC:** 12	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 21	
Climate Control? No	**Visual:**	
Drive Train: Surface Water		
Crew: 1		
Passengers: 0	**Sensors:**	
Cargo Space: 8vl		
Fuel: 4vl		
Range: 3 hours	**Comm:**	
Speeds:		
Acceleration = 6kph		
Off Road = n/a	Very Slow = 6kph	Slow = 15kph
Cruising = 30kph	Fast = 45kph	Maximum = 60kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

SMALL SAILBOAT

Class: Watercraft	**EP Output:** 0	
Cost: Cr1, 282	**Agility:** 0	
Tech Level: 2	**Initiative:** 0	
Size: Large (500vl)	**AC:** 10	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 25	
Climate Control? No	**Visual:**	
Drive Train: Sails		
Crew: 1		
Passengers: 1	**Sensors:**	
Cargo Space: 128vl		
Fuel:		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.6kph		
Off Road = n/a	Very Slow = 0.6kph	Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph	Maximum = 6kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

8

LUXURY SAILBOAT

Class: Watercraft	**EP Output:** 10.5	
Cost: Cr43, 410	**Agility:** 0	
Tech Level: 9	**Initiative:** 0	
Size: Huge (7, 000vl)	**AC:** 8	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 59	
Climate Control? No	**Visual:**	
Drive Train: Sails/Water		
Crew: 2		
Passengers: 4	**Sensors:**	
Cargo Space: 64.55		
Fuel: 37.8		
Range: 24 hours	**Comm:** 2-way Radio (5000km)	
Speeds:		
Acceleration = 0.5/3kph		
Off Road = n/a	Very Slow = 0.5/3	Slow = 1/7kph
Cruising = 2/15kph	Fast = 2/22kph	Maximum = 5/30kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LONGBOAT

Class: Watercraft	**EP Output:** 6.4	
Cost: Cr86, 451	**Agility:** 0	
Tech Level: 1	**Initiative:** +0	
Size: Gargantuan (32, 000vl)	**AC:** 6	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 79	
Climate Control? No	**Visual:**	
Drive Train: Sails/Watercraft		
Crew: 32		
Passengers: 0	**Sensors:**	
Cargo Space: 10,656		
Fuel: 0		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.7/0.4kph		
Off Road = n/a	Very Slow = 1/0.4	Slow = 2/1kph
Cruising = 3/2kph	Fast = 5/3kph	Maximum = 7/4kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

TRIREME

Class: Watercraft	**EP Output:** 34	
Cost: Cr276, 000	**Agility:** 0	
Tech Level: 1	**Initiative:** 0	
Size: Gargantuan (70, 000vl)	**AC:** 6	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 88	
Climate Control? No	**Visual:**	
Drive Train: Sails/Oars		
Crew: 200		
Passengers: 0	**Sensors:**	
Cargo Space: 2910vl		
Fuel:		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.5kph		
Off Road = n/a	Very Slow = 0.5kph	Slow = 1.5kph
Cruising = 3kph	Fast = 4.5kph	Maximum = 6kph
Other Equipment: Front Ram		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

COASTER

Class: Watercraft	**EP Output:** 0	
Cost: Cr270, 600	**Agility:** 0	
Tech Level: 2	**Initiative:** +0	
Size: Colossal (120, 000vl)	**AC:** 2	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 100	
Climate Control? No	**Visual:**	
Drive Train: Sails		
Crew: 30		
Passengers: 0	**Sensors:**	
Cargo Space: 60,650		
Fuel:		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.4kph		
Off Road = n/a	Very Slow = 0.4kph	Slow = 1kph
Cruising = 2kph	Fast = 3kph	Maximum = 4kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

8

SCHOONER

Class: Watercraft	**EP Output:** 0	
Cost: Cr173, 520	**Agility:** 0	
Tech Level: 3	**Initiative:** 0	
Size: Gargantuan (43, 000vl)	**AC:** 4	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 81	
Climate Control? No	**Visual:**	
Drive Train: Sails		
Crew: 620		
Passengers: 0	**Sensors:**	
Cargo Space: 290		
Fuel: 0		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.4kph		
Off Road = n/a	Very Slow = 0.4kph	Slow = 1kph
Cruising = 2kph	Fast = 3kph	Maximum = 4kph
Other Equipment:		

Fixed Mount (4x Right, 4x Left): Light Artillery, ROF 2: 3, Attack +0, damage 5d12, range 705m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CLIPPER

Class: Watercraft	**EP Output:** 86	
Cost: MCr8.8	**Agility:** 0	
Tech Level: 9	**Initiative:** +0	
Size: Colossal (840, 000vl)	**AC:** 2	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 190	
Climate Control? Yes	**Visual:** lights (1.5m area x10)	
Drive Train: Sails		
Crew: 56		
Passengers: 7	**Sensors:** Radar (50km)	
Cargo Space: 357, 000vl		
Fuel: 3, 069		
Range:	**Comm:** Radio 2-Way (5000km)	
Speeds:		
Acceleration = 1.2kph		
Off Road = n/a	Very Slow = 1.2kph	Slow = 3kph
Cruising = 6kph	Fast = 9kph	Maximum = 12kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

STEAMBOAT

Class: Watercraft		**EP Output:** 160
Cost: Cr170, 680		**Agility:** 0
Tech Level: 4		**Initiative:** +0
Size: Gargantuan (100, 000vl)		**AC:** 6
Streamlining: Standard		**AR:** 0
Pressurized? No		**SI:** 96
Climate Control? No		**Visual:** Lights (1.5m area x10)
Drive Train: Watercraft		
Crew: 22		
Passengers: 80		**Sensors:** Sonar (0.2km)
Cargo Space: 20, 000vl		
Fuel: 9, 600vl		
Range: 10 days		**Comm:** Radio 2-way (50km)
Speeds:		
Acceleration = 3kph		
Off Road = n/a	Very Slow = 3kph	Slow = 8kph
Cruising = 16kph	Fast = 24kph	Maximum = 32kph
Other Equipment:		

TAS Form 3.1v (Condensed) **Vehicle Data (Commercial)**

LUXURY POWERBOAT

Class: Watercraft		**EP Output:** 42
Cost: Cr40, 180		**Agility:** 0
Tech Level: 8		**Initiative:** +0
Size: Huge (7, 000vl)		**AC:** 8
Streamlining: Partial		**AR:** 0
Pressurized? No		**SI:** 59
Climate Control? No		**Visual:** Lights (1.5m area x5)
Drive Train: Watercraft		
Crew: 2		
Passengers: 2		**Sensors:**
Cargo Space: 778.85		
Fuel: 504		
Range: 24 hours		**Comm:**
Speeds:		
Acceleration = 12kph		
Off Road = n/a	Very Slow = 12kph	Slow = 30kph
Cruising = 60kph	Fast = 90kph	Maximum = 120kph
Other Equipment: Fresher/Shower		

TAS Form 3.1v (Condensed) **Vehicle Data (Commercial)**

8

PERFORMANCE POWERBOAT

Class: Watercraft	**EP Output:** 72.5 (32 excess)	
Cost: Cr58, 020	**Agility:** 2	
Tech Level: 9	**Initiative:** +2	
Size: Huge (4, 00vl)	**AC:** 10	
Streamlining: Partial	**AR:** 0	
Pressurized? No	**SI:** 53	
Climate Control? No	**Visual:** Lights (1.5m area x5)	
Drive Train: Hydrojet		
Crew: 2		
Passengers: 0	**Sensors:** Sonar (0.2km)	
Cargo Space: 90.85vl		
Fuel: 1305vl		
Range: 7 days	**Comm:** 2-way Radio (50km)	
Speeds:		
Acceleration = 20kph		
Off Road = n/a	Very Slow = 20kph	Slow = 50kph
Cruising = 100kph	Fast = 150kph	Maximum = 200kph
Other Equipment: Fresher		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

RACING HYDROPLANE

Class: Watercraft	**EP Output:**21.122 (8 excess)	
Cost: Cr5, 971	**Agility:** 4	
Tech Level: 8	**Initiative:** +4	
Size: Large (486vl)	**AC:** 13	
Streamlining: Airframe	**AR:** 0	
Pressurized? No	**SI:** 28	
Climate Control? No	**Visual:**	
Drive Train: Watercraft		
Crew: 1		
Passengers: 0	**Sensors:**	
Cargo Space: 0.2311		
Fuel: 5.28		
Range: 1 hour	**Comm:**	
Speeds:		
Acceleration = 54kph		
Off Road = n/a	Very Slow = 54kph	Slow = 135kph
Cruising = 270kph	Fast = 405kph	Maximum = 540kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

FISHING BOAT

Class: Watercraft		**EP Output:** 2310
Cost: Mcr4.9		**Agility:** 0
Tech Level: 14		**Initiative:** 0
Size: Enormous (1, 40,000vl)		**AC:** 2
Streamlining: Standard		**AR:** 0
Pressurized? No		**SI:** 276
Climate Control? Yes		**Visual:** Floodlight (10x 6m area), work lights (6x 51m beam)
Drive Train: Watercraft		
Crew: 50		
Passengers: 0		**Sensors:** Sonar (50km), Radar (50km)
Cargo Space: 913, 310vl		
Fuel: 103, 950vl		
Range: 3 months		**Comm:** 2-Way Radio (500km)
Speeds:		
Acceleration = 3kph		
Off Road = n/a	Very Slow = 3kph	Slow = 7.5kph
Cruising = 15kph	Fast = 22.5kph	Maximum = 30kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LARGE CARGO SHIP

Class: Watercraft		**EP Output:** 66,000
Cost: Mcr82.1		**Agility:** 0
Tech Level: 14		**Initiative:** +0
Size: Enormous (33Mvl)		**AC:** 2
Streamlining: Standard		**AR:** 0
Pressurized? No		**SI:** 6,851
Climate Control? No		**Visual:** floodlights (6m area x20)
Drive Train: Watercraft		
Crew: 40		
Passengers: 0		**Sensors:** Radar (50km x2)
Cargo Space: 23.28Mvl		
Fuel: 1,188,000vl		
Range: 1 year		**Comm:** 2 way radio (500km x2)
Speeds:		
Acceleration = 4kph		
Off Road = n/a	Very Slow = 4kph	Slow = 10kph
Cruising = 20kph	Fast = 30kph	Maximum = 40kph
Other Equipment: Small Cabin (40), Galley (10)		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

8

SHORE PATROL SHIP

Class: Watercraft	**EP Output: 8500** (excess)	
Cost: MCr5.32	**Agility:** 1	
Tech Level: 12	**Initiative:** +1	
Size: Colossal (600,000vl)	**AC: 8**	
Streamlining: Streamlined	**AR:** 3	
Pressurized? No	**SI:** 160	
Climate Control? Yes	**Visual: Floodlights (6m area x10), Spotlights (50m beam x6)**	
Drive Train: Watercraft		
Crew: 37		
Passengers: 0	**Sensors:** Sonar (50km), Radar (50km)	
Cargo Space: 10,103vl		
Fuel: 153,475vl		
Range: 15 day	**Comm: 2-way radio (500km)**	
Speeds:		
Acceleration = 22kph		
Off Road = n/a	Very Slow = 22kpm	Slow = 55kph
Cruising = 110kph	Fast = 165kph	Maximum = 220kph
Other Equipment: Vehicle Shop (X4), Sickbay (x4), Galley (x10)		

Heavy Turret: 2x VRF Gauss Gun, Damage 2d12-5, ROF100, Range ??

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

ICEBREAKER

Class: Watercraft	**EP Output:** 20,160	
Cost: Mcr25.55	**Agility:** 2	
Tech Level: 14	**Initiative:** +2	
Size: Enormous (1.8Mvl)	**AC:** 7	
Streamlining: Standard	**AR:** 3	
Pressurized? No	**SI:** 351	
Climate Control? Yes	**Visual:** Floodlights (6m area x10), Spotlights (50m beam x6)	
Drive Train: Hydrojet		
Crew: 24		
Passengers: 0	**Sensors:** Sonar (50km), Radar (50km)	
Cargo Space: 750,000		
Fuel: 362,000vl		
Range: 1 year	**Comm:** Radio, 2-way (500km)	
Speeds:		
Acceleration = 12kph		
Off Road = n/a	Very Slow = 12kph	Slow = 30kph
Cruising = 60kph	Fast = 90kph	Maximum = 120kph
Other Equipment: Vehicle Ship (4), Sickbay (2), Galley (6)		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

EARLY SUBMARINE

Class: Submarine	**EP Output:** 0.4	
Cost: Cr1195	**Agility:** 0	
Tech Level: 4	**Initiative:** +0	
Size: Large (760vl)	**AC:** 9	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 32	
Climate Control? No	**Visual:**	
Drive Train: Subsurface		
Crew: 3		
Passengers: 0	**Sensors:**	
Cargo Space: 0		
Fuel: 0		
Range:	**Comm:**	
Speeds:		
Acceleration = 0.15kph		
Off Road = n/a	Very Slow = 0.1kph	Slow = 0.4kph
Cruising = 0.75kph	Fast = 1.1kph	Maximum = 1.5kph
Other Equipment:		

Safe Depth: 60m / 4m

TAS Form 3.1v (Condensed) **Vehicle Data (Commercial)**

HAND SUB

Class: Submarine	**EP Output:** 0.1	
Cost: Cr71	**Agility:** 0	
Tech Level: 11	**Initiative:** +0	
Size: Tiny (2.7vl)	**AC:** 12	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 3	
Climate Control? No	**Visual:** Light (6m beam)	
Drive Train: Subsurface		
Crew: 1		
Passengers: 0	**Sensors:**	
Cargo Space: 0		
Fuel:		
Range: 8 hours	**Comm:**	
Speeds:		
Acceleration = 0.5kph		
Off Road = n/a	Very Slow = 0.5kph	Slow = 1.2kph
Cruising = 2.5kph	Fast = 3.8kph	Maximum = 5kph
Other Equipment:		

TAS Form 3.1v (Condensed) **Vehicle Data (Commercial)**

8

SHALLOW WATER EXPLORER

Class: Submarine	**EP Output:** 6	
Cost: Cr8,088	**Agility:** 0	
Tech Level: 9	**Initiative:** +0	
Size: Huge (2100vl)	**AC:** 8	
Streamlining: Standard	**AR:** 0	
Pressurized? Yes	**SI:** 50	
Climate Control? No	**Visual:** Lights (1.5m area, x5)	
Drive Train: Subsurface		
Crew: 1		
Passengers: 6	**Sensors:** Sonar (0.2km)	
Cargo Space: 102		
Fuel:		
Range: 10 hours	**Comm:** Radio, 2-way (50km)	
Speeds:		
Acceleration = 0.8kph		
Off Road = n/a	Very Slow = 0.8kph	Slow = 2kph
Cruising = 4kph	Fast = 6kph	Maximum = 8kph
Other Equipment:		

Safe Depth 30m / 3m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LUXURY SUBMARINE

Class: Submarine	**EP Output:** 41	
Cost: Cr194,229	**Agility:** 0	
Tech Level: 12	**Initiative:** +0	
Size: Huge (14,400vl)	**AC:** 10	
Streamlining: Reinforced	**AR:** 2	
Pressurized? Yes	**SI:** 73	
Climate Control? No	**Visual:** Lights (1.5m area x12)	
Drive Train: Subsurface		
Crew: 2		
Passengers: 12	**Sensors:** Sonar (0.2km)	
Cargo Space: 354vl		
Fuel: 256		
Range: 625km	**Comm:** Radio, 2-way (500km)	
Speeds:		
Acceleration = 1kph		
Off Road = n/a	Very Slow = 1kph	Slow = 2.5kph
Cruising = 5kph	Fast = 7.5kph	Maximum = 10kph
Other Equipment: Fresher/Shower, Galley (4)		

Safe Depth: 250m / 16m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

DEEP WATER EXPLORER

Class: Submarine	**EP Output:** 62	
Cost: Cr602,230	**Agility:** 0	
Tech Level: 14	**Initiative:** +0	
Size: Huge (8,000 vl)	**AC:** 22	
Streamlining: Bathyscaphe	**AR:** 14	
Pressurized? Yes	**SI:** 61	
Climate Control? No	**Visual:** Holovideo+IR+LI (x8), Light (6m area x12)	
Drive Train: Subsurface		
Crew: 3		
Passengers: 0	**Sensors:** Sonar (1km), Densitometer	
Cargo Space: 634.3vl		
Fuel: 279		
Range: 3 months	**Comm:** Radio, 2-way (5000km)	
Speeds:		
Acceleration = 3kph		
Off Road = n/a	Very Slow = 3kph	Slow = 7.5kph
Cruising = 15kph	Fast = 22.5kph	Maximum = 30kph
Other Equipment: Arms STR:10, DEX:10 x2, Laboratory, Galley		

Safe Depth: 15,000m / 900m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

CARGO SUBMARINE

Class: Submarine	**EP Output:** 18,500	
Cost: Mcr16.78	**Agility:** 0	
Tech Level: 13	**Initiative:** +0	
Size: Enormous (2Mvl)	**AC:** 10	
Streamlining: Standard	**AR:** 8	
Pressurized? Yes	**SI:** 385	
Climate Control? No	**Visual:**	
Drive Train: Subsurface		
Crew: 33		
Passengers: 0	**Sensors:** Sonar (50km)	
Cargo Space: 893,640vl		
Fuel: 83,250vl		
Range: 3 months	**Comm:** Radio, 2-way (500km)	
Speeds:		
Acceleration = 4kph		
Off Road = n/a	Very Slow = 4kph	Slow = 10kph
Cruising = 20kph	Fast = 30kph	Maximum = 40kph
Other Equipment: Galley (13), Sickbay		

Safe Depth: 60m / 4m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

8

SUPERCAVITATION SUBMARINE

Class: Submarine	**EP Output:** 256 (48 excess)	
Cost: MCr3.31	**Agility:** 1	
Tech Level: 11	**Initiative:** +1	
Size: Huge (12,000vl)	**AC:** 12	
Streamlining: Supercavitation	**AR:** 3	
Pressurized? Yes	**SI:** 69	
Climate Control? No	**Visual:** Vidoe+IR+LR x6	
Drive Train: Underwater Grav		
Crew: 6		
Passengers: 8	**Sensors:** Sonar (50km), Densitometer	
Cargo Space: 413.2vl		
Fuel: 691.2vl		
Range: 24 hours	**Comm:** Radio, 2-way (500km)	
Speeds:		
Acceleration = 40kph		
Off Road = n/a	Very Slow = 40kph	Slow = 110kph
Cruising = 220kph	Fast = 330kph	Maximum = 440kph
Other Equipment: Vehicle Shop, Sickbay, Fresher		

Safe Depth: 250m / 15m

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

LAND SAILER

Class: Ground Vehicle	**EP Output:** 0	
Cost: Cr188	**Agility:** 0	
Tech Level: 6	**Initiative:** +0	
Size: Medium (45 vl)	**AC:** 10	
Streamlining: Standard	**AR:** 0	
Pressurized? No	**SI:** 10	
Climate Control? No	**Visual:**	
Drive Train: Wheeled/Sails		
Crew: 1		
Passengers: 0	**Sensors:**	
Cargo Space: 0		
Fuel: 0		
Range: n/a	**Comm:**	
Speeds:		
Acceleration = 1.2kph		
Off Road = 1.2kph	Very Slow = 1.2kph	Slow = 3kph
Cruising = 6kph	Fast = 9kph	Maximum = 12kph
Other Equipment:		

TAS Form 3.1v (Condensed)

Vehicle Data (Commercial)

VEHICLE INDEX

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