2300AD

PROJECT BAYERN
TECHNICAL REFERENCE MANUAL

TRAVELLER®

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CONTENTS

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TECHNICAL REFERENCE MANUAL

INTRODUCTION

Humanity's epic trip to the Pleiades has required innovations in technology and systems to protect the lives of the brave explorers and help probe the mysteries they found along the way. From the revolutionary new drive tuner that *Bayern* carries and the delicate long term cryogenic hibernation pods that protect her crew, to the simple comforts of fresh food and a comfortable EVA suit, no effort has been spared to provide everything the mission needs.

The *Bayern* flotilla comprises starships, aerospace vehicles, robot probes and remotes, and several vehicles and robots. This book contains the details of the vessels, vehicles, robots, drones and equipment that the scientists and explorers will use on their way to and during their exploration of the Pleiades cluster. It includes a comprehensive overview of *Bayern* herself, which should be read in conjunction with the included poster map to understand the giant ship that will be home for more than five years, if all goes well.

Also included are descriptions and deck plans for the other flotilla ships, the encounter vessel *Entdecker*, the mining and support ship *George Bauer* and the pathfinder vessel *Anton Dohrn,* as well as the *Orkan* and *Kenntnis* landers and space planes. The robotic drones and vehicles are also described, along with new equipment and armour that the Travellers may use.

We were cruising at WE2.12 for our rendezvous system with the rest of the flotilla, a respectable speed considering we had Entdecker *clamped to our belly. Drive Core B was in use and performing as expected. I could see from the blue book that they were still having problems with the cryogenic pumps for the backup MHD so it was offline again. There was a note to make sure the batteries and solar arrays stayed selected as secondary power plants. The portside lateral sensor array was down for maintenance, so the science team had requested we gently roll the ship to get whole sky pictures as we travelled. Ace was managing that by adjusting the speed of the contra-spin flywheels for the spinhabs. It was all normal, routine stuff.*

I was purging the secondary RCS clusters prior to a mid-course vector correction when I felt the ship suddenly pitch nose down, a sensation I was not expecting whilst at warp. The straps tightened across my shoulders and the objects that had been floating in zero-G suddenly 'fell' towards the dorsal bulkhead, behind me. I quickly double checked the purge routine to make sure I hadn't accidentally initiated a burn but the thrusters were all in standby and inert. Klaxons sounded and warning tell-tales started appearing all over my board – spin hab magnetic bearing torsion alarms, hull overstress alarms and fuel tank surge warnings. The flight computer pre-empted me and brought the secondary RCS systems back on-line and I saw emergency activity on all primary and secondary clusters. The whole ship began to shake and shudder with an alarming grinding, screeching sound as the RCS clusters started to fire in a series of bangs and pops from all round the ship. Something was trying to flip us end over end whilst we were travelling at nearly 800 times the speed of light.

THE AR-I

AR-I Timeline

2144	Official founding of the Astronomischen Rechen-Institut
2182	Detailed survey of Beta Canum system begins
2188	First Deep Penetration race among ESA members
2189	First edition of Das Nachschlagewerk der Sternen published
2198	Second Deep Penetration race among ESA members
2202	Last survey mission of Beta Canum system
2205	Third Deep Penetration race among ESA members
2231	Construction on Kolonie Zwei begins (Hochbaden system)
2261	*Entferntest* probe launched towards the galactic core
2262	Outpost established to study Eber ruins on Daikoku
2286	Starship *Baade* arrives at neutron star 1RXS J141256.0+792204
2287	Halogenic life discovered on Oiseau (Vogelheim system)
2291	First capture of quantum black hole for study
2297	*Bayern*'s launch date postponed until 2301 following accident

Although there is a great diversity of research Foundations, each has developed its own style or method of operation to accomplish its goals. The Royal Society is known to be rather stuffy and conservative, while the North American Research League is vocal, radical and, in the opinion of many corporate and political leaders, often obnoxious.

No other Foundation, however, can even begin to compare itself to the Astronomischen Rechen-Institut when it comes to showmanship and flamboyance. In the past, many groups which shared its dream of 'pure research for its own sake' had found little or no public, corporate or political support. In order to defeat this potential setback, the AR-I always works with two points in mind.

The first is simple economics; in short, the AR-I always considers the potential monetary gain which a venture might provide. In cases where there is no direct commercial potential, such as the *Baade* mission to the neutron star 1RXS J141256.0+792204 'Calvera' in 2286, they consider spin-off projects. Using the *Baade* mission as an example, the project leaders knew that information acquired on a solitary neutron star was unlikely to provide rapid monetary return, so they focused much of the public's attention on the newly designed aspects of the ship itself. These included the AR-I's most advanced stutterwarp drive systems and their highest level of computer technologies. Both of these fields proved to be big money-makers.

The second is showmanship. The AR-I is well-aware that the average media consumer in 2300 has seen a great deal of film footage on the 'perils of space exploration' and the 'never-ending struggle of life

on the Frontier', so they try to ensure that all of their programmes have the highest profile possible in order to outshine the competition. Among the press, it is well-known that an AR-I briefing is certain to be an outstandingly entertaining affair, if nothing else. As such, they are always well-covered.

There are few limits on the projects which interest the AR-I but those that do are rigidly enforced. For example, the Institut will not pursue any process of investigation which they feel to be of great military potential. This is reflected in the Foundation's policy of total neutrality in all forms of conflict (whether military, social or economic in nature). The degree of their dedication to this principle can be seen by the AR-I's increasing independence even from its own roots in Germany.

HEADQUARTERS

Just as there are few groups as eye-catching as the AR-I, there are few structures as majestic as the Great Arch which houses their main offices on Earth. It has been said that it is far more impressive to stand beneath the Arch than to stand in the shadow of the majestic beanstalks on Earth or Beta Canum Venaticorum. The French government, it might be noted, disputes this.

Located on a large plot of land donated to the fledgling AR-I just over a century ago by the German philanthropist Lise Kristian, the towering structure of glass and alabaster stands in the shape of a mighty Gothic arch almost half a kilometre high. There are 165 floors in each of the Arch's two towers and a dozen more located beneath the lush gardens which surround them.

Scattered around the main complex are dozens of administrative and research facilities which, although often spectacular in their own right, are dwarfed by the mammoth construct. Over half of the AR-I's 500,000 members live and work in and around the Great Arch.

Beyond the property owned by the Institut is the sprawling community of Heidelberg. Although this city was devastated in a nuclear exchange some time during the chaos of Twilight, it has been totally rebuilt. Superior planning and administrative regulations on the part of the city's governmental officials have enabled this metropolis to represent the perfect blend of traditional European charms and modern technological comforts and services.

Chief among the fringe benefits citizens of Heidelberg receive from the proximity of the Institut headquarters is an educational system tied to the organisation's vast wealth and knowledge. The primary and secondary schools located in the city are reputed to be among the finest in the world, drawing upon AR-I computer libraries and the many skilled and knowledgeable lecturers who pass through the headquarters. The children of Heidelberg enjoy a superior education and often have a better grasp of the far reaching effects of interstellar exploration and colonisation than their peers.

There are also several semi-independent universities in the Heidelberg area which similarly receive greater assets from the Institut. Grants and special educational plans are always in place to promote and encourage superior students, gearing to be vital members of the Institut's organisation. Well over 20 percent of the AR-I's personnel receive their higher education in the Heidelberg area.

Many colleges and universities near the Heidelberg AR-I headquarters are respected world and colony-wide. This is but a brief list.

HEIDELBERG UNIVERSITY: Specialising in all areas of study, Heidelberg University was founded in the 14th century. In all areas of the humanities, Heidelberg is a respected university.

RHEINE INSTITUT: The Rheine institute specialises in social and political science, turning out such respected graduates as Alfred Goebel (2210-2278, political writer and activist) and Hyram P. Stringfellow (b. 2234, current speaker of the House of Representatives in America). The Rhein Institut also boasts of having the most complete library dealing with political and historical issues.

UNIVERSITY OF ILLINOIS-HEIDELBERG CAMPUS: One of the great computer sciences schools in human space, the University of Illinois has branched out to over 12 campuses around the world. This facility at Heidelberg was constructed in 2238 with assistance and grant money from the AR-I, anxious to put high powered supercomputing technology to the tasks of interstellar exploration and learning.

JURGEN ZUHR TEKNISCHES SCHULE: Named for the renowned Bavarian statesman of the 22nd century, the Jurgen Zuhr Teknisches Schule is an engineering college of the highest calibre. Graduates are in demand in all aspects of state of the art materials and engineering science. Most of *Bayern*'s construction was originally theorised by the Schule and its members supervised the many technical aspects of her construction.

THE BAYERN

SS BAYERN

International Registry	DSXV(S) CH-0918.97
Original Date of Design	August 12, 2291
First Example Laid Dow	September 30, 2292
Example Completed	December 12, 2296
Fleet of Service	Astronomischen Reichen-Institut

General Information

Length	233.25 m
Height	90.75 m
Width	85.5 m
Displacement	5,750 tons
Volume	83,372 m^3
Loaded Mass	43,125,250 kg
Empty Warp Efficiency	2.72 ly/day
Loaded Warp Efficiency	2.51 ly/day
Grappled Warp Efficiency	2.46 ly/day
Thruster Rating	172,500 tons thrust
Cargo	7,436 m^3
Fuel	11,217 m^3

Additional Information

Accommodations	192 single occupancy staterooms (in spin habitats)
Sensors	Navigational Sensors, Deep System Scanners, GADS, Distributed Advanced Survey Sensors Suite, Advanced Telescope, Enhanced Signal Processing, Long Distance Laser Comms
Auxiliary Craft	2 Landers, 2 Space Planes, 6 EVA Bugs, 6 Remote Surface Probes, 6 Interstellar Probes, 12 Message Drones, 3 External Grapples (400 tons)
Weapons	None
Screens	None

False Start

Bayern was scheduled to begin her trek in 2297. While making a brief shakedown cruise prior to departure, an accident disabled the craft. A faulty umbilical line failed to detach from the ship and *Bayern's* computer system registered the mass of the orbital facility to which the craft was docked as being a part of the ship itself. When the main drive was engaged, it tried to move both objects. Consequently, the overloaded stutterwarp suffered a critical failure and exploded, destroying itself and doing severe damage to its surroundings. After minor repairs, *Bayern* limped back to Earth and returned for repair by the team which had built her at the orbital Clarke Habitat. While she was being repaired, the designers at Polarstern Architekten re-examined various aspects of the ship's design and instituted additional changes. Fully repaired and partially redesigned, *Bayern* once again makes ready to boldly head off into the cosmos.

Bayern was constructed by Polarstern Architekten, the AR-I's shipbuilding division, in Earth orbit near the European Space Agency's Clarke Habitat. Her drive, computer and power systems are all among the most advanced ever created. As with every deep penetration vessel manufactured by the Institut, *Bayern* carries no weapons of any kind and is under strict orders to avoid hostile confrontation under any circumstances.

Bayern's design is a progressive development of her predecessor, the *Baade*. *Baade* departed on a mission to the neutron star 1RXS J141256.0+792204, also known as Calvera, in 2285 to study the closest example of this type of collapsed star. Despite failure of her primary radiation screen, and several casualties, *Baade*'s mission was judged a success. At nearly 750 light years for the round trip, this voyage was the furthest any human vessel had travelled up to that point. However, faulty radiation screening aside, the trip highlighted a number of shortcomings with *Baade*'s design including a dependency on stored supplies for food and life support, a limited capability to explore systems off the planned route and a dependency on a single power supply and stutterwarp.

The *Bayern* mission was in the planning stages when *Baade* left and designs had already been drawn up on her return in 2287. Following mission debriefings from *Baade*, the *Bayern* design was expanded to include a full hydroponics and carniculture bay, addition of a secondary MHD plant, extended solar arrays and a redundant battery backup for essential systems.

The heavy, nuclear powered interstellar probes were proving to be less than reliable in testing, with barely a 40% success rate on automated missions. The AR-I issued a challenge to universities and engineering institutes to produce an autonomous interstellar probe. A team from the respected Open University Space Sciences Department in the UK produced a fuel cell equipped design using off-the shelf components which achieved remarkable success. This was also adapted to create message drones and planetary landers using a common engineering package.

At the same time the AR-I began investigating potential options for additional stutterwarp equipped ships travelling with *Bayern*. The team identified three roles required of sub-craft – a pathfinder vessel, an encounter ship and a logistics vessel. A decision had already been made to proceed with the *Entdecker*-class for the encounter ship, although this programme was facing its own challenges. Attempts to combine pathfinder and logistics functions into a single craft failed and the Polarstern Architekten design, the *Tyrker,* was also taking far longer to develop than expected.

In the meantime, deep field interferometry of the corridor to the Pleiades had revealed several potential routes to the cluster but each was dogged by at least one broken link of more than 7.7 light-years. The mission had seemed doomed until the AR-I was made aware of the advances that Hyde Dynamics had been making in constructing an operational, portable stutterwarp drive tuner. If *Bayern* had the ability to calibrate an offline drive in deep space, broken links could be crossed by discarding a fully charged stutterwarp drive and bringing an offline drive into service.

The skilled negotiators at the AR-I contacted Hyde and a mutually agreeable arrangement was made. The details of the arrangement were not made public but Hyde contributed a prototype of their new Generation 3 drive tuner. It has the reduced energy requirements of a Generation 3 tuner but is the same size as a Generation 2 tuner; a Generation 2.5, of sorts. This kind of collaboration had been unthinkable for the AR-I up until now but with one deal made, a similar arrangement was also made with Trilon. Their contribution was a wealth of personal equipment and several key systems, as well as the two outstanding sub-craft for the flotilla, the logistics vessel and the pathfinder.

What's in a name?

The *Anton Dohrn* and *George Bauer* are anomalies in the *Bayern* project naming. Most ships and probes designed for the project are named for natural forces or abstract concepts, Bayern herself aside. The two ships delivered to the AR-I by Trilon, however, are named after historical German scientists. This caused a small amount of embarrassment for the AR-I when they were questioned on why the other craft were not also honouring famous Germanic scientists such as Kepler, Herschel, Bode, Enke, Copernicus and so on.

The truth is that the AR-I was playing a delicate political game when the *Bayern* project was in its infancy. The naming of the project after Bavaria was clearly a move to garner favour but the AR-I also wanted to favour France and the other ESA members. By not undertaking a programme highlighting German accomplishments, it was much easier to selectively position the project as a being focused on Bavarian interests, French prestige or a close relationship with the ESA, depending on who the AR-I was speaking to at the time

The details of the deals have not been made public but it is assumed that in exchange for the contributions the AR-I have agreed to provide Hyde and Trilon with enhanced information regarding the surveys *Bayern* would conduct during her mission. Neither expects the data to be actionable immediately but they are prepared to play the long game. Of course, having a corporate logo in almost every piece of footage and on most of the equipment is also an incentive.

The design was finalised in 2291 and building commenced just months before the start of the German War of Reunification. Although the AR-I was an extra-national organisation, the *Bayern* was a Bavarian construction – as her name suggested. Bavaria was a close partner of France and a member of the ESA, and the AR-I had been leveraging those two advantages as much as possible; getting the best out of the ESA yards and obtaining advanced French technology for what was seen as a prestige project. After the conclusion of the war the relationship between the unified Germany and the humiliated France was much chillier, making the new affiliation with Trilon all the more important.

FORWARD HULL

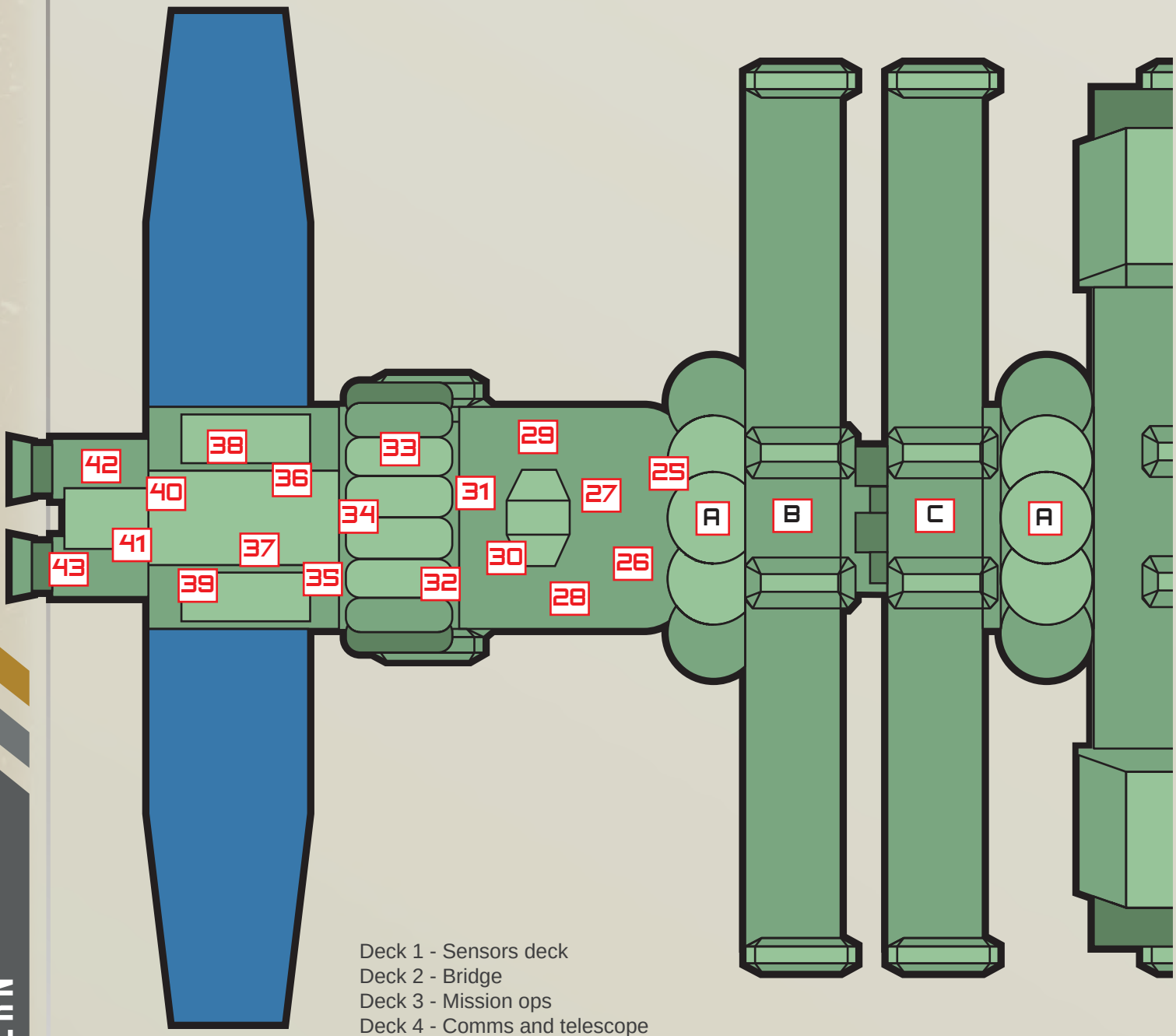
The forward hull houses *Bayern's* bridge, much of her sensor suite, her sub-craft and drone hangars, the quarantine suites and main cargo hold. The decks are arranged laterally, so if Bayern is using her nuclear thrusters, gravity is felt towards the deck. Each deck is numbered from the bow backwards towards the nuclear thrusters. It is common to consider the aft of the ship as 'down' and the bow as 'up, as if Bayern were standing on her tail.

The main structural keel of the ship runs through the forward hull from the forward engineers, all the way aft to the engineering section. Known as the core, it consists of four structural members containing feeds for power, life support and data, plus two access tubes and the core elevator system. Each core elevator is a rounded cube two metres per side. They travel via magnetic induction from the forward hull all the way down to deck 31, upper engineering. Each car can carry up to eight people at a squeeze and there are usually several active at any time. Cars travelling to the spin habitats will automatically reorient to match orientation of the destination deck.

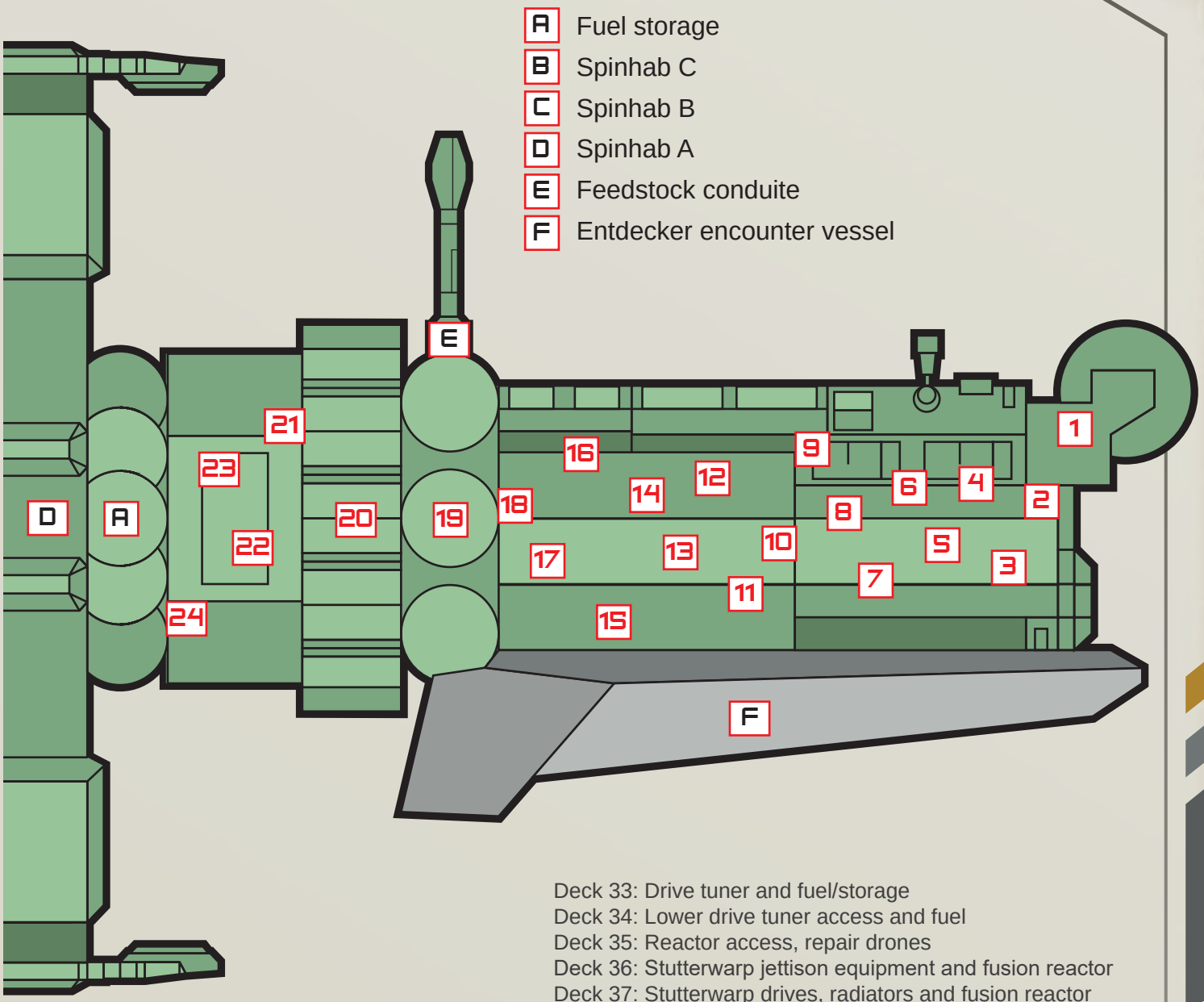
One of the most instantly recognised sections of *Bayern* is the spherical housing of her navigation systems located in the nose of the craft. This houses both the navigational sensors and part of her deep system scanners. Immediately below, or aft, of this is the observation deck and forward airlock. The observation deck consists of comfortable furnishings and snack dispensers for crew who relax in zero gravity. The hull features large, armoured windows here and there is also a small telescope for recreational use.

Immediately below the observation lounge is the primary bridge, dominated by a large holotank in the centre, with workstations arrayed around it and along the surrounding bulkheads. There are positions here for engineering monitoring, communications, flight operations and remote ops plus several spare workstations that can be tasked as required. The holotank is multipurpose and can be used to create individual screens or a large, common display. Three of the bulkheads also feature large windows which give panoramic views of space. Aft of the bridge are four one-ton lifeboats, capable of evacuating the entire bridge crew in the event of an emergency.

Below the bridge on deck three is a small galley, so crew do not have to return to the spinhabs for meals during their shifts and the mission control centre. This facility combines the functions of a tactical action



Deck 1 - Sensors deck
Deck 2 - Bridge
Deck 3 - Mission ops
Deck 4 - Comms and telescope
Deck 5 - Sensors and lifeboat bays
Deck 6 - Craft storage and astrometrics
Deck 7 - Upper Quarantine & Observation Drones
Deck 8 - Lower Quarantine & Observation Drones
Deck 9 - Lander Access, Workshop and Probe Bays
Deck 10 - Ventral Airlock and Probe Bays
Deck 11 - Ventral Cargo Lock and Probe Bays
Deck 12 - Ventral Cargo Lock and Planetary Probe Bays
Deck 13 - Planetary Probe Bays and Spaceplane Hangar
Deck 14 - Planetary Probe Bays and Spaceplane Hangar
Deck 15 - Gremlin bays and spaceplane hangar
Deck 16 - Gremlin bays and spaceplane hangar
Deck 17 - Gremlin bays and spaceplane hangar
Deck 18 - Gremlin bays and spaceplane access
Deck 19 - Life support and primary systems



A Fuel storage
B Spinhab C
C Spinhab B
D Spinhab A
E Feedstock conduite
F Entdecker encounter vessel

Deck 20 - Probe carousel
Deck 21 - Cargo bay 1
Deck 22 - Cargo bay 2
Deck 23 - Cargo bay 3
Deck 24 - Cargo bay 4
Deck 25 - Autofactory A and backup power
Deck 26 - Autofactory B and backup power
Deck 27 - Cargo bay 5
Deck 28 - Cargo bay 6
Deck 29 - Lateral grapples and Cargo bay 7
Deck 30 - EVA and core car maintenance
Deck 31 - Engineering control
Deck 32 - Upper drive tuner access and fuel

Deck 33: Drive tuner and fuel/storage
Deck 34: Lower drive tuner access and fuel
Deck 35: Reactor access, repair drones
Deck 36: Stutterwarp jettison equipment and fusion reactor
Deck 37: Stutterwarp drives, radiators and fusion reactor
Deck 38: Stutterwarp drives, radiators and fusion reactor
Deck 39: Stutterwarp drives, radiators and fusion reactor
Deck 40: Stutterwarp jettison equipment, radiators and fusion reactor
Deck 41: Reaction drive access
Deck 42: Reaction drive access
Deck 43: Reaction drive

centre, communications hub, co-ordination centre for the sensor systems and the drone and remote systems control centre. All mission data can be controlled from here, be it from ground teams, remote probes or any of *Bayern's* sub-craft. Also on Deck 3 is the main avionics control room, where all of *Bayern's* flight control systems and computers are maintained. Usually this area is not staffed, as the avionics and control systems operate automatically.

Deck 4 features the primary communications array and the optical telescope bay, as well as access into the main avionics bay. The zero-G labs found on deck 5 and 6 along with two further lifeboat bays. Deck 5 also contains the stellar cartography and navigation bays with their specialised holotanks for mapping stars and planning *Bayern's* route.

Decks seven and eight contain the eight quarantine suites. Between the eight hermetically sealed rooms there is capacity for 32 members of *Bayern's* crew to be held in isolation from the rest of the ship. A series of bulkhead doors allows the quarantine suites to be accessed from any of the sub-craft bays and hangars or the forward grapple. Likewise, a path to the core can be isolated if a crewmember needs to be transferred to the medical section. The quarantine suites are cramped and uncomfortable, with little privacy when at full capacity. The facilities are basic at best. It is mission policy to maintain and enforce quarantine aboard the flotilla ships if at all possible and usually only ground teams recovering directly aboard *Bayern* from her *Orkan* or *Kenntnis* sub-craft would use these suites. The bays for the *Kolkrabe* inspection drones are also found on these decks.

The remaining decks in *Bayern's* forward hull are arranged around the central access and loading bay for the landers and spaceplane hangars. This cavernous open space runs from frame 9 all the way back to frame 18, with retractable gantries at frames 10 and 12. The open area is designed to facilitate the loading and unloading of cargo into the spaceplanes and landers, and the large cargo lift runs on four rails in the centre of the chamber. The large cargo lift can transport palletised cargo, such a collapsible bases or ATV's, directly from storage into the holds of the sub-craft and, via the dorsal grapples, into the *Entdecker* encounter craft. When the gantries and lift are retracted this is the largest open space aboard *Bayern.*

Adjacent to the loading bay are the four sub-craft bays and hangars. With their large, external doors the two spacious hangars for the *Orkan*-class spaceplanes are easily recognisable. Ahead of these are the two more cramped bays for the *Kenntnis* landers. All hangars are served by large cargo doors into the central loading bay and smaller personnel hatches that allow for contact-free entry to the quarantine suites. *Bayern's* dorsal airlock can also be accessed from this area, along with her docking umbilicus connections. Cargo can be loaded directly from the cargo bays or palletised loads can be embarked here and transferred via the cargo lift. This area is also used for crew transfers and there is a small muster area set aside for embarking crew or for departing mission teams to assemble prior to boarding one of the sub-craft.

Mounted on decks 9 through 14 are the six silos for the *Suche* planetary landers. These silos are designed to allow the probes to be 'baked' between missions, sterilising them from contaminating alien worlds with *Bayern's* micro-organisms and likewise *Bayern* with any that might be brought back from an alien world. This capability is also built into the hangars for the *Orkan* and *Kenntnis* sub-craft. Below these are the six docks for the *Gremlin* cargo bugs.

The primary sensor systems are mounted in a pylon which extends above the forward hull on deck 6 and two lateral sensor pallets that are adjacent to the hangers. The pylon contains the primary telescope and elements of the primary DSS and advanced survey sensors. The secondary lateral sensor arrays mounted in pairs on either side of the hull and mount the secondary telescopes and further advanced survey sensors.

At the bottom of the forward hull is the docking clamp for the *Entdecker* encounter ship. The clamp is designed to allow docking to either *Entdecker*'s upper personnel hatch or the dorsal cargo hatch. The clamp also contains fuel and power hook-ups and if necessary *Entdecker* can connect its fission plant into *Bayern's* power grid.

CORE, PROBE CAROUSEL AND CARGO HOLDS

Aft of the forward hull is the primary sensors boom which works in conjunction with the sensors in the lateral pallets and secondary boom on deck 6. Also found on this deck are tanks for the fuel for the sub-craft and probes and part of the oxygen recycling systems.

Deck 20 is the probe carousel. This deck is nine metres deep and features the bays for the interstellar probes and message drones arranged radially around the core. The bays are cramped, so maintenance work is usually

completed as part of an EVA with the probe or drone outside, either floating free or in one of the spaceplane hangars if a shirtsleeves environment is required. Part of *Bayern's* magnetic shielding system, designed to provide protection for the ship from high energy cosmic rays, is also mounted here.

Immediately behind the probe bay are the primary cargo bays. These four decks can be reconfigured into one large cargo hold if required but are usually divided into four separate levels. Both the core cars and cargo elevator stop at each level, and palletised cargo can easily be loaded into the lift. The forward cargo bays are used for the storage of mission related items. *Bayern* carries an extensive stock of exploration equipment and several vehicles including ATV's and hover jeeps. A hydrogen-powered microlight aircraft is also stored here in a disassembled form. As well as exploration equipment there is also a section set aside for a zero-G gymnasium and the ship's emergency stores of preserved food are spread amongst the cargo holds. A loading arm runs on a track around the inside of each level and can reach any point in the hold.

SPIN HABITATS

All of *Bayern*'s spin habitats have a radius of 40.5 metres and rotate at a comfortable 4 rpm, which gives a simulated gravity of 0.8 G. The spin/de-spin, de-coupler machinery and twin counterweight wheels are all found in *Bayern*'s core adjacent to the transfer hub. Core cars can transit directly into the spin habitats by passing through the transit hub and into the arms that connect the rings to the hull. The core continues unbroken through each spin hub and the habitats rotate on magnetic bearings.

In the event of breakdown in the core car system there are two access shafts that run parallel to the core. These also open into the transfer hub and a second set of access shafts run down each spoke. These access shafts are not typically used whilst the core car system is operational.

Situated between the spinhabs are four fuel storage decks. Each of these consists of eight fuel tanks and the pumping machinery to support them. The fuel from these tanks is typically used to support the probes, drones and small craft in the forward hangar bays.

Spin Habitat A

Spin Habitat A houses all non-accommodation areas under spin. This includes the labs, berths for the *Schutz* CCV, medical facilities, extended life support and recreation spaces. On the outer hull of the ring are mounted the two Skysweep sensor booms, eight lifeboats and the primary solar panels.

The eight lifeboats are mounted around the rim of the ring 'below' the floor of the habitat. Each pair is located in the core car foyer along with the emergency spoke access. In addition, blow-away panels also allow the core cars to be used as short term life pods. Each can support eight people, at a squeeze, for four hours.

The life support bays are split between hydroponics and carniculture systems. The hydroponics bays produce a variety of crops including beans, radishes, strawberries, melons, onions, various green leafy vegetables such as Chinese cabbage and lettuce, peppers, herbs and sweet potatoes. The use of advanced aquaculture techniques also means that several species of aquatic creatures can be farmed including tilapia, catfish and crayfish. The hydroponics bays also feature some of *Bayern's* waste recycling systems and are an important part of oxygen replenishment aboard the ship. Although *Bayern* does have sufficient life support machinery to recycle the atmosphere for the whole crew, the hydroponics bay means that the load on the artificial systems is significantly reduced. The constant flow of air through the bays, along with the daylight lamps and softly gurgling water make the hydroponics bays a welcome relief and reminder of being outside on a planet's surface; crewmembers can often be found strolling in the bays while off duty.

In a contrast to the vibrant hydroponics bays, the carniculture bays are a stark and clinical environment. Each bay consists of racks of gleaming, stainless propagation tanks. The tanks are hooked up to individual life support units and fed nutrient rich medium through a network of pipes, whilst electrodes stimulate the artificial flesh. Despite the bays' cleanliness, there is an ever present, sickly sweet aroma of the nutrient medium which many people find unpleasant. It is rare to find a crewmember here that is not performing an essential task. The meat produced by the carniculture vats is palatable and nutritious but many diners feel it lacks the full flavours of animal-grown meat. Eventually the crew on the *Bayern* will come to refer to the meat not as beef or chicken or pork, but as red, white and pink, reflecting the general lack of distinctive flavour. Attempting to devise recipes that make best use of the meat and maximise flavour will become a common pastime for crewmembers with culinary skills.

The medical centre consists of a pair of operating theatres, two recovery wards and four general med bays adjacent to one of the spoke access areas. The

spoke lobby also contains access to *Bayern*'s four automed units and its use is restricted to medical personnel alone. *Bayern* is equipped with the most advanced medical facilities and the small but well stocked medical centre can perform virtually any surgery that could be conducted in a modern hospital. The biggest limitation is bed space; with limited recovery beds available, a major incident could require crew with minor injuries to be treated in their cabins.

The four CCV berths are usually off limits to unauthorised staff. The *Shutz* Cryogenic Containment Vessels are mounted below the hull and access is through a floor hatch that mates with the *Schutz* top hatch. Cryonic technology is still an inexact science and injuries, although rare, are not impossible. *Bayern's* cryonic technology uses that latest advances to chill the body and buffer the cells against the damage that reducing the temperature can cause. A crew member in one of *Bayern*'s cryotubes will not be completely frozen but their body temperature is reduced to a very low level and their blood is replaced with an oxygenating chemical mix that prevents both ischemic trauma and low temperature necrosis, whilst preventing intracellular ice formation and keeping tissues oxygenated.

Spinhab A also features *Bayern's* library. A selection of hardcopy books are kept here, along with data slates, portacomps and terminals which can all access or download books from *Bayern*'s comprehensive library. The library features a number of comfortable tables and leather bound chairs. The walls have been panelled in simulated wood and the shelves are actual library shelves from some of the foremost libraries on Earth, including the British Library, Library of Congress, Trinity Library, Heidelberg Library and Bibliothéque National de France. Each shelf has a small dedication plaque at the end and been carefully chosen to complement the others and conform to the aesthetic in the room. The overall effect is that of a quiet air of studious contemplation that could be found in any university or library.

Bayern's science labs are split between four sections of the spinhab. Each section can be isolated and has independent life support in the event of contamination of some kind. *Bayern* has a full suite of labs with space for each of her scientist crew and the scientists from the sub-craft. There are a mix of specialist labs, multipurpose labs and large, collaborative workspaces. The equipment mounted in the labs is the most advanced that the AR-I could find and provide DM+2 to checks related to the science field the lab is geared towards. Several labs are also outfitted for sample storage and live capture of small life forms. Those labs also feature burn buttons and refuges in the event of any accidental escape or exposure.

Also found in the A ring are the galley, theatres, briefing rooms, armoury, offices and exercise equipment. The galley features seating for 44 under normal circumstances but it could hold all of the expedition's crew if required. The kitchen area features a fully stocked food preparation area as well as cold storage and a walk in-fridge for fresh produce from the carniculture and hydroponics bays. Christa the robot is often found here with one or more of the support staff preparing meals, especially as more of the crew are awakened. Other crewmembers are encouraged to volunteer their services as chef.

Pre-packaged meals are always available and the crew have a wide selection of fresh and preserved ingredients to choose from if they prefer to prepare their own meals. There is almost always a set menu available that usually consists of salads, soups and one-pot recipes such as chilli, curries, casseroles and so on that can be eaten with reconstituted pasta or rice. The medical team are careful to ensure that the menus are nutritionally balanced and include the vitamins and minerals required by the crew. Naturally, coffee is always available.

Each theatre can seat 30 comfortably or 50 in somewhat cramped conditions. The theatres feature full projection systems and are often used to give briefings and lectures. They can also be used to show movies and the ship's library contains an extensive database.

The briefing rooms feature large, interactive hologram tanks suitable for presentation and strategy, and can, in a pinch, be reconfigured to run the ship's systems at DM-2 to any check attempted. The nearby offices are general purpose rooms that can be adapted to different functions.

The armoury is restricted to authorised personnel only and access can be granted only by the captain, commanders of the sub-craft, first officer and groundside security officer. *Bayern*'s small store of weapons is kept here, along with any personal weapons brought on board. Thomas Austin Ferris takes regular inventory and ensures the weapons are in good working order at all times.

Although *Bayern* features artificial gravity, crew health is still of paramount importance and regular exercise is a vital part of that. Bayern features a fully stocked gym featuring cardio, weights, cross-fit and resistance

machines designed to ensure that the crew are kept strong and fit. Resistance and weight machines ensure muscle tone is retained even in the lower 0.65 G of *Bayern's* spin habitats. Regular exercise is considered a part of the crew's duties and regularly skipping sessions in the gym is a disciplinary matter.

Spin Habitats B and C

The remaining spin habitats are given over to the crew's living quarters and recreation. There are 192 standard cabins split equally between rings B and C. Each ring also features four large lounges for crew recreation.

A standard cabin on board *Bayern* consists of a comfortable but compact living area with plenty of hidden storage. Each cabin is fitted with a comfortable bed, a second-fold down bunk, desk with computer terminal, fresher, entertainment unit and personal storage. Since there are not sufficient cabins aboard *Bayern* for all the crew to have one each once they are all roused from cryosleep, the second bed allows the cabin to be converted to double occupancy whilst the full crew is active. This situation only really becomes an issue as *Bayern* approaches the Pleiades and additional crew are roused from cryosleep.

The lounges are split into smaller areas known as informal lounges, which provide a break-out space and access to the core cars and lifeboats with a small kitchen. The slightly larger recreation lounges feature either a small multipurpose room that can be partitioned off from the larger space, or a comfortable seating area with entertainment systems. Both also provide access to the core car system and the lifeboats. All lounges feature freshers and a small utility area for domestic tasks and laundry, decorated in soft, relaxing colours and will be personalised and customised as the mission progresses. Each will be informally named by the crew and then decorated according to a theme, such as the Underwater Lounge after a member of the crew constructs a fish tank in one of the lounges as a personal project and transplants fish from the aquaponics bay.

GRAPPLES AND PROCESSING

The next section of hull aft of the spinhabs is given over to many of *Bayern's* secondary and logistical systems. Decks 25 and 26 house the backup power system; a powerful MHD turbine that can be used to supply power in the event that *Bayern*'s fusion plant is unavailable. Housed alongside is *Bayern*'s fuel processing plant. Also found on these decks are two of *Bayern*'s workshops and the autofactories capable of producing replacement parts, components and even entire assemblies if required. *Bayern* carries blueprints for almost every part of the ship and the two autofactories will be used to create spare parts and replacements for equipment lost or consumed during the voyage.

The autofactories and fuel processor are fed by access tubes that run through the cargo decks on levels 27, 28 and 29. These bays are segregated into hoppers for raw materials and loading arms are able to change the hoppers to deliver the right raw materials to the fuel processor and autofactories.

Deck 29, as well as containing part of the lower cargo bays, also houses the lateral grapples. These are designed to accommodate the *Anton Dohrn* and *George Bauer* and mate with the forward EVA room. The arms and docking mechanisms have sufficient clearance and built-in dampers to allow vessels to continue to use their partially retracted spin habitats whilst grappled to *Bayern*, increasing crew comfort. The grapples also include power and fuel linkages, allowing ships to be refuelled and draw on or supplement *Bayern*'s power grid. The forward face of each grapple also includes part of an interferometer sensor system that uses the widely spaced grapples to simulate a much larger sensor system.

Deck 30 is *Bayern*'s primary EVA deck. The upper repair drone racks can be found here, along with the two EVA airlocks, suit racks and storage lockers. This is also the storage and maintenance level for the core cars. Deck 31 features the lower engineering control, reactor

control rooms, engineering storage and further repair drone racks and battery backups. The reactor control rooms are responsible for monitoring the performance of the fusion reactor and *Bayern*'s power systems, adjusting and distributing power as required. Only one control room is usually required and the other is usually reserved as a backup bridge in case of emergency. This is the furthest aft commonly manned during normal ship operations and the core tracks do not proceed any further aft of this point. Two *Solar-10* lifeboats are also mounted here for the engineering crew's use. Access to the lower engineering decks is via four access tubes which run alongside the drive tuner.

POWER AND DRIVES

The final section of *Bayern* is her drives and power plant, consisting of the stutterwarp tuner, fusion plant, stutterwarp drives, radiator fins and nuclear thrusters.

Below the engineering control deck is the drive tuner, surrounded by eight fuel tanks for the nuclear thrusters and as a reserve for the backup power plant. The drive tuner is an experimental device donated by Hyde Dynamics which allows a Jerome Effect stutterwarp drive to be brought online and calibrated in deep space. Calibration of a stutterwarp drive is usually a trivial task when the drive is in the stressed space produced by a gravity well of more than 0.0001 G. However, as gravity falls below this threshold, calibrating the drive had previously been impossible. The drive tuner uses a series of delicately balanced components held in a high quality vacuum chamber and magnetic suspension to map minute gravimetric fluctuations around the offline drive which are required to integrate the Jerome Effect field to surrounding space. Once local fluctuations are mapped, the drive tuner is able to build a very precise set of parameters which can be used to calibrate the stutterwarp and align internal components and the Jerome field correctly.

Aft of the drive tuner is the massive fusion reactor chamber and its giant radiator fins. Access to the reactor compartments is through deck 39. Access hatches in the deck allow entry into the reactor housing and the reactor core access chamber allows entry into the interior of the fusion reactor containment vessel. The areas within the reactor are intensely radioactive, due to residual neutron bombardment and are completely inaccessible whilst the rectors are running. Radiation suits and protective clothing are kept in storage lockers on deck 39. Further repair drone racks and emergency power cells are located on this deck. The power cells here are usually used as a buffer to smooth the flow of power from the fusion reactor and can also be used to jump start the fusion processes during reactor start-up. There are also four secondary access airlocks on this deck but they are rarely used.

Aft of the control rooms is the reactor vessel itself. Over 20 metres long and nearly 18 metres in diameter, the fusion plant features three fusion reactors, partly to keep the assemblies a manageable size and partly for redundancy. Two of the reactors are spherical Tokomak reactors and one is a ring Tokomak. The reactors are all triple phase Tokomak reactors with a plasma-dynamic electron tap that converts the drive plasma directly to electricity. An induction loop MHD turbine is also built into the reactor to use the fusing plasma as a drive fluid to act as a secondary power tap but its primary purpose is to assist in constricting and accelerating the fusion plasma flow during reactor start-up following a quench. Also located here is the primary power distribution systems, tied into conduits linking to *Bayern's* core and the rest of the ship.

Also found in the drive section are the four Jerome Effect stutterwarp drives. *Bayern*'s powerful drives are mounted in cradles along the inner hull of the reactor section and the hull is designed to hinge open to allow cores to be jettisoned. The drives are exposed along their full length in the rector hull which eases maintenance in microgravity. Each can be used to propel the *Bayern* but usually only one drive is online at any time.

The radiator fins project well away from *Bayern*'s hull and use an exotic mix of metals and salts to transmit heat away from the hull. These panels are especially vulnerable to micrometeorite damage due to their delicate structure, so there is almost always one or two of the crab-like repair drones crawling over the fins.

The final section of *Bayern*'s hull is the nuclear thruster assembly at the tail end of the starship. Reaction drives for space travel are all but obsolete in the era of stutterwarp but *Bayern*'s designers recognised that there are still some things that require them. The nuclear thruster design is a simple one, descended from the NERVA engines of hundreds of years ago. Hydrogen fuel is passed through the reactor chamber in a low pressure magnetic bypass loop. It begins fusing into plasma and is directed towards a combustion chamber, where it mixes with more hydrogen to produce a very high temperature and velocity exhaust which is used for thrust. The thruster assembly is used rarely and the inspection spaces become hazardous due to temperature and radiation flux whilst the drive is operational.

POLARSTERN ARCHITEKTENAR-I *BAYERN* LONG RANGE EXPLORER

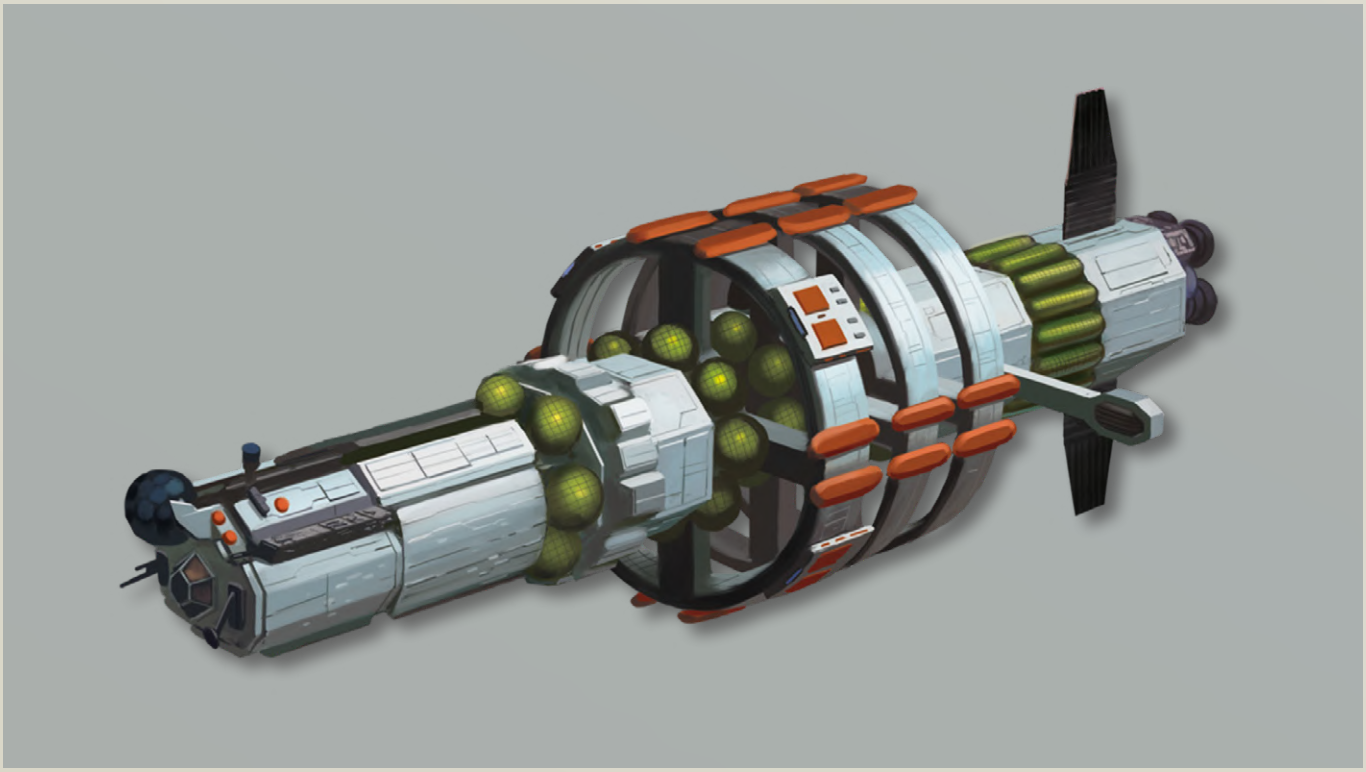
NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2292
MANUFACTURER: POLARSTERN ARCHITEKTEN
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 1,534 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 1
LENGTH: 233.25 M
WIDTH: 85.8 M
LAUNCH MASS (FULLY FUELLED): 57,600.25 TONS
POWER PLANT: 2 X TRILON ASTR-15 150 MW FUSION REACTOR, TRILON ARTR-9 90 MW FUSION REACTOR, BMFP AEROSPACE GMBH MT-18, 18 MW MHD TURBINE, 12 MW SOLAR ARRAY
REACTION DRIVE: BMFP AEROSPACE GMBH JUPITER NTS, 170,000 TONS THRUST
STUTTERWARP: 4 X HYDE DYNAMICS RD-128, 76 MW GEN II JEROME-EFFECT STUTTERWARP

Power Requirements	Power
Basic Ship Systems	57.5
Reaction Drive	575
Stutterwarp	760
Fuel Processor	750
Sensors	109
UNREP system	30
Advanced, Extended Life Support	1.5
Autofactories	40

Running Costs

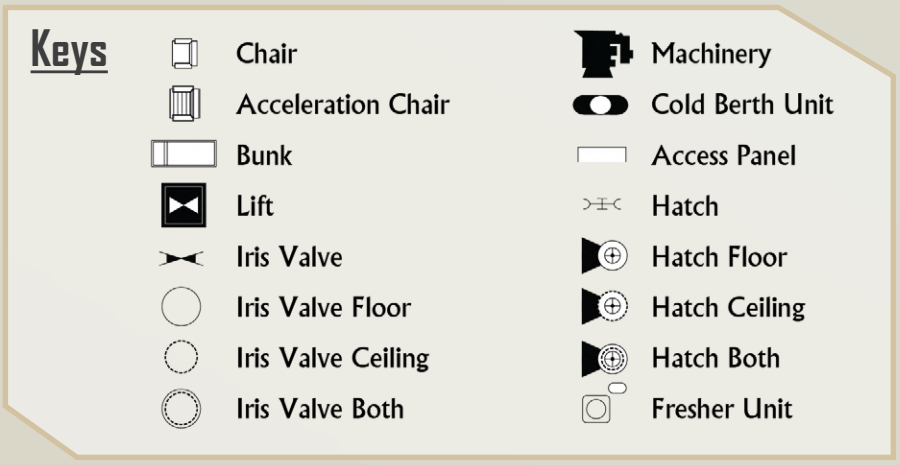
Maintenance Cost: Lv208,308.08/month
Purchase Cost: MLv2499.6

Crew	Passengers	Hull Points	Signature
Captain, Executive Officer, Bridge Officers x 4, Astrogators x 2, Flight Engineers x 2, Pilots x 2, Sensor Techs x 4, Reaction Drive Engineers x 2, Stutterwarp Engineers x 2, Power Engineers x 33, Life Support x 5, Medical x 6, Press x 5, Support x 5, Scientists x 54, EVA x 6, Small Craft Pilots x 4, Small Craft and Drone Techs x 17, Passengers (flotilla craft crew) x 77	16 Comfort +2	690	Base Reflected: 7 Base Radiated: 4

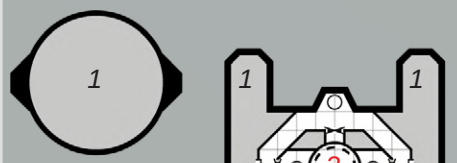


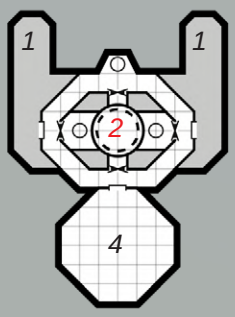
TL12		Tons	Cost (MCr)
Hull	5,750 ton Synthetic Spaceframe	—	138
Hull Features	Advanced Radiation Shielding Efficient Tough	— — — —	201.25
Reaction Drive	Nuclear OMS Thruster (advanced)	155.25	345
Stutterwarp 1	2.51 ly/day	13	64.98
Stutterwarp 2	2.51 ly/day	13	64.98
Stutterwarp 3	2.51 ly/day	13	64.98
Stutterwarp 4	2.51 ly/day	13	64.98
Drive Tuner	Gen 2.5	74.98	74.98
Power Plant	Fusion (advanced), Power 1500 Fusion (advanced), Power 1500 Fusion (advanced), Power 900 MHD Turbine (advanced), Power 180 Solar Panels x 20, Power 120	100 100 60 15 —	120 120 72 8.25 6
Emergency Power	Batteries 2, 760 Power/hours	2.76	2.76
Fuel Tanks	Nuclear OMS Thruster (6 Burns) MHD Power Plant (14 days) Sub-craft Storage	310.5 90.72 400	— — —
Fuel Processing	27 tons per day	75	150
Radiators	ADHR, Capacity 3,900	195	97.5
Bridge	Full Bridge, Neural Link Backup Bridge/Engineering Control, Neural Link	60 40	43.5 32.65
Computer	Primary: Core/50fib Secondary: Computer/35fib Tertiary: Computer/35fib Science Core: Core/40fib Aristotle: Core/40	— — — — —	52.5 30 30 48.75 32.5
Sensors	Military Sensors (very advanced) DSS x 4 Extended Survey Sensors (advanced) x 6 GADS Telescopes x 3 Signal Processing x 2 Long Range Laser Comms x 2	5 8 90 1.3 6 4 4	4 6 18 6.6 1.5 16 10

TL12		Tons	Cost (MCr)
Drone Controllers		2	1
Systems	Under Spin: Freshers x 16, 20 person Theatres x 2, Armoury, 4-person Briefing Rooms x 2, 40 Person Galley and Full Galley, 30 Person Exercise Space, General Science Labs x 45, Libraries x 4, Medbays x 4, Operating Theatres x 2, 8-bed Recovery Wards x 4, Static Automeds x 4, Recreation Space (384 tons), Offices x 4, Advanced Extended Life Support and Backup, Safety Lockers Freshers x 10, 10 ton/hour UNREP Systems x 3, Autofactories x 2, Workshops x 4, Repair Drones x 50, Inspection Drones x 20, Grappling Arms x 4, Loading Arms x 2, Cargo Arms x 2, Safety Lockers	1,022.75	248.265
Sub-craft	400 ton Magnetic Slings x 3, Gremlin Berths x 6, 50 ton Full Hangars (spaceplane) x 2, 50 ton Close Hangars (lander) x 2, Planetary Drone Berths x 6, Interplanetary Drone Berths x 6, Message Drone Berths x 12, 10 ton Lifeboat Bays x 26, 1 ton Lifeboat Bays x 6, CCV Berths x 4	1,358	109.28
Airlocks	Standard Airlocks x 7, Large Cargo Airlock, Large Cargo Doors x 6, Docking Collars x 4	12	0.12
Accommodations	Under Spin: Staterooms x 192 Quarantine Suites x 8	768 32	96 4
Artificial Gravity	Double Hull (1,871 tons under spin) Radius 45 m, 3.5 rpm, 0.65 G Spin Up/Down 39 minutes	93.55	18.71
Software	Archive, Auto Repair/2, Intellect, Manoeuvre, Stutterwarp Control, Neural Interface, Security/3, Aristotle, Expert Science Systems	—	73.2
Life Support Consumables		81.03	—
Cargo		531.18	—
Total: MLv2499.6			

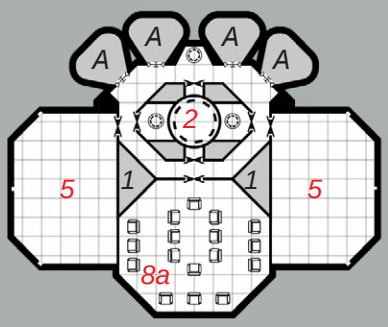


A. Lifeboat





Deck 1



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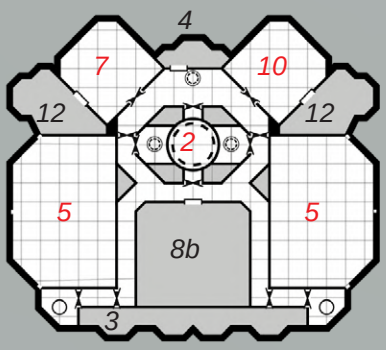

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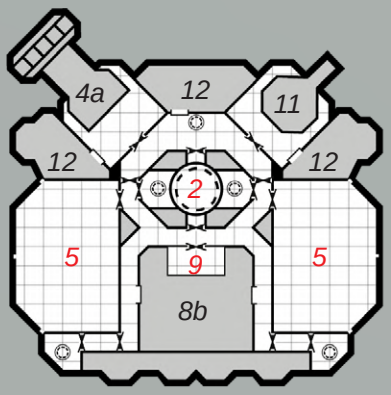

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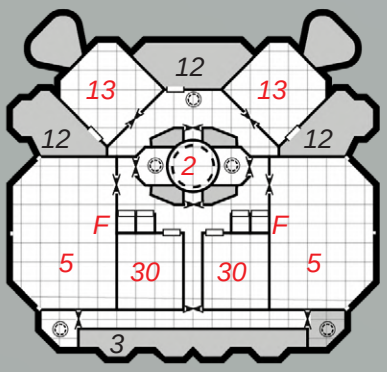

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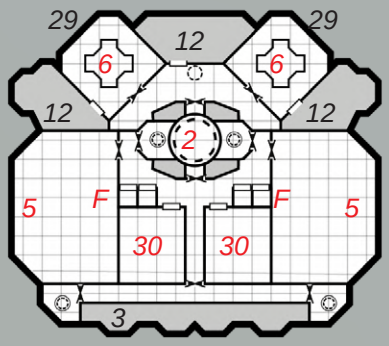
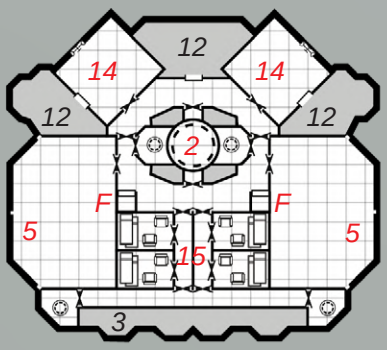
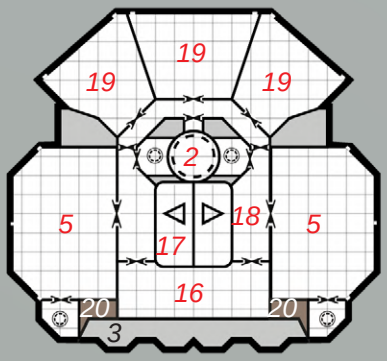


Deck 6

F. Fresher



Deck 7 & 8



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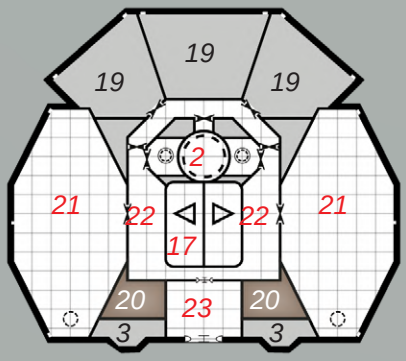

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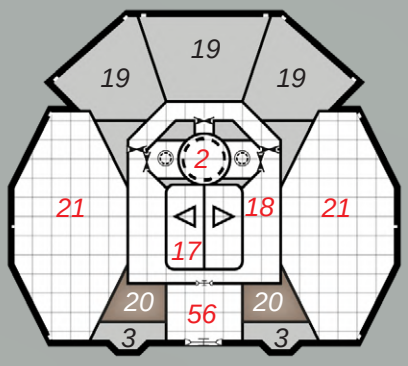

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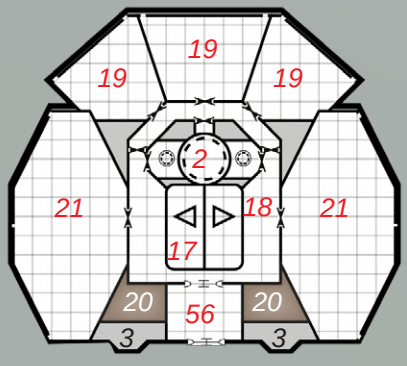
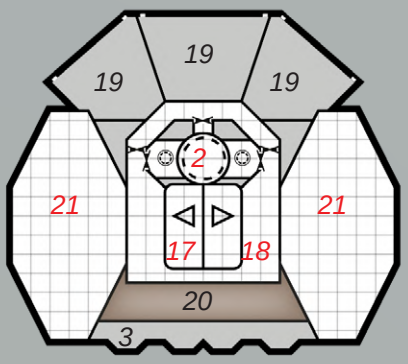


Deck 12

1. Sensor globe
2. Core
3. Magnetic sling
4. Observation deck
5. Lander bay
6. Holotank
7. Forward galley
8a. Bridge
8b. Avionics bay
9. Engineering control
10. Mission ops
11. Telescope bay
12. Extended survey sensors



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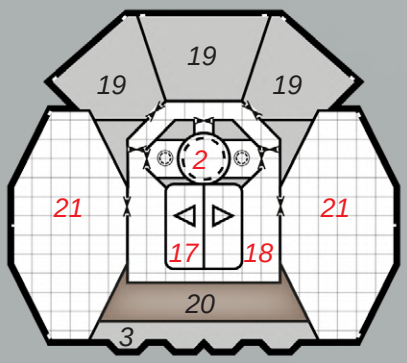

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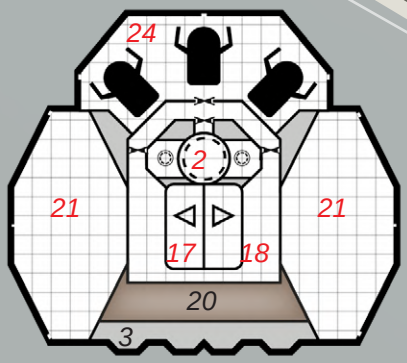

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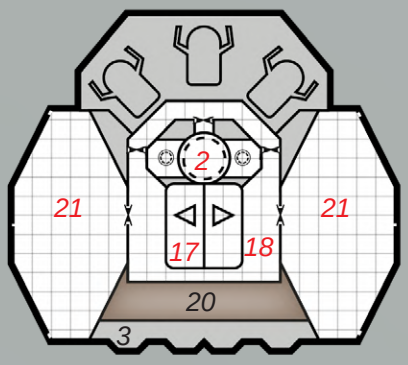

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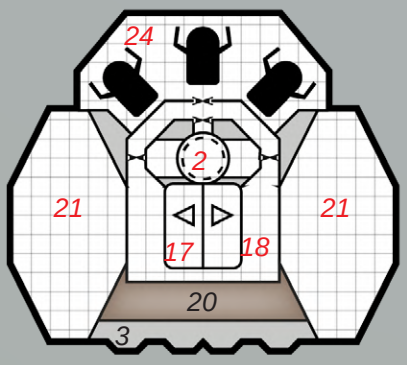
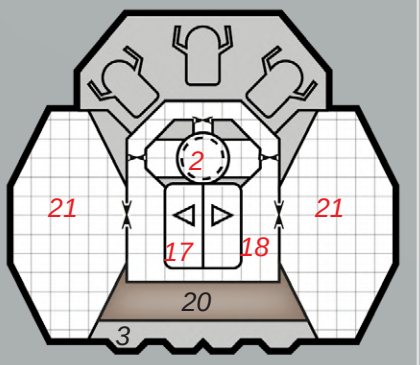


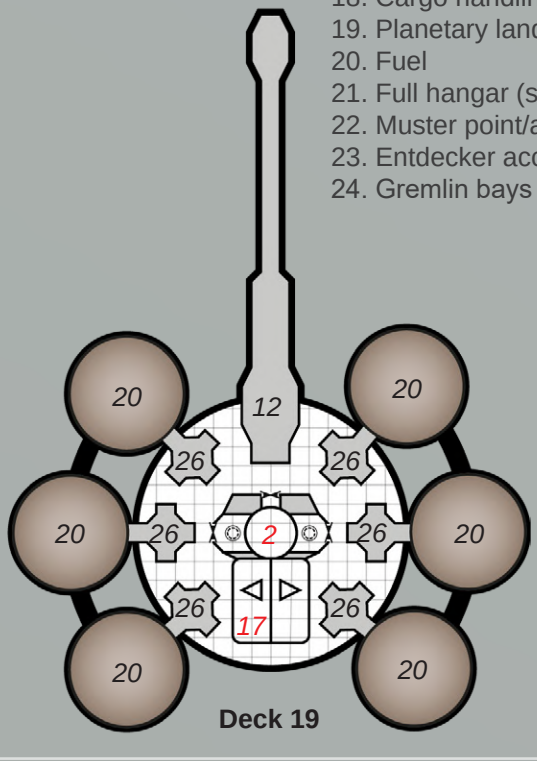
Deck 17



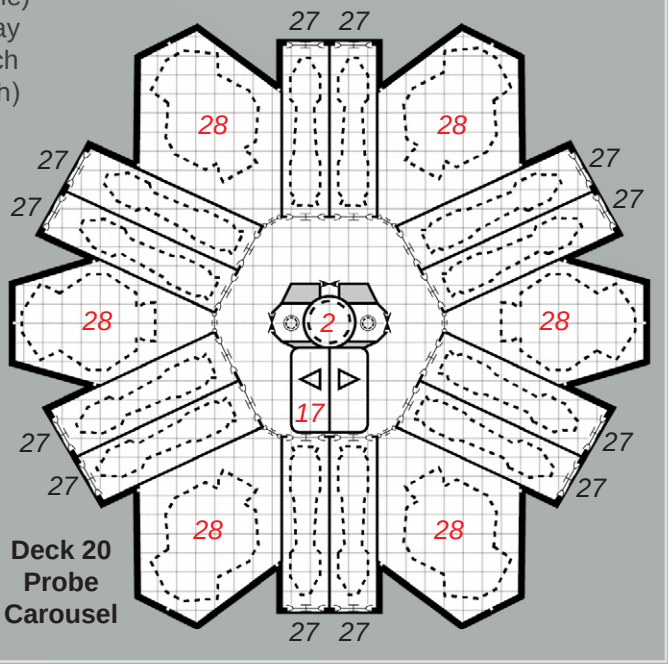
Deck 18

13. Lifeboat bay
14. Drones
15. Quarantine areas
16. Workshops
17. Cargo lift
18. Cargo handling area (30 m high)
19. Planetary lander berth (9 m high)
20. Fuel
21. Full hangar (spaceplane)
22. Muster point/accessway
23. Entdecker access hatch
24. Gremlin bays (6 m high)

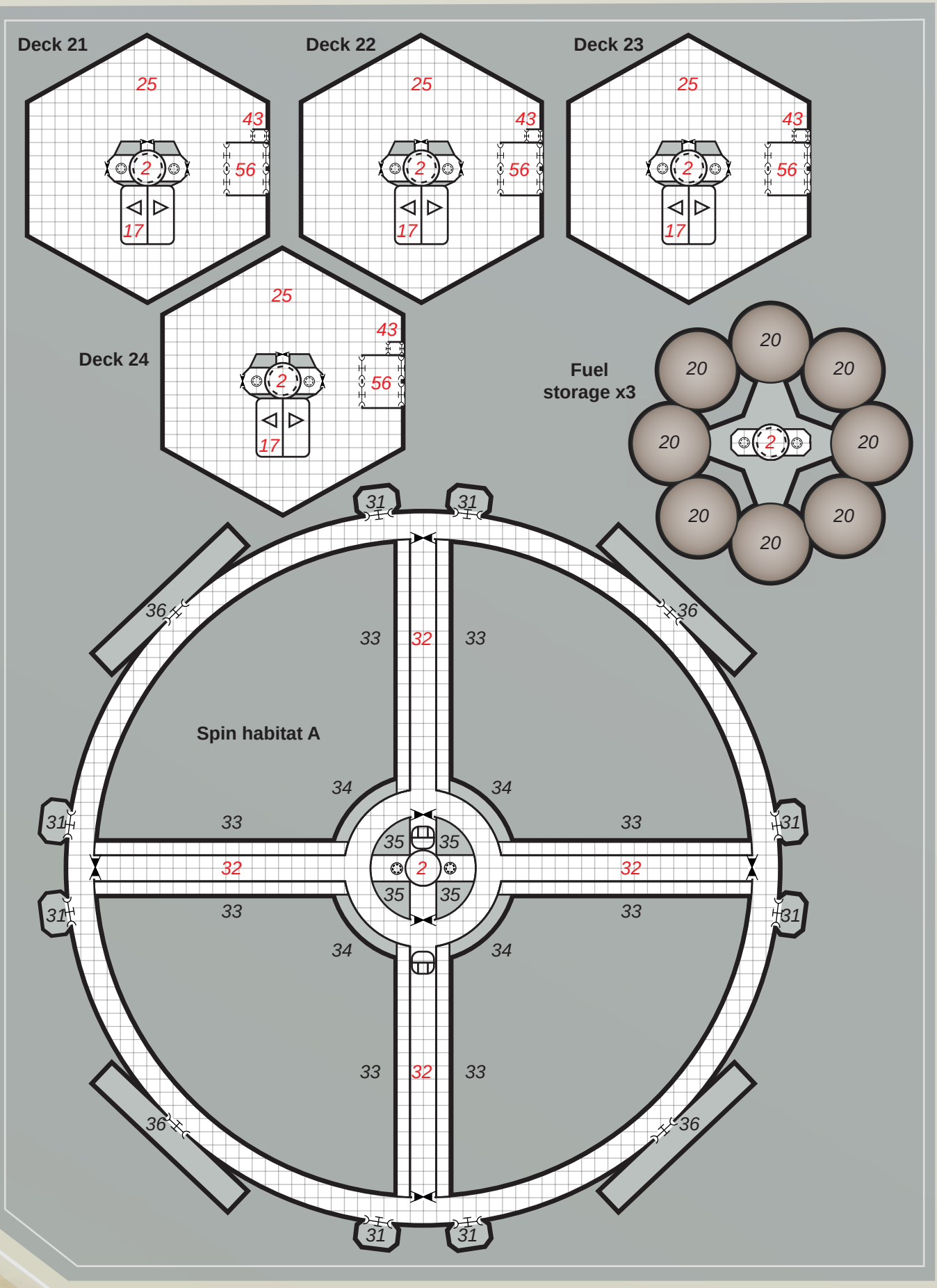
25. Cargo bay
26. Fuel processor
27. Message drone berth (6 m high)
28. Interstellar probe bay (9 m high)
29. Lifeboat
30. Zero-G labs
31. Lifeboat bay



Deck 19



Deck 20
Probe
Carousel


Deck 21
Deck 22
Deck 23
Deck 24
25
43
56
2
17
Fuel storage x3
20
Spin habitat A
31
32
33
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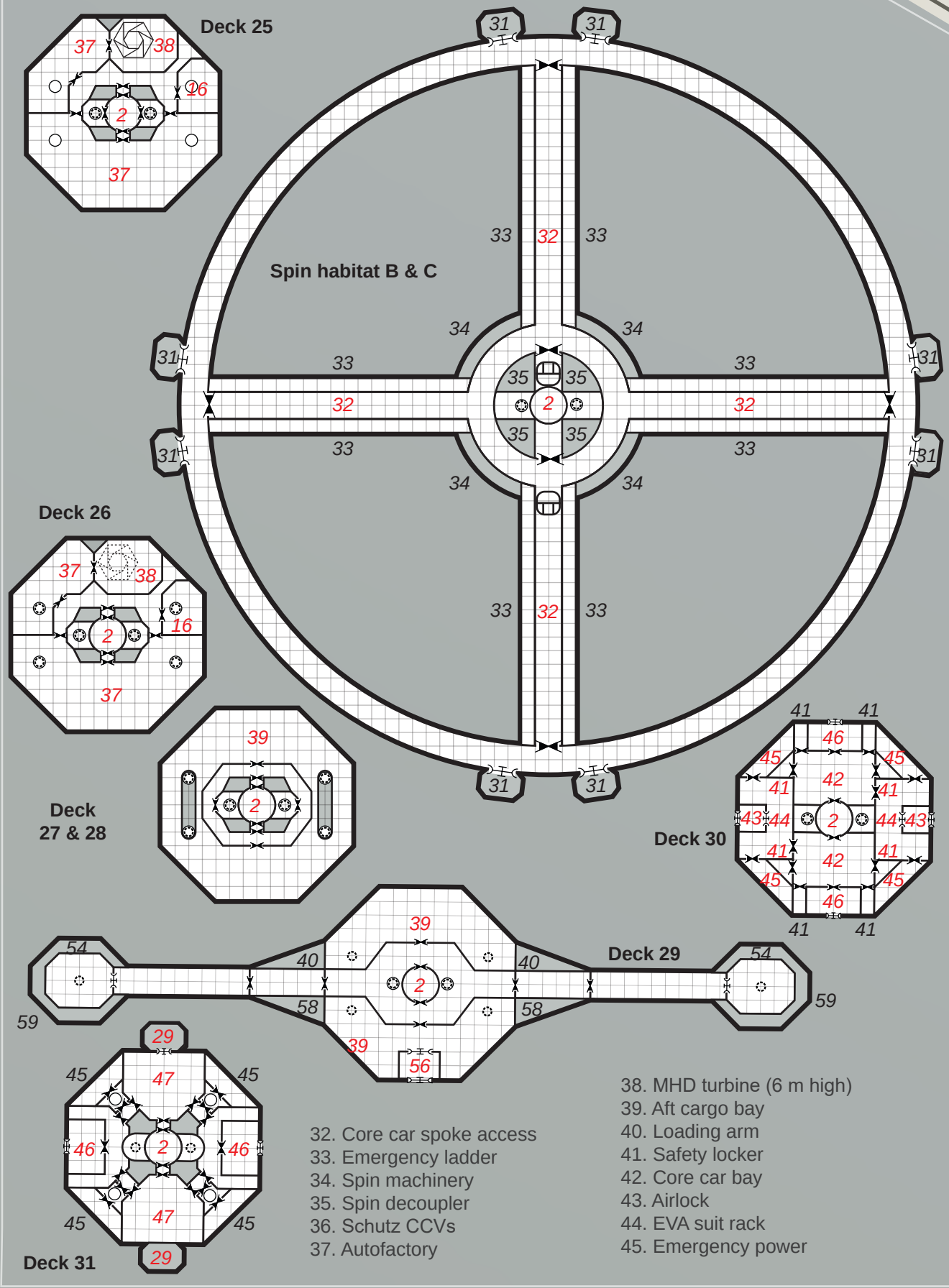
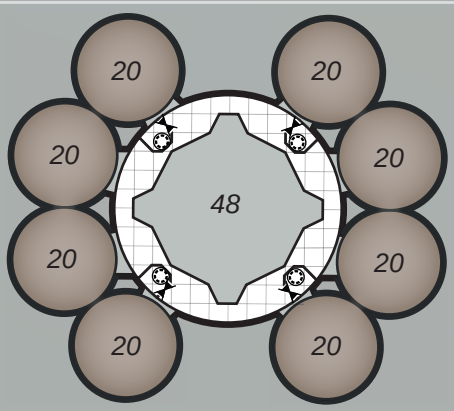


32. Core car spoke access
33. Emergency ladder
34. Spin machinery
35. Spin decoupler
36. Schutz CCVs
37. Autofactory
38. MHD turbine (6 m high)
39. Aft cargo bay
40. Loading arm
41. Safety locker
42. Core car bay
43. Airlock
44. EVA suit rack
45. Emergency power



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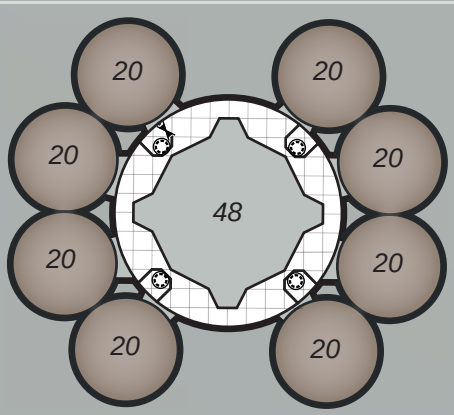

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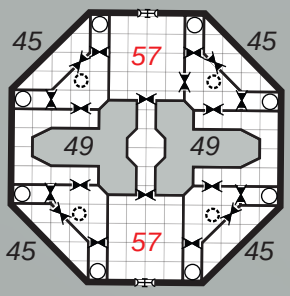

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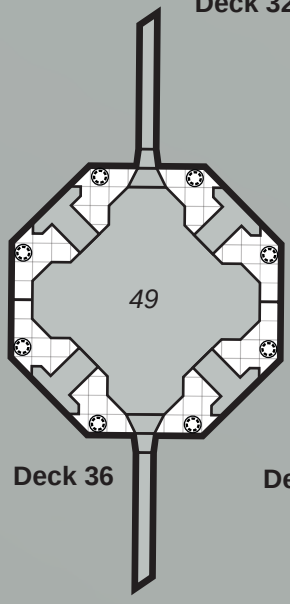

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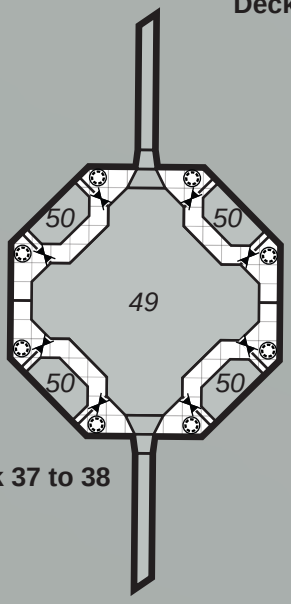
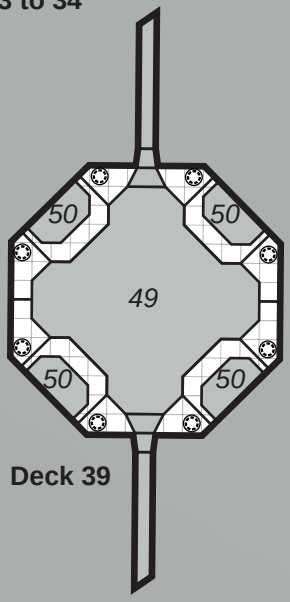


Deck 37 to 38



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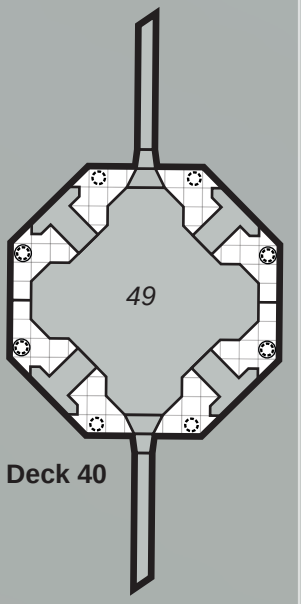

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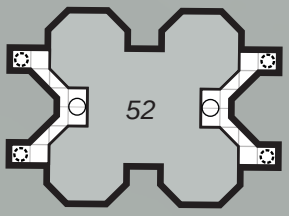

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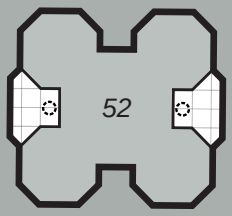

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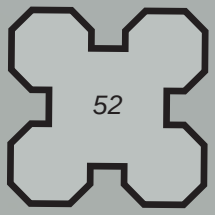
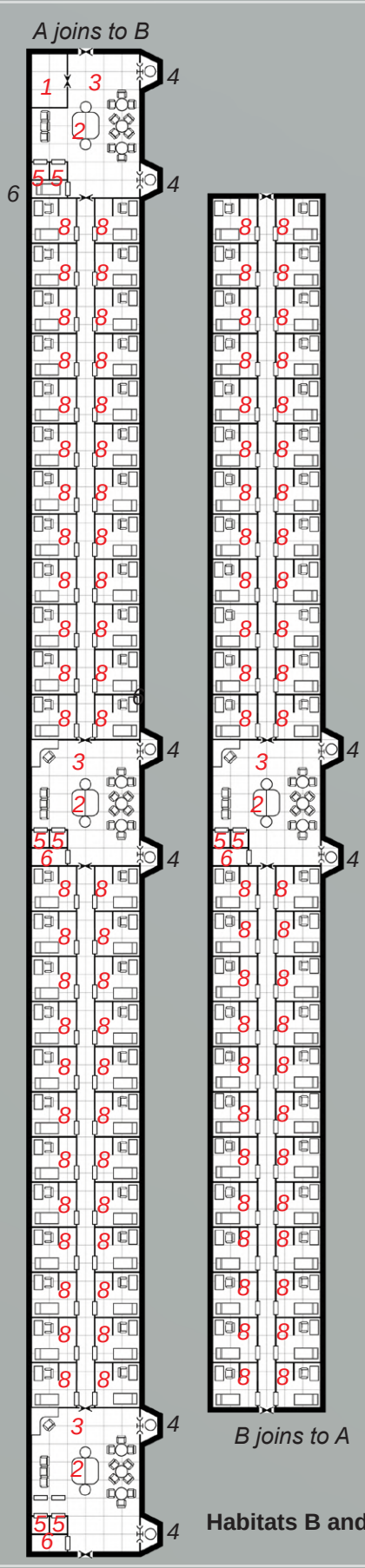


Deck 43

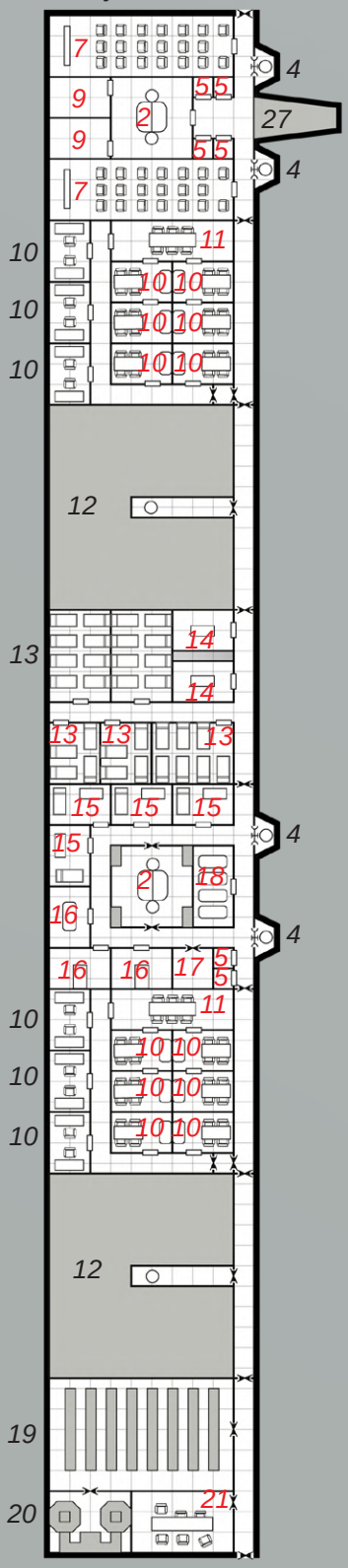
46. Repair drones
47. Engineering control room
48. Stutterwarp drive tuner
49. Fusion reactor
50. Stutterwarp drive
51. Radiators
52. Nuclear thruster
53. Accessway
54. UNREP system
55. Large cargo airlock
56. Large cargo door
57. Inspection drones
58. Cargo arm
59. Lateral grapples

SPIN HABITATS

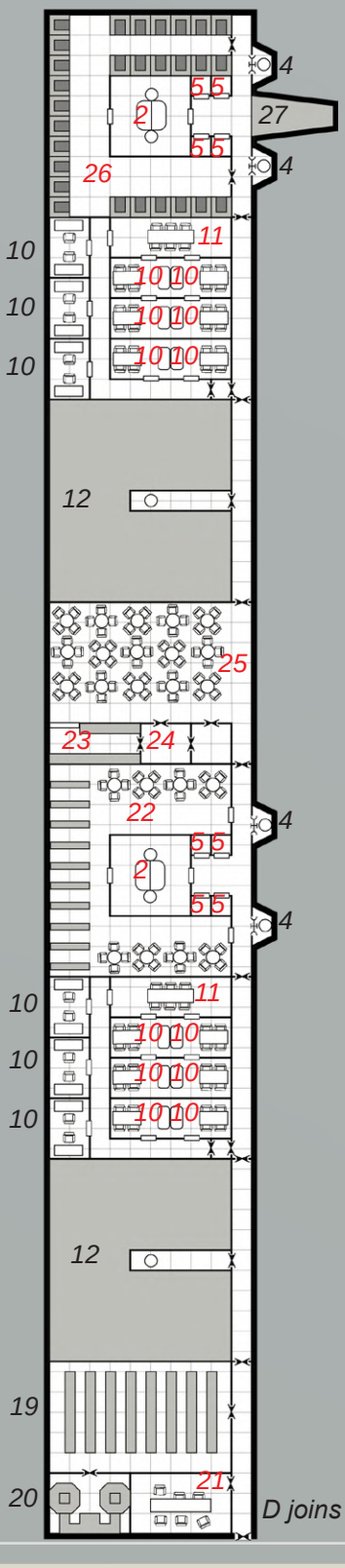
1. Multi-purpose space
2. Core
3. Lounge and lifeboat access
4. Lifeboat access
5. Fresher
6. Automed
7. Theatre
8. Small stateroom
9. Office
10. Laboratory
11. Briefing room
12. CCV docking and support equipment
13. Recovery ward
14. Operating theatre
15. Medbay
16. Office
17. Armoury
18. Automed bay
19. Hydroponics bay
20. Carniculture bay
21. Briefing room
22. Library
23. Kitchen
24. Food storage
25. Galley
26. Gymnasium
27. Skysweep sensors



Habitats B and C



Habitats A



LIFE ABOARD *BAYERN*

Although the designers of *Bayern* have done what they can to make the crew as comfortable as possible during their trip to the Pleiades, it is impossible to wholly escape the problems inherent in such a voyage.

Perhaps the most difficult aspect of life aboard a starship is lack of free space. When only the flight crew is active, *Bayern* is spacious enough but when the ship is engaged in scientific studies, and the entire crew has been revived from cryogenic suspension, it becomes quite crowded. Areas once open and seldom used will become packed with people and it will be difficult for anyone to find a place of total solitude.

Another important aspect to consider is the fact that there will be no shore leaves for quite some time. Only if *Bayern* were to come across an environment which seemed to be totally free of hazards would Captain Schmidt even consider allowing nonessential crew to join a landing team. As such, those aboard *Bayern* are certain to develop a sense of 'cabin fever'. *Bayern's* computer has a complete library of entertainment software and is constantly at work creating new and better versions of favourite programmes while eliminating older, unused ones. In a sense, it might be thought of as a constantly revised video arcade which has a steady supply of original and unusual games. In addition, the crew of *Bayern* has several professional and amateur artists who try to keep up morale with shows and exhibitions. A number of the ship's company even plan on forming a small theatre group to stage shows for everyone.

Continuing education is also considered important by the sponsors of the mission. Throughout the entire voyage, classes in various subjects ranging from astrophysics to Zen will be taught either by computer or by ship's personnel.

Bayern's computer also has a wide variety of books available. In fact, it has as much reading material available as the Grossebibliothek in Heidelburg or the Library of Congress in America. It has been estimated that an average crewmember that spent their entire off-duty time engaged in reading (and never slept) would be able to travel to the core of the galaxy and back again before running out of material.

In addition to mental development, every member of the crew has a regular programme of physical fitness tailored to their specific physical and psychological (exercise relieves stress) needs by Dr. Bernhardt, the chief medical officer. Lack of adherence to the prescribed programme is a serious violation of standing orders (and contract) and can result in disciplinary action. After all, the AR-I does not want the crew of its finest starship to return in dreadful physical condition. It would look bad in the press.

In order to promote physical exercise and development, Spin Habitat A is equipped with a complete gymnasium and exercise facility. For zero-G athletes, there is a similar area located in an area set aside in Cargo Bay 4. *Bayern's* chief computer officer, Nichole St. Nicholas, has agreed to teach a special class in zero-G combat and acrobatics for interested members of the crew.

Life aboard the *Bayern* can be likened to that on an oceangoing vessel. While as much space as possible has been devoted to crew recreation, it is still cramped. Although the analogy is somewhat loose and *Bayern* is slightly roomier, this should serve to get the picture across.

Subtle Hints

The referee should endeavour to drop subtle hints during the course of the campaign, especially if the Travellers do not at first know about AGRA. Cosmologists aboard ship might be overheard discussing anomalies in the spectra of the brightest Pleiades or changes in the nebulosity surrounding Maia and Merope.

Since, in one respect, travelling towards the Pleiades is like travelling 400 years into the future, changes occurring during those four centuries will be compressed into the length of the voyage in a manner similar to time lapse photography. Thus, changes in spectra or anomalous activities with nebulosity will be more apparent as the voyage continues and these changes will become the subject of talk among the expedition scientists.

If the Travellers know about AGRA from the beginning, of course, such hints are not necessary for unfolding the story. However, the Travellers might be charged with keeping the anomalies secret... and that could lead to trouble as they try to stop mission scientists from discussing the strange things they are discovering!

ISV-5 ANTON DOHRN

Anton Dohrn

The *Anton Dohrn* was originally the *SS Comet* and was renamed for the *Bayern* mission in honour of a prominent German scientist of the late 19th century noted for his contributions to the collaborative efforts of science. Dohrn was a zoologist born in 1840 in Stettin in modern day Poland, then part of Prussia. He was a strong proponent of Darwinism and studied marine biology extensively. In the 1870's he was responsible for setting up the *Statione Zoologica* in Naples, an early zoological research institute that became the model for many similar research stations around the world. He also developed a system of renting out fully equipped laboratory space that began the modern ideas of international scientific collaboration, with the free exchange of ideas and information between scientists. His efforts towards scientific collaboration are echoed in the goals of the *Bayern* mission.

The SS *Anton Dohrn* is a Trilon Associates Initial Survey Vessel-5 Mk2 Mod D that was donated to the AR-I by Trilon, along with its sister ship, the LSV-5C *George Bauer*.

The *Anton Dohrn* is the pathfinder vessel for the mission, its purpose to scout ahead of *Bayern*'s path and locate interesting and unusual worlds and phenomena for *Bayern* to investigate in more detail. It is not expected that *Anton Dohrn* investigate a target in any great detail, although the ship is fitted with an advanced set of sensors and probes, and while it is certainly capable of completing a thorough scientific mission, the ship will note a subject for further study, deploy probes as necessary and move on. Each mission the ship is despatched on will then provide a 'shopping list' of potential scientific curiosities for *Bayern* to investigate further.

The ISV-5 was originally designed exclusively for Trilon's use. The expansion of Trilon's interests throughout human space has been spearheaded by frequent, fast and accurate acquisition of claims on new worlds, claims which require survey information. Trilon built the ISV-5 to provide that survey information.

Powered by a small, but powerful, MHD turbine, the ISV-5 is capable of making a high powered sprint into a system with a respectable warp efficiency of 2.59 light-years/day. Once in-system the ISV-5 can throttle down the turbine and deploy solar panels to supplement the power plant whilst the system survey is underway. She carries a brace of survey satellites that allows the *Dohrn* to drop one off to catalogue a world as she transits through a system. The ship can then either gather the satellite's data by broadcast burst transmission or recover it as she exits the system. This way multiple worlds can be surveyed in one pass.

The modifications for the *Bayern* mission include additional radiation shielding, a self-sealing hull, advanced sensor suite and enlarged fuel tanks and solar arrays. The fuel processor allows for wilderness refuelling for the MHD turbine and she can process an entire load of fuel in the time it takes to survey a system. The addition of a set of external grapples allows the ship to clamp up to an additional 400 tons of sub-craft to the main docking port at the expense of cruising speed, allowing her to act as an emergency tender for other flotilla craft.

TRILON AEROTECH INITIAL VESSEL-5 MARK 2 MOD D

NATION: AMERICA
FIRST EXAMPLE LAID DOWN: 2290
MANUFACTURER: TRILON AEROTECH
PRODUCTION STATUS: IN PRODUCTION
CONSTRUCTION TIME: 366 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AMERICA, CORPORATE, FOUNDATION
NUMBER IN SERVICE: 100
LENGTH: 44.03 M
WIDTH: 51.04 M
LAUNCH MASS (FULLY FUELLED): 4,000 TONS
POWER PLANT: TRILON PDV 10 MW MHD TURBINE, 1 MW SOLAR ARRAY
REACTION DRIVE: TRILON EXOWORKS ARIEL RT-990, 4,000 TONS THRUST
STUTTERWARP: TRILON STARWORKS ASW4, 6.5 MW GEN II JEROME-EFFECT STUTTERWARP

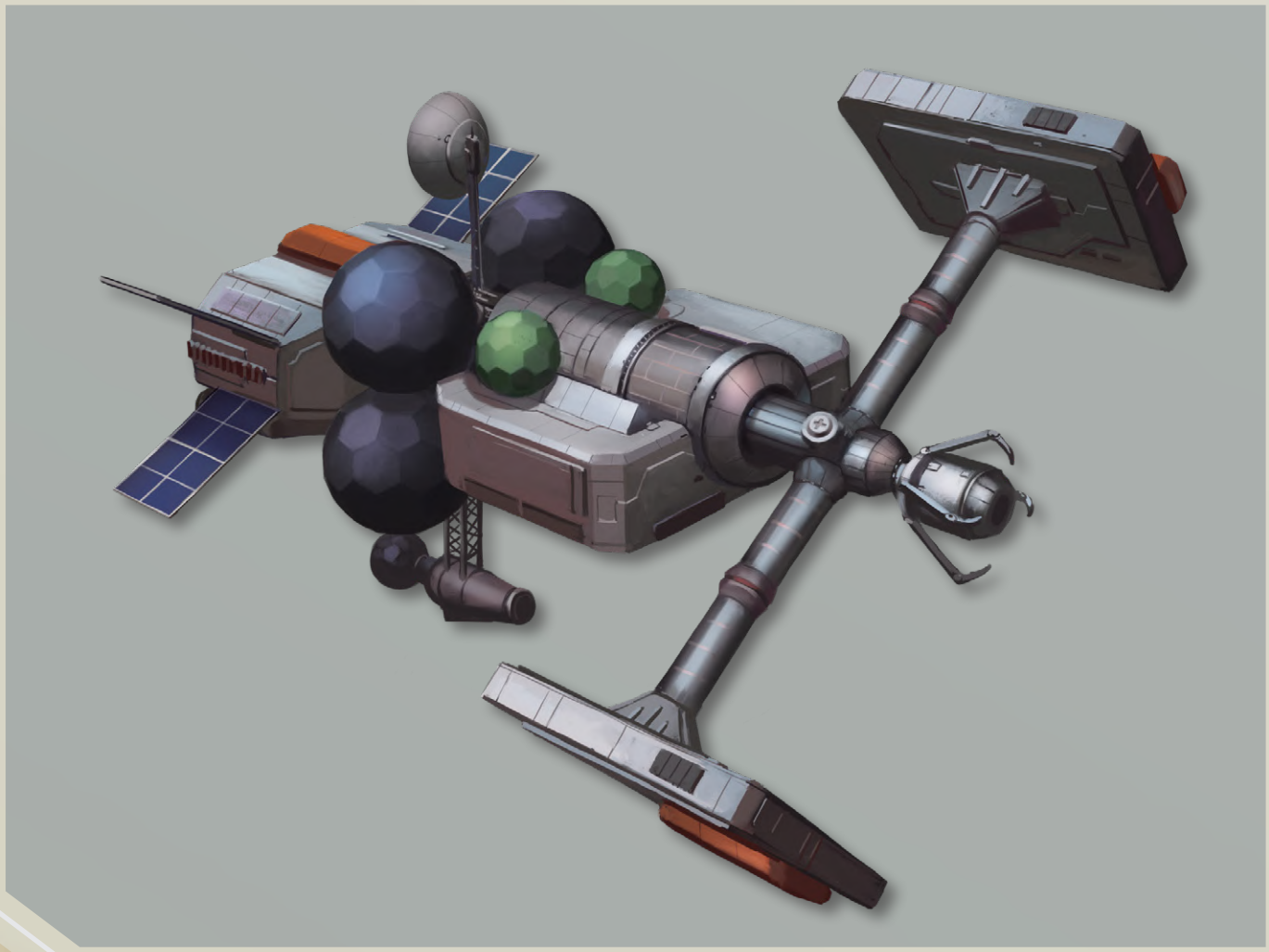
Crew
Captain, Executive Officer, Bridge Officers x 2, Astrogators x 2, Flight Engineers x 2, Pilots x 2, Sensor Techs x 2, Reaction Drive Engineers x 2, Stutterwarp Engineers x 2, Power Engineers x 4, Support x 2, Scientists x 4

Passengers	Hull Points	Signature
— Comfort +2	32	Base Reflected: 6 Base Radiated: 2

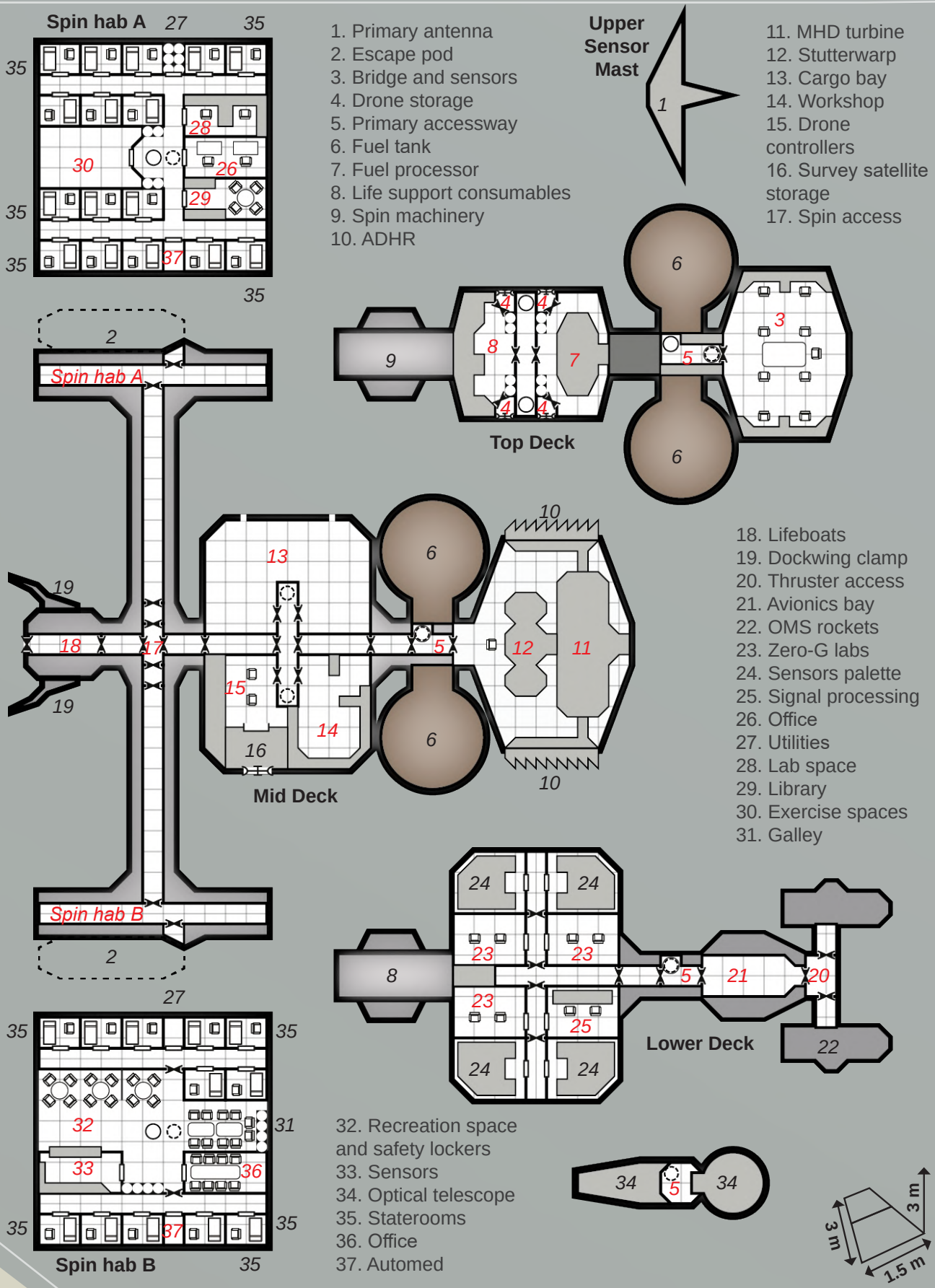
Running Costs

Maintenance Cost: Lv16097/month
Purchase Cost: MLv193.18

Power Requirements	Power
Basic Ship Systems	4
Stutterwarp	65
Fuel Processor	30
Sensors	24



TL12		Tons	Cost (MCr)
Hull	400 ton Aligned Crystal Steel Distributed	—	6
Hull Features	Advanced Radiation Shielding	— —	10 —
Reaction Drive	OMS Rocket (advanced)	8	0.24
Stutterwarp	2.59 ly/day	3.8	19
Power Plant	MHD Turbine (advanced), Power 100 Solar Panels x 10, Power 60	8.3	7.6
Emergency Power	Batteries, 192 Power/hours	0.05	0.05
Fuel Tanks	OMS Rocket (6 Burns) Power Plant (2 weeks)	63 50	— —
Fuel Processing	1.08 tons per day	3	6
Radiators	ADHR, Capacity 100	5	2.5
Bridge	Standard, Holographic Controls, Neural Link	20	9.875
Computer	Primary: Computer/35fib Secondary: Computer/20fib	— —	30 3.75
Sensors	Basic Nav, DSS, GADS, Extended Survey (advanced) x 2, Telescope	39.3	14.6
Drone Controllers	2	2	1
Systems	Under Spin: Office, Freshers x 2, 10 Person Galley and Full Galley, Exercise Spaces x 7 Equipment, Science Lab, Library, Static Automed, Recreation Spaces x 26 Science Labs x 3, Workshop, Signal Processing, Safety Lockers x 10, 400 ton Sling, Inspection Drones x 4, Repair Drones x 4, Survey Satellites x 10, 10 ton Lifeboats x 3	105.8	32.08
Airlocks	Standard Airlocks x 3, Small Cargo Airlock	—	—
Accommodations	Under Spin: Small Staterooms x 28	56	2.8
Artificial Gravity	Spin Capsules (113.75 tons under spin) Radius 21.5 m, 4 rpm, Gravity 0.4 G, Spin Up/Down 18 minutes	12.5	6.26
Software	Archive, Auto Repair/2, Intellect, Manoeuvre, Stutterwarp Control, Neural Interface, Security/3	—	23.2
Life Support Consumables	60 days for 28 people	3.12	—
Cargo		20.77	—
Total: MLv193.18			


Spin hab A
Spin hab B
Upper Sensor Mast
Top Deck
Mid Deck
Lower Deck
1. Primary antenna
2. Escape pod
3. Bridge and sensors
4. Drone storage
5. Primary accessway
6. Fuel tank
7. Fuel processor
8. Life support consumables
9. Spin machinery
10. ADHR
11. MHD turbine
12. Stutterwarp
13. Cargo bay
14. Workshop
15. Drone controllers
16. Survey satellite storage
17. Spin access
18. Lifeboats
19. Dockwing clamp
20. Thruster access
21. Avionics bay
22. OMS rockets
23. Zero-G labs
24. Sensors palette
25. Signal processing
26. Office
27. Utilities
28. Lab space
29. Library
30. Exercise spaces
31. Galley
32. Recreation space and safety lockers
33. Sensors
34. Optical telescope
35. Staterooms
36. Office
37. Automed
3 m
3 m
1.5 m

Locations

1. **Primary Antenna:** The large, high gain antenna is mounted atop the main sensor mast. It is used for receiving and transmitting broadcast traffic and can be used as a radio telescope, although both functions cannot be undertaken at the same time.
2. **10 Ton Escape Pod:** The ISV-5 is equipped with three escape pods. Two are mounted 'below' the spin habitats and a third is above the bridge. All three are the same 10 ton Solar-10 ballistic lifeboats as carried by *Bayern*.
3. **Bridge:** The bridge of the ISV-5 is spacious and well laid out. Each of the workstations feature multifunctional displays and can be reconfigured to run any of the ships systems.
4. **Drone Storage:** These four compartments house the repair and inspection drones, and feature charging points and small access hatches to allow the drones egress from the ship.
5. **Primary Accessway:** This access way runs all the way through the ship. Equipment lockers line the walls and on the lowest level it leads into the primary avionics bay.
6. **Fuel Tanks:** Four spherical fuel tanks hold more than 3,000 cubic metres of hydrogen fuel. The tanks are insulated and protected by a layer of micrometeorite shielding to prevent punctures.
7. **Fuel Processor:** The machinery in this room is capable of breaking down sufficient water ice, in conjunction with the solar panels, to provide just over a ton of fuel per day. This is insufficient to keep pace with the MHD turbine's consumption at full power, so the turbine is often throttled back to minimum power and the solar panels used instead.
8. **Life Support:** The ISV 5 has sufficient life support stores for 60 days of operation at maximum crew support of 28**.** This machinery includes the air and water scrubbers plus storage for the various supplies required to keep the life support systems operational.
9. **Spin Machinery:** This machinery includes the spin de-coupler and flywheel to counterbalance the rotational torque of the ISV-5's 30 metre rotating spin arms. Although not fully retractable, the ISV-5's spin arms are able to contract by 15 metres to allow her to dock with *Bayern* without fouling her hull.
10. **Radiators:** Waste heat is the bane of any starship and specialist equipment must be provided to radiate it away to space.
11. **MHD Turbine:** The compact, but powerful, Trilon power plant is capable of running at full power for just over 14 days, or 60 days at low power.
12. **Stutterwarp:** Trilon has always been at the forefront of starship design and the stutterwarp drives installed into their ISV-5 ships have been amongst the best they have ever produced. The drive installed in the ISV-5 is capable of a sustained, loaded speed of 2.59 light-years per day and an impressive 3.17 unloaded.
13. **Cargo Bay:** Although not designed for shipping large quantities of equipment, this area is capable of accepting a modest amount of cargo. This area is often used for storing additional supplies and probe drones. Internal partitions can be erected and collapsible fuel bladders can also be installed.
14. **Workshop:** This fully equipped zero-gravity workshop is capable of undertaking most repairs beyond those needing major dry dock time. A supply of spare parts and materials is kept here, along with a pair of industrial fabrication units capable of constructing many components from stored blueprints. This is also where the ship's repair drones are stored.
15. **Probe Control:** The launch and recovery of the survey satellites is conducted from here. Satellites can be manually controlled, or set to an automated programme. Whilst technically fulfilling the same purpose as a warship's remote controller, the drone controllers lack the sophisticated encryption and security of military counterparts.
16. **Satellite Bay:** This bay holds 10 Trilon Exoworks Wayfarer survey satellites, along with the equipment to launch and recover them.
17. **Spin Access:** Access to the main spin habitat is achieved through an interlock with the rotating portion of the ship in this room. Signs are clearly posted showing direction of spin and reminders to proceed along the spin arms with the correct orientation to accommodate the change in gravity. When the spin arm is locked there are also two lateral docking ports available.
18. **EVA Room:** The walls of this room contain racks for EVA suits, along with various zero-gravity adapted tools. The controls for the magnetic grapples can also be operated manually from here.

19. **Docking Clamp:** The ISV-5 is capable of carrying 400 tons of grappled craft with the mechanical and magnetic clamps. It is often used for carrying a Resinde stutterwarp probe to further enhance the mission's survey range.
20. **Thruster Access:** This small compartment allows access to the adjacent OMS rocket systems. It includes a system diagnostics panel and manual inspection hatch.
21. **Avionics Bay:** Many of the ISV-5's sensor processing subsystems are located in this bay, which has racks of equipment along each bulkhead. The GADS signal processing system is also located here.
22. **OMS Rockets:** The ISV has a pair of Trilon Exoworks Ariel RT-990 OMS rockets to provide reaction drive when stutterwarp operation is not possible or desired. There is sufficient fuel for five burns, allowing for multiple orbital insertions and departures. Whilst the fuel processor can be configured to provide rocket fuel, refilling the tanks is not considered a frontier fuelling operation.
23. **Zero-G Labs:** These areas are multipurpose, zero-gravity science labs. Each one is typically slaved to a particular sensor pallet.
24. **Lateral Sensor Pallet:** These sensor pallets contain various elements of the survey sensors. Further sensor clusters are also mounted on the lower surfaces of the spin habs, to provide a full-sky sweep with each rotation.
25. **Signal Processing:** This room contains the dedicated hardware for improving and filtering sensor returns. It is best used when slaved to a particular set of sensors (optical, EM, ultraviolet and so on and requires a skilled operator to get the best results.
26. **Office:** A multipurpose room designed for impromptu meetings, briefings and ship's business. Contains a smartwall display and two terminals, plus assorted miscellaneous office junk.
27. **Utilities:** This small area contains compact utilities for laundry and housekeeping duties.
28. **Low-G Lab:** This lab caters for scientific endeavours that require gravity, or for those scientists who prefer not to work in microgravity.
29. **Library:** The walls of this compartment are lined with a number of smart paper readers and it has access to the ship's Archive program. Several large smart displays are also available, as are a small selection of print books. A rapid printing and binding machine is also located here which can produce paper books and manuals upon demand.
30. **Exercise Machines:** Although the ISV has spin gravity, the crew still need to take regular exercise to mitigate the effects of low G. Machines here are designed to increase and maintain muscle mass and ensure that resistance exercises help alleviate bone density loss and concurrent hypercalcemia.
31. **Galley:** This compartment contains food preparation and storage areas, as well as dining facilities with drinks dispensers and waste disposal. It can cater for up to 14 diners at a time and is open to the nearby recreation spaces.
32. **Recreation:** This area features the ship's recreational equipment, including two foldable partitions to subdivide it into smaller rooms, a holotank and entertainment system, and lots of comfortable seating. The main access to the rest of the ship is through a hatch in the ceiling and there is a hatch in the floor to the Solar-10 lifeboat on the exterior of the spin habitat.
33. **DSS:** The deep system scanner is a multispectral fast-scan telescope mounted on the sensor pylon below the lower deck.
34. **Optical Telescope:** The main telescope is located here on a sensitive, vibration resistant gimballed mount. It is a three metre optical and near infra-red scope.

Staterooms: Each stateroom contains a compact low gravity shower/washbasin/toilet combination, comfortable ergonomic bunk or hammock, fold up desk, as well as cleverly concealed storage. The cabins are compact but comfortable.

LSV5-C GEORGE BAUER

George Bauer

The *George Bauer* was originally the *SS Meteor* and renamed for the *Bayern* mission in honour of a prominent German scientist of the late 15th century known as 'the father of mineralogy'. George Bauer, also known as Georgius Agricola, was born in Saxony in 1494 and a precocious scholar, gaining a teaching position by the age of 20. In 1527 he became the physician in a mining and smelting town and began a systematic study of minerals and ores. His writings on the subject brought him recognition and in 1530 he moved to Chemnitz, the centre of mining industry at that time. It was here that he published the bulk of his work, including the *De Re Metallica*. This work, published after his death, was a systematic examination of mining and minerals, and established many of the conventions and terms still in use today. His multidisciplinary approach to science and pioneering involvement in mining and mineralogy prompted Trilon to christen the logistical support ship after him.

The SS *George Bauer* is a Trilon Associates Logistics Support Vessel-5C donated to the AR-I by Trilon, along with its sister ship, the ISV-5 *Anton Dohrn*.

The *George Bauer* is the support vessel for the *Bayern* mission, its purpose to keep the *Bayern* and other ships of the flotilla in good repair and fully supplied with fuel and raw materials. Whilst all ships in the flotilla are capable of frontier refuelling, this is time consuming and may not always be possible. The *George Bauer* is equipped with facilities and equipment to conduct asteroid mining for volatiles used in ship fuel and raw materials for *Bayern*'s autofactories. Standard operating procedure is for the LSV-5C to operate in the same system as *Bayern,* harvesting volatiles and raw materials. It is not expected that the ship will proceed alone with any great regularity, unless there is a very particular requirement that demands she does not accompany *Bayern*.

The LSV-5C was a design that did not originate with Trilon, instead a conversion originally undertaken as an experiment by the Aberdeen Mining and Exploration Corporation (AMEC). AMEC purchased a decommissioned ISV-5 in 2293 and converted it to act as a support vessel for their asteroid mining teams. The conversion proved a success and AMEC leased the design back to Trilon, who now produce it as a standard variant of the ISV-5 hull.

The LSV-5C eschews the advanced sensors and lab equipment of the ISV-5. Since the requirements for asteroid mining may require multiple burns to reach a suitable body, the OMS rockets of the standard ISV-5 are replaced with more versatile OMS thrusters tied to the MHD turbine. The higher consumption of the thrusters requires the installation of a set of auxiliary fuel tanks nestled below the distinctive spheres of the original ISV-5.

The ISV-5's sensors and science labs in the main hull have been replaced by an extendable cargo hold, carrying up to 200 tons of crushed minerals or hydrogen fuel. The survey satellites are usually replaced with a suite of mining drones such as Sortech MERV-213 drones.

The additional modifications to the *George Bauer* for the *Bayern* mission include radiation shielding, a self sealing hull and of a set of external grapple arms that allow the ship to manipulate and hold larger bodies, as well as assisting in launch and recovery of mining drones.

TRILON AEROTECH/AMEC LOGISTICAL SUPPORT VESSEL-5C

NATION: AMERICA
FIRST EXAMPLE LAID DOWN: 2295
MANUFACTURER: AMEC/TRILON AEROTECH
PRODUCTION STATUS: IN PRODUCTION
CONSTRUCTION TIME: 380 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AMERICA, CORPORATE, FOUNDATION
NUMBER IN SERVICE: 14
LENGTH: 44.03 M
WIDTH: 51.04 M
LAUNCH MASS (FULLY FUELLED): 4,000 TONS
POWER PLANT: TRILON PDV 10 MW MHD TURBINE, 1 MW SOLAR ARRAY
REACTION DRIVE: TRILON EXOWORKS MERCURY TT-1100, 4,000 TONS THRUST
STUTTERWARP: TRILON STARWORKS ASW4, 6.5 MW GEN II JEROME-EFFECT STUTTERWARP

Crew
Captain, Executive Officer, Bridge Officers x 2, Astrogators x 2, Flight Engineers x 2, Pilots x 2, Sensor Techs x 2, Reaction Drive Engineers x 2, Stutterwarp Engineers x 2, Power Engineers x 4, Support x 2, Scientist, Mining x 4

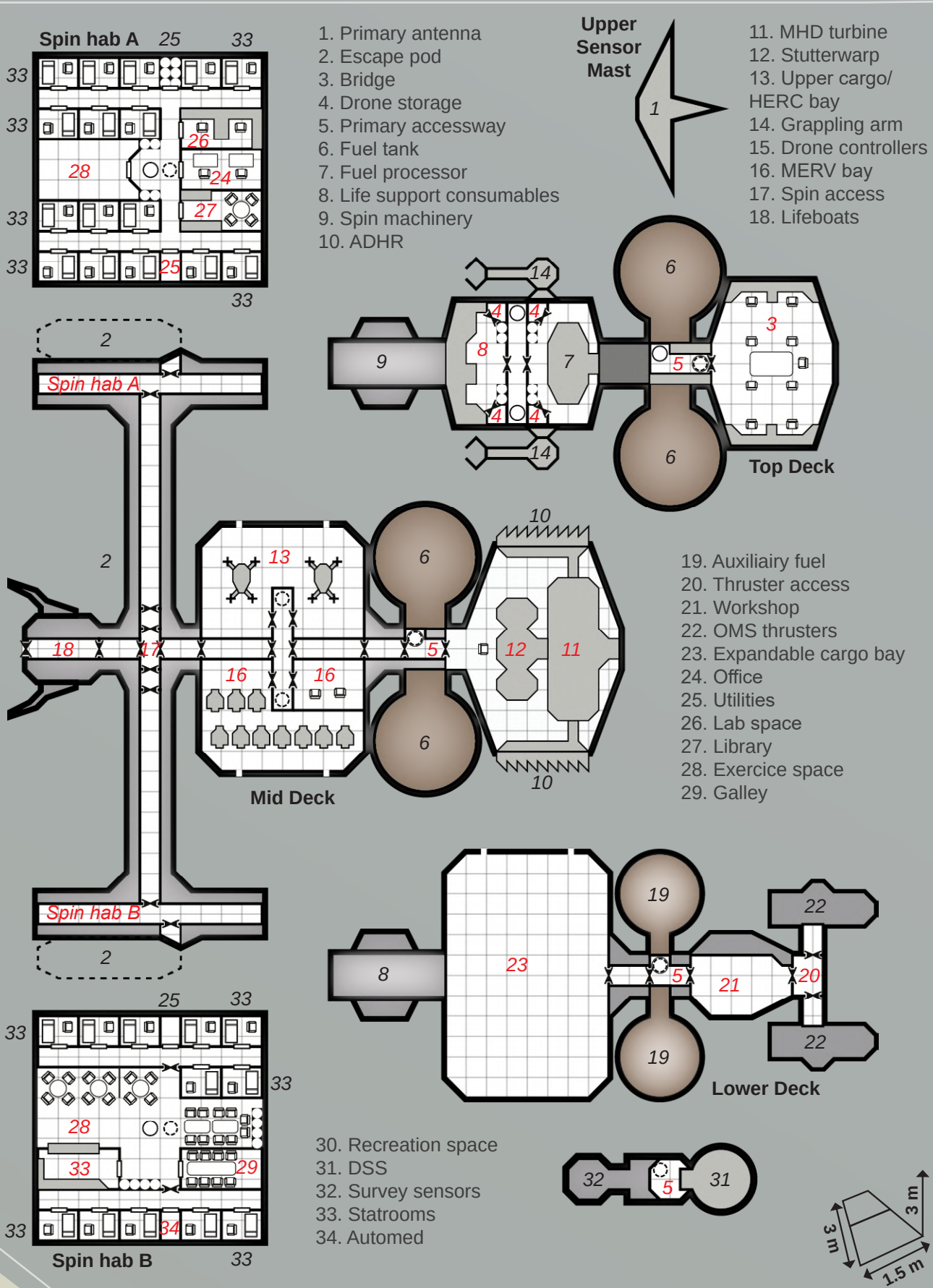
Passengers	Hull Points	Signature
— Comfort +2	32	Base Reflected: 6 Base Radiated: 2

Running Costs

Maintenance Cost: Lv12832/month
Purchase Cost: MLv153.99

Power Requirements	Power
Basic Ship Systems	4
Reaction Drive	40
Stutterwarp	65
Fuel Processor	30
Sensors	24

TL12		Tons	Cost (MCr)
Hull	400 ton Aligned Crystal Steel Distributed	—	6
Hull Features	Advanced Radiation Shielding Tough	— — —	14
Reaction Drive	OMS Thruster (advanced)	10.8	0.72
Stutterwarp	2.59 ly/day	3.8	19
Power Plant	MHD Turbine (advanced), Power 100 Solar Panels x 10, Power 60	8.3 —	4.58 3
Emergency Power	Batteries, 192 Power/hours	0.05	0.05
Fuel Tanks	OMS Thruster (7 Burns) Power Plant (2 weeks)	75.6 50	— —
Fuel Processing	1.08 tons per day	3	6
Radiators	ADHR, Capacity 100	5	2.5
Bridge	Standard, Holographic Controls, Neural Link	20	9.875
Computer	Primary: Computer/35fib Secondary: Computer/20fib	— —	30 3.75
Sensors	Basic Nav, DSS Survey Sensors	7	2.6
Drone Controllers	2	2	1
Systems	Under Spin: Office, Freshers x 2, 10 Person Galley and Full Galley, Exercise Spaces x 7 Equipment, Science Lab, Library, Static Automed, Recreation Spaces x 26 Workshop, Safety Lockers x 10, Inspection Drones x 4, Repair Drones x 4, MERV Drones x 10, HERC Drones x 2, Grappler Arms x 2, 10 ton Lifeboats x 3, Extendable Cargo Bay Machinery	91.29	18.655
Airlocks	Standard Airlocks x 3, Small Cargo Airlock, Large Cargo Doors x 2	—	—
Accommodations	Under Spin: Small Staterooms x 28	56	2.8
Artificial Gravity	Spin Capsules (113.75 tons under spin) Radius 21.5 m, 4 rpm, Gravity 0.4 G, Spin Up/Down 18 minutes	12.5	6.26
Software	Archive, Auto Repair/2, Intellect, Manoeuvre, Stutterwarp Control, Neural Interface, Security/3	—	23.2
Life Support Consumables	60 days for 28 people	3.12	—
Cargo		53	—
Total: MLv153.99			


Spin hab A
Spin hab B
Upper Sensor Mast
Top Deck
Mid Deck
Lower Deck
1. Primary antenna
2. Escape pod
3. Bridge
4. Drone storage
5. Primary accessway
6. Fuel tank
7. Fuel processor
8. Life support consumables
9. Spin machinery
10. ADHR
11. MHD turbine
12. Stutterwarp
13. Upper cargo/ HERC bay
14. Grappling arm
15. Drone controllers
16. MERV bay
17. Spin access
18. Lifeboats
19. Auxiliairy fuel
20. Thruster access
21. Workshop
22. OMS thrusters
23. Expandable cargo bay
24. Office
25. Utilities
26. Lab space
27. Library
28. Exercice space
29. Galley
30. Recreation space
31. DSS
32. Survey sensors
33. Statrooms
34. Automed
3 m
3 m
1.5 m

Locations

1. **Primary Antenna:** The large, high gain antenna is mounted atop the main sensor mast. It is used for receiving and transmitting broadcast traffic and can be used as a radio telescope, although both functions cannot be undertaken at the same time.
2. **10 Ton Escape Pod:** The ISV-5 is equipped with three escape pods. Two are mounted 'below' the spin habitats and a third is above the bridge. All three are the same 10 ton Solar-10 ballistic lifeboats as carried by *Bayern*.
3. **Bridge:** The bridge of the ISV-5 is spacious and well laid out. Each of the workstations feature multifunctional displays and can be reconfigured to run any of the ship's systems.
4. **Drone Storage:** These four compartments house the repair and inspection drones, and feature charging points and small access hatches to allow the drones egress from the ship.
5. **Primary Accessway:** This access way runs all the way through the ship. Equipment lockers line the walls and on the lowest level it leads into the primary avionics bay.
6. **Fuel Tanks:** Four spherical fuel tanks hold more than 3,000 cubic metres of hydrogen fuel. The tanks are insulated and protected by a layer of micrometeorite shielding to prevent punctures.
7. **Fuel Processor:** The machinery in this room is capable of breaking down sufficient water ice, in conjunction with the solar panels, to provide just over a ton of fuel per day. This is insufficient to keep pace with the MHD turbine's consumption at full power, so the turbine is often throttled back to minimum power and the solar panels used instead.
8. **Life Support:** The ISV 5 has sufficient life support stores for 60 days of operation at maximum crew support of 28. This machinery includes the air and water scrubbers plus storage for the various supplies required to keep the life support systems operational.
9. **Spin Machinery:** This machinery includes the spin de-coupler and flywheel to counterbalance the rotational torque of the ISV-5's 30 metre rotating spin arms. Although not fully retractable, the ISV-5's spin arms are able to contract by 15 metres to allow her to dock with Bayern without fouling her hull.
10. **Radiators:** Waste heat is the bane of any starship and specialist equipment must be provided to radiate it away to space.
11. **MHD Turbine:** The compact, but powerful, Trilon power plant. The plant is capable of running at full power for just over 14 days, or 60 days at low power.
12. **Stutterwarp:** Trilon has always been at the forefront of starship design and the stutterwarp drives installed into their ISV-5 ships have been amongst the best they have ever produced. The drive installed in the ISV-5 is capable of a sustained, loaded speed of 2.59 light-years per day and an impressive 3.17 unloaded.
13. **Upper Cargo/HERC Bay:** Although not designed for shipping large quantities of equipment, this area is capable of accepting a modest amount of cargo. This area is most often used to store two HERC mining drones and carry out maintenance on them and the MERV drones.
14. **Grappler Arms:** A pair of collapsible grapplers are mounted either side of the upper hull. The grapplers are capable of extending up to 25 metres each and can reach most parts of the ship.
15. **Mining Control:** The launch and recovery of the mining drones is conducted from here. Drones can be manually controlled or set to an automated programme. Whilst technically fulfilling the same purpose as a warship's remote station, the drone controllers lack the range and sophisticated encryption and security of military counterparts
16. **MERV Bay:** This bay holds 10 Sortech MERV-213 mining drones, along with the equipment to launch and recover them.
17. **Spin Access:** Access to the main spin habitat is achieved through an interlock with the rotating portion of the ship in this room. Signs are clearly posted showing direction of spin and reminders to proceed along the spin arms with the correct orientation to accommodate the change in gravity. When the spin arm is locked there are also two lateral docking ports available.
18. **EVA Room:** The walls of this room contain racks for EVA suits, along with various zero-gravity adapted tools. The controls for the magnetic grapples can also be operated manually from here.
19. **Auxiliary Fuel:** Additional fuel for the OMS thrusters is stored in small spherical tanks here.
20. **Thruster Access:** This small compartment allows access to the adjacent OMS rocket systems. It includes a system diagnostics panel and manual inspection hatch.

21. **Workshop:** This fully equipped zero-gravity workshop is capable of undertaking most repairs beyond those needing major dry dock time. A supply of spare parts and materials is kept here, along with a pair of industrial fabrication units capable of constructing many components from stored blueprints. This is also where the ship's repair drones are stored.
22. **OMS Thrusters:** The LSC has a pair of Trilon Exoworks Mercury TT-1100 OMS thrusters to provide reaction drive when stutterwarp operation is not possible or desired. There is sufficient fuel for seven burns, allowing for approaches to multiple bodies. Whilst the fuel processor can easily be configured to provide additional thruster fuel.
23. **Expandable Cargo Hold:** This area contains the expandable cargo hold which normally allows for 50 tons of crushed rock or ice to be carried. The cargo hold can instead be expanded to allow for up to 200 tons of processed fuel or minerals. The hold can further be subdivided using partitions to carry both water ice and minerals if required. Water ice is usually stored in one compartment and then pumped to the fuel processor using internal plumbing. The ice is then broken down to hydrogen and oxygen and pumped into another section of the hold configured as a fuel tank. Minerals are loaded directly into the hold via the external doors. Converting a section of the hold from holding minerals to fuel, or vice versa, requires several hours' work and the installation (or removal) of various filters and baffles.
24. **Office:** A multipurpose room designed for impromptu meetings, briefings and ship's business. Contains a smartwall display and two terminals, plus assorted miscellaneous office junk.
25. **Utilities:** This small area contains compact utilities for laundry and housekeeping duties.
26. **Low-G Lab:** This lab caters for scientific endeavours that require gravity, or for those scientists who prefer not to work in microgravity.
27. **Library:** The walls of this compartment are lined with a number of smart paper readers and it has access to the ship's Archive software. Several large smart displays are also available, as are a small selection of print books. A rapid printing and binding machine is also located here which can produce paper books and manuals upon demand.
28. **Exercise Machines:** Although the ISV has spin gravity, the crew still need to take regular exercise to mitigate the effects of the low-G. Machines here are designed to increase and maintain both muscle mass and ensure that resistance exercises help alleviate bone density loss and concurrent hypercalcemia.
29. **Galley:** This compartment contains food preparation and storage areas, as well as dining facilities with drinks dispensers and waste disposal. It can cater for up to 14 diners at a time and is open to the nearby recreation spaces.
30. **Recreation:** This area features the ship's recreational equipment, including two foldable partitions to subdivide it into smaller rooms, a holotank and entertainment system and lots of comfortable seating. The main access to the rest of the ship is through a hatch in the ceiling and there is a hatch in the floor to the Solar-10 lifeboat on the exterior of the spin habitat.
31. **DSS:** The deep system scanner is a multispectral fast-scan telescope mounted on the sensor pylon below the lower deck.
32. **Survey Sensors:** Whilst not as well equipped as the original ISV-5, the LSV retains a suite of survey sensors to search for suitable targets for mining.

Staterooms: Each stateroom contains a compact low gravity shower/washbasin/toilet combination, comfortable ergonomic bunk or hammock, fold up desk, as well as cleverly concealed storage. The cabins are compact but comfortable.

ENTDECKER-CLASS ENCOUNTER VESSEL

Like the *Orkan* spaceplanes and *Kenntnis* landers, the *Entdecker* encounter vessel was designed by the American architectural firm Robert Lawson and Son, on a commission from the AR-I in 2994. Construction was delayed by over a year after problems forming the complex shape of the huge internal fuel tanks required for a pure MHD design were found. It was thought that a substitute design would have to be sought to meet *Bayern's* original launch date in 2297. However, a last moment change in design philosophy removed the pure MHD solution and substituted the small, commercially available Trilon GWZ-225 fission reactor instead. The altered design was finalised, approved and constructed with just enough time left to complete testing and space trials in 2297. After *Bayern's* aborted launch the *Entdecker* underwent a more thorough test plan and undertook short interstellar missions of her own whilst *Bayern* was readied for her re-launch.

The switch from a pure MHD power plant design to a fission/MHD design was made after the design team decided that the fuel consumption requirements of an MHD design placed unacceptable limitations on the specifications of the ship. The quantity of fuel required to keep the turbine running for sufficient time quickly outstripped the volume of the hull. The decision was made to switch to a compact nuclear fission plant instead which, although the power plant itself is much larger than an MHD turbine, would require no fuel. An MHD turbine was still retained for the air-breathing thrusters, as the AR-I wished to avoid the contamination of pristine alien worlds which a nuclear thruster would produce. Lawson and Son were also quick to point out that the fission plant also offered the mission another power plant that would not be dependent upon consumables, essential for providing emergency power in the event of failure in *Bayern's* main plant.

The role of the encounter vessel is to follow up on the findings of the pathfinder vessel, *Anton Dohrn*, where it may be necessary to explore or investigate groundside, or where it may be hazardous for *Bayern* to go. The encounter vessel, with its nuclear power plant, is better able to undertake missions which may not allow for frontier refuelling operations, or where an extended time away from *Bayern* is required. The large cargo bay also allows mission teams to carry heavy equipment from *Bayern's* stores such as a collapsible base, ATV, recon drones and so on.

In addition, Robert Lawson and Son have designed collapsible passenger modules that can be mounted in *Entdecker's* cargo bay to convert cargo space into additional cabin space for mission specialists. Each module fitted reduces *Entdecker's* cargo capacity by 20 tons and can be installed or removed with four hours' work. When not in use the modules can be dismounted and pack into a fraction of their assembled size. The modules include connections to *Entdecker's* power systems but use their own life support systems, allowing additional passengers to be carried without taxing *Entdecker's* systems. Each module has four double cabins with freshers and a small galley and can support up to eight additional passengers. The module can also be configured as a high-density bunkroom, allowing 16 additional passengers to be carried but at considerable reduction in comfort. A large cargo

elevator and access hatches on both dorsal and ventral hull surfaces allow for loading and unloading to *Bayern* or onto a planet's surface.

The *Entdecker* is a large craft, its lifting body obeying aerodynamic rules that hark back to designs from the earliest days of spaceflight. The rounded body is a thick delta with twin upward canted winglets at the tips of the main hull. The four sets of landing gear feature rugged, rough terrain tyres and *Entdecker* has landed and taken off from unprepared strips on a number of worlds. Shuttered doors cover the cargo ramp and the VTOL engines on the underside of the ship. These same VTOL drives allow the *Entdecker* to land anywhere there is any reasonably flat opening two to three times the size of the ship. The VTOL engines consume fuel at a prodigious rate, however, and under most circumstances a STOL landing is preferred.

Accommodations on board are cramped but comfortable. The ship lacks spin habitats and all crew are housed in individual cabins. A generous allocation of crew recreation space is split over three crew common areas. Exercise machines and a galley further serve to alleviate the cramped conditions.

Fortunately, the *Entdecker* is reasonably fast. Her loaded efficiency is a respectable 3.99 light-years/day and, if required, she can eschew all fuel for the MHD turbine and cargo, and achieve 4.69 light-years/day. Doing so limits her ability to land on a planet to unpowered glide approaches and a return to space would require processing sufficient fuel to achieve lift-off. A standard load of fuel provides the *Entdecker* with an orbital insertion, transit to low orbit, powered descent, VTOL landing, VTOL lift off, return to low orbit and then transit to the Wall. This only consumes 7 of the 11 Burns available, so allows for an additional 40 minutes of VTOL flight or more than 6 hours of atmospheric cruising. She is capable of 3G acceleration, speeds up to 8,000 kilometres per hour.

Interior Locations

The *Entdecker*'s internal locations are split over two decks. The aft area of the lower deck is given over to engineering systems, with the fission reactor dominating. The engineering compartment also features the MHD turbine, stutterwarp and the variable geometry aerospike thruster. Also in the engineering section are the fuel processor and workshop, and port and starboard access bays allow the VTOL engines and landing gear to be maintained.

The forward portion of the lower deck is given over to the cargo hold and storage. This area contains the main cargo lift, which is capable of connecting to *Bayern's* ventral cargo lock to transfer pallets from one to the other in zero-gravity. The magnetic grapples are also located on the outer hull around the cargo lock and allow *Entdecker* to carry another vessel of up to 400 tons whilst underway in stutterwarp. Lockers along the wall hold supplies as well as the life support machinery. The forward landing gear and navigational sensors are located towards the bow.

On the upper deck, the ships radiators are mounted on the rear bulkhead. A radiological bulkhead separates the crew quarters from the engineering compartment below in case of a breach of the reactor casing. There are 26 cabins provided for the crew and the crew common areas and galley are also found here. The common areas are configurable in a number of ways, and the chairs and table can also be stored in the deck to create more space if required. The crew cabins are cramped, and there is no spin gravity, but they are comfortable for short journeys. Unlike the crews of *George Bauer* and *Anton Dohrn*, *Entdecker* crews tend to bunk on board *Bayern* whilst the ship is docked.

The science labs and survey sensors are also found on *Bayern's* upper deck. The sensors are capable of performing all standard tasks but not up to the quality of *Bayern* or *Anton Dohrn*. The forward section contains more storage and the ship's automed. Although the *Entdecker* does not have a dedicated medical bay, the supplies stored here are sufficient that a trained medic could perform almost any task up to minor surgery.

Towards the bow of the upper deck is the bridge. The centre of the bridge features a multifunction holotank, which can project individual screens for use as workstations or provide larger displays if required. Several spare workstations are installed to allow the *Entdecker* to be used as a communications relay, sensor uplink or remote controller for drones or probes. The forward section of the bridge features large, panoramic windows.

In the centre of the crew section on the upper deck is the primary airlock. Nearby lockers contain p-suits and zero-G tools. The latches to mate with *Bayern's* dorsal grapples can also be released from here. Adjacent to this airlock is the upper access to the cargo airlock and lift.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2298
MANUFACTURER: ROBERT LAWSON AND SONS
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 965 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 1
LENGTH: 59.20 M
WIDTH: 48.50 M
LAUNCH MASS (FULLY FUELLED: 4,000 TONS
POWER PLANT: TRILON GWZ-225 16 MW FISSION REACTOR, BMFP AEROSPACE GMBH MT-4 4 MW MHD TURBINE, 0.6 MW SOLAR ARRAY
REACTION DRIVE: BMFP AEROSPACE GMBH AS-4K 12,000 TONS THRUST
STUTTERWARP: HYDE DYNAMICS RD11-C, 14.8 MW GEN II JEROME-EFFECT STUTTERWARP

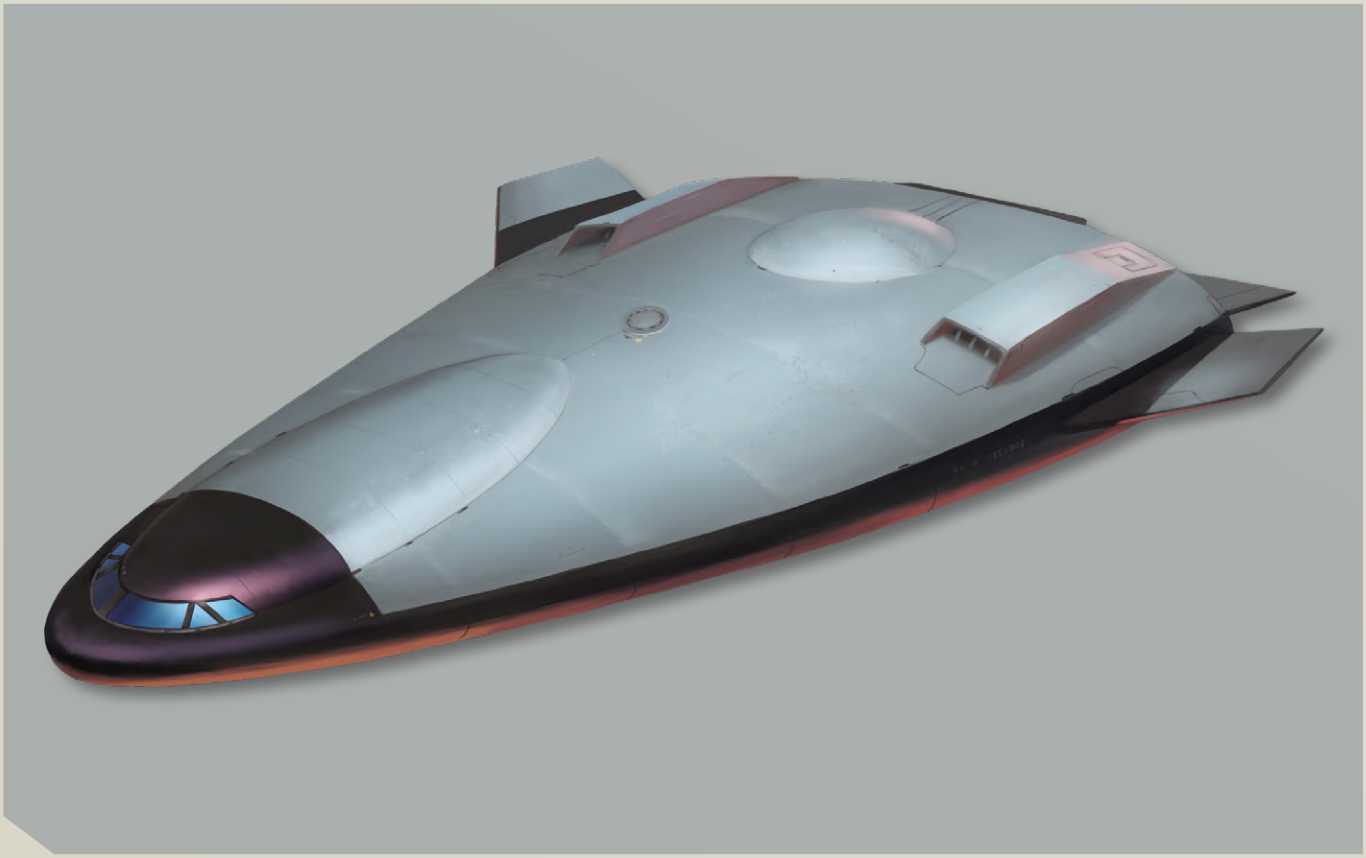
Crew
Captain, Executive Officer, Bridge Officers x 2, Astrogators x 2, Flight Engineers x 2, Pilots x 2, Sensor Techs x 2, Reaction Drive Engineers x 2, Stutterwarp Engineers x 2, Power Engineers x 5, Support, Scientists x 2

Passengers	Hull Points	Signature
— Comfort +1	40	Base Reflected: 2 Base Radiated: 3

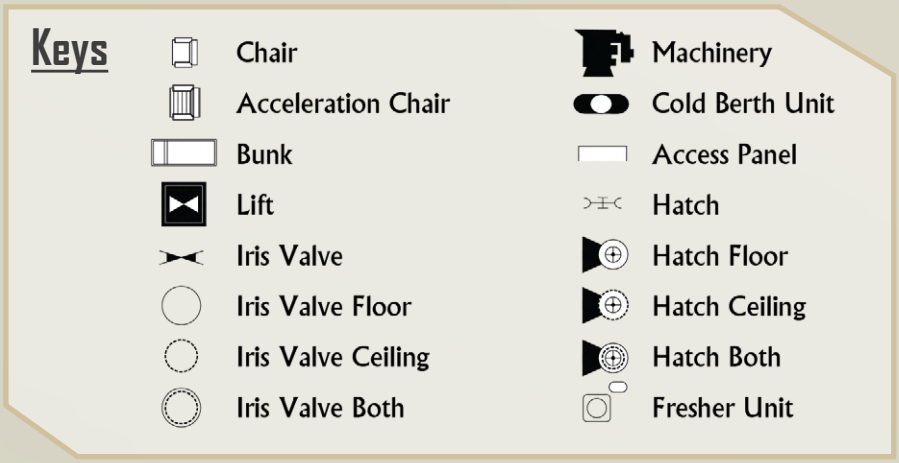
Running Costs

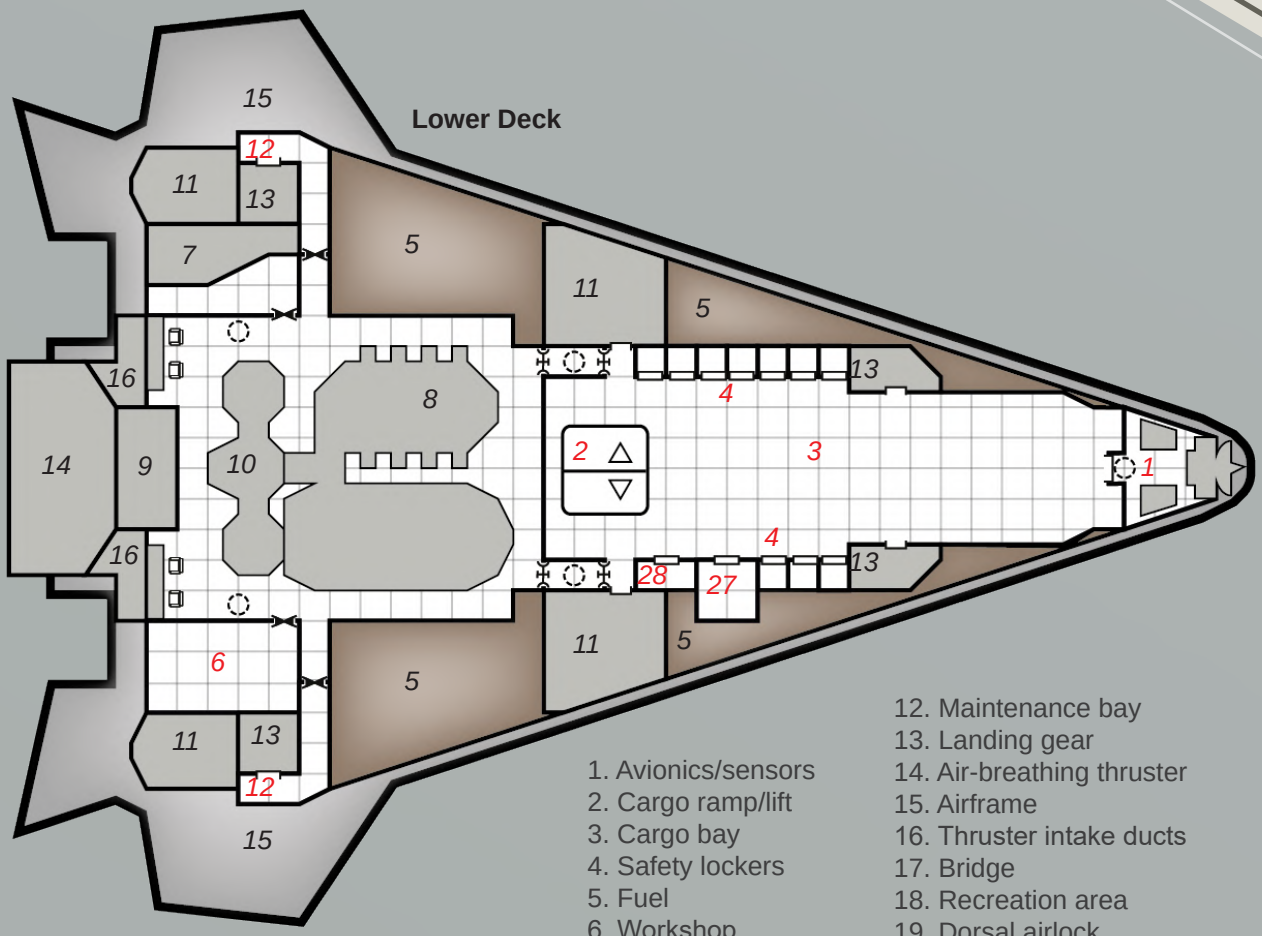
Maintenance Cost: Lv17703/month
Purchase Cost: MLv212.43

Power Requirements	Power
Basic Ship Systems	4
Reaction Drive	40
Stutterwarp	148
Fuel Processor	40
Sensors	7

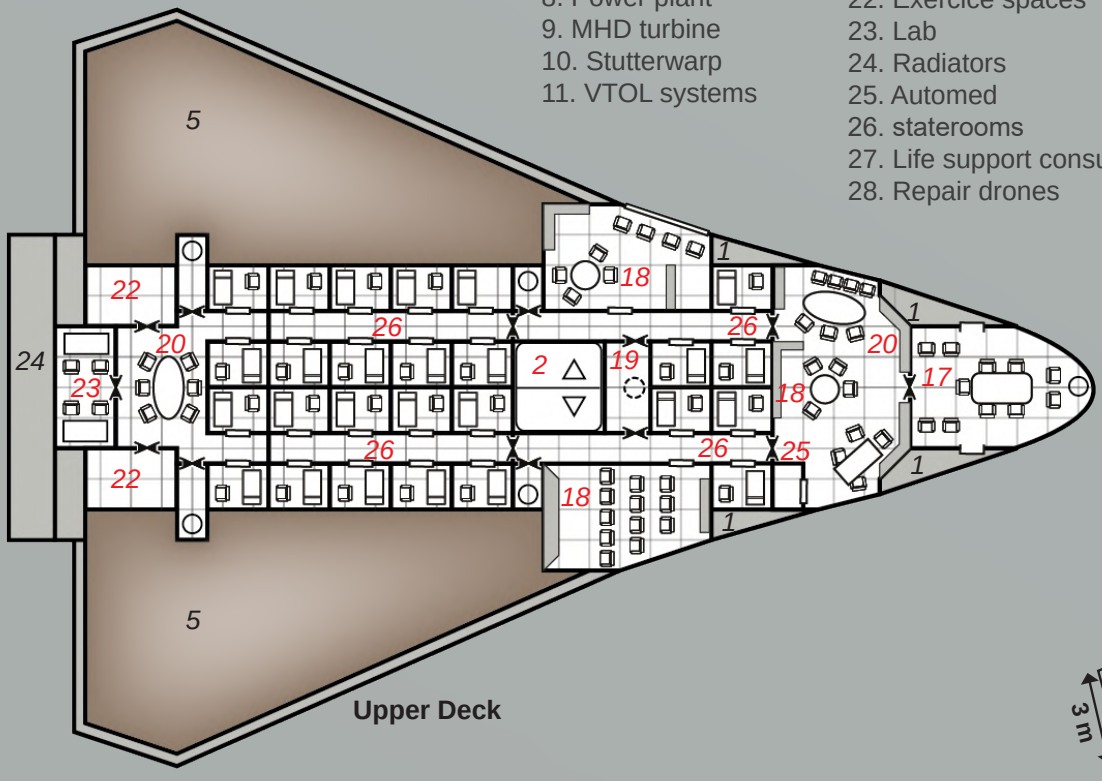


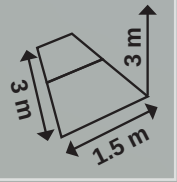
TL12		Tons	Cost (MCr)
Hull	400 ton Composite Lifting Body	—	13.6
Hull Features	Advanced Radiation Shielding Heat Shielding VTOL Frontier Hardening	16 — — — —	46.4 — — — —
Reaction Drive	Air Breathing Thruster (advanced)	16	20
Stutterwarp	3.99 ly/day	5.8	29
Power Plant	Fission (advanced) Power 160 MHD Turbine (advanced), Power 40 Solar Panel, Power 6	20 3.4 1	8 1.87 0.3
Emergency Power	Batteries, 192 Power/hours	1.92	1.92
Fuel Tanks	OMS Thruster (11 Burns) MHD Power Plant (24 hours)	110 1.44	— —
Fuel Processing	9.6 tons per day	4	8
Radiators	ADHR, Capacity 160	8	4
Bridge	Standard, Neural Link	20	3
Computer	Primary: Computer/35fib Secondary: Computer/20fib	— —	30 3.75
Sensors	Basic Nav, DSS, Standard Survey Sensors	7	2.6
Systems	5 Person Galley and Full Galley, Exercise Spaces x 5, Science Lab, Static Automed, Recreation Spaces x 26, Workshop, Safety Lockers x 10, Repair Drones x 2, Cargo Arms x 2, 400 ton Magnetic Sling	76.75	13.79
Airlocks	Standard Airlocks x 2, Large Cargo Airlock, Large Cargo Doors, Docking Collar	—	—
Accommodations	Small Staterooms x 26	52	2.6
Software	Archive, Auto Repair/2, Intellect, Manoeuvre, Stutterwarp Control, Neural Interface, Security/3	—	23.6
Life Support Consumables	50 days for 26 people	2.69	—
Cargo		54	—
Total: MLv212.43			





1. Avionics/sensors
2. Cargo ramp/lift
3. Cargo bay
4. Safety lockers
5. Fuel
6. Workshop
7. Fuel processor
8. Power plant
9. MHD turbine
10. Stutterwarp
11. VTOL systems
12. Maintenance bay
13. Landing gear
14. Air-breathing thruster
15. Airframe
16. Thruster intake ducts
17. Bridge
18. Recreation area
19. Dorsal airlock
20. Galley
22. Exercice spaces
23. Lab
24. Radiators
25. Automed
26. staterooms
27. Life support consumables
28. Repair drones





ORKAN-CLASS SPACEPLANE

Like all *Bayern's* other manned auxiliary vessels, the *Orkan* spaceplane was designed by the architectural firm of Robert Lawson and Son and built on Luna by the well-known St. Lawrence Yards. It is very similar in layout and operation to the *Engel*-class which is used by the survey fleets of many nations and Foundations.

The nose of the craft contains the avionics array, communications equipment and onboard computer system. Directly above this is the cockpit, which has the acceleration couches for both the pilot and co-pilot. This area's layout is somewhat cramped and has a restricted headroom of just 1.5 metres but allows the flight crew maximum access to all controls. Below and aft of the cockpit is a small crew section which has stations for 12 passengers. A provisions locker in this area holds food and supplies for a mission of up to 4 weeks' duration. Aft of this is the main airlock, allowing access to the ground through a belly hatch or to the dorsal surface of the craft via a topside hatch. Both of these hatches have couplings for *Bayern's* grapples. Aft of the airlock is a small cargo storage area which can hold 12 tons or 168 cubic metres of equipment.

The remaining areas of *Orkan's* fuselage are taken up by her drive and fuel tanks. Her thrusters are able to vector their thrust, allowing the craft to take off and land vertically. When in flight, the thrust can be vented directly aft, allowing speeds of up to 8,000 kilometres per hour (just over Mach 6). By vectoring the thrust at angles between these two extremes, *Orkan* and *Donner* can greatly increase their manoeuvrability during flight. The hull is reinforced and sealed for water landings, allowing the spaceplanes to utilise any body of water as a landing zone.

One of the most interesting features of *Orkan* spaceplanes is their ability to reconfigure the shape of their winglets during flight. If speed is desired, they can be altered to offer minimum resistance to an atmosphere. When the craft is trying to gain altitude rapidly or carry a maximum load of passengers and supplies, the wings can be shifted to provide maximum lift.

Orkan and her sister craft, *Donner,* are not intended for use as routine orbit-to-surface transport craft. Rather, they are meant to be used as recon craft to establish information prior to descent of a lander. By making a high altitude pass over a potential landing site, specialists from *Bayern* can spot the best regions for future scientific explorations. However, their VTOL capability, long range and ability to land in unprepared areas, or on water, make them a versatile addition to *Bayern's* capabilities. Commander Schmidt could elect to use *Orkan* and *Donner* as backup landers but the greater cargo capacity of the *Kenntnis* landers makes such use of the *Orkan* a secondary choice.

Orkan's chief pilot is David Bruenweller and *Donner's* is Kristoffer Kulmehrn. As with all the other auxiliary pilots, they are kept in cryogenic suspension until needed.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2297
MANUFACTURER: ROBERT LAWSON AND SONS
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 155 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 2
LENGTH: 25.8 M
WIDTH: 27.15 M
LAUNCH MASS (FULLY FUELLED): 500 TONS
POWER PLANT: BMFP AEROSPACE GMBH MT-1C 1.3 MW MHD TURBINE
REACTION DRIVE: BMFP AEROSPACE GMBH AS-50K AIR BREATHING THRUSTER, 1,500 TONS THRUST

RL&S ORKAN CLASS SPACEPLANE

TL12		Tons	Cost (MCr)
Hull	50 ton Aligned Crystal Steel Lifting Body	—	1.2
Hull Features	Advanced Radiation Shielding Heat Shielding VTOL Tough Frontier Hardening Hydrodynamic Hull	4.5 — — — — — —	9.17 — — — — — —
Reaction Drive	Air Breathing Thruster (advanced)	1.35	3.75
Power Plant	MHD Turbine (advanced), Power 13	1.1	0.6
Emergency Power	Batteries, 48 Power/hour	0.048	0.048
Fuel Tanks	Thruster (16 Burns) MHD Power Plant (96 hours)	14.4 1.87	— —
Radiators	ADHR, Capacity 13	0.65	0.325
Bridge	Flight Deck, Neural Link	3	0.375
Computer	Primary: Computer/15fib Secondary: Computer/10fib	— —	1 0.8
Sensors	Basic Nav, Basic Survey Sensors	3	0.6
Systems	Survival Locker	—	0.05
Airlocks	Standard Airlocks, Cargo hatch, Docking Collar	2	0.03
Accommodations	12 Long Endurance Couches	6	0.3
Software	Archive, Manoeuvre, Neural Interface, Security/3	—	11
Life Support Consumables	28 days for 12 people	0.112	—
Cargo		12	—
Total: MLv29.24			

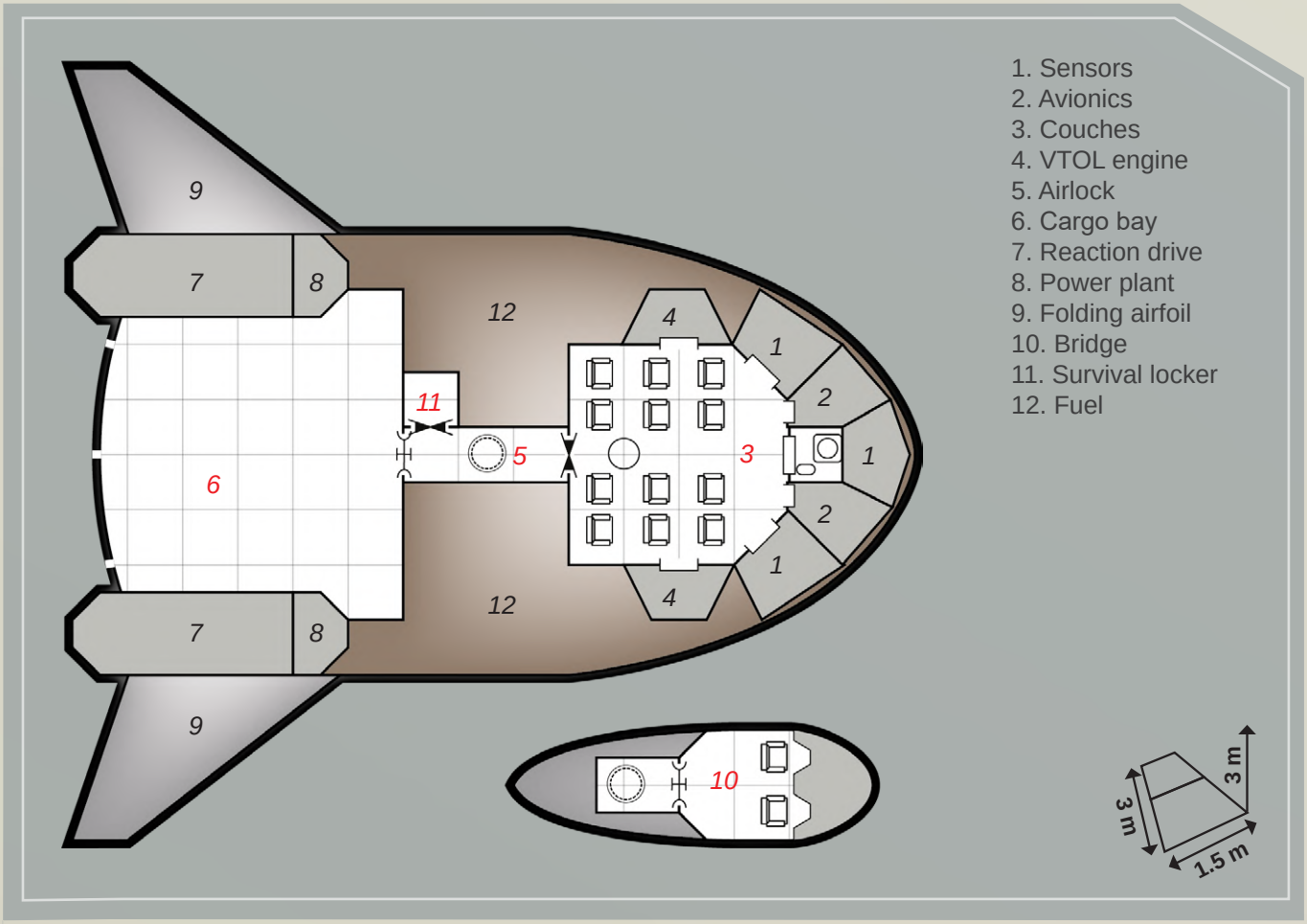
Crew
Pilot, Co-pilot

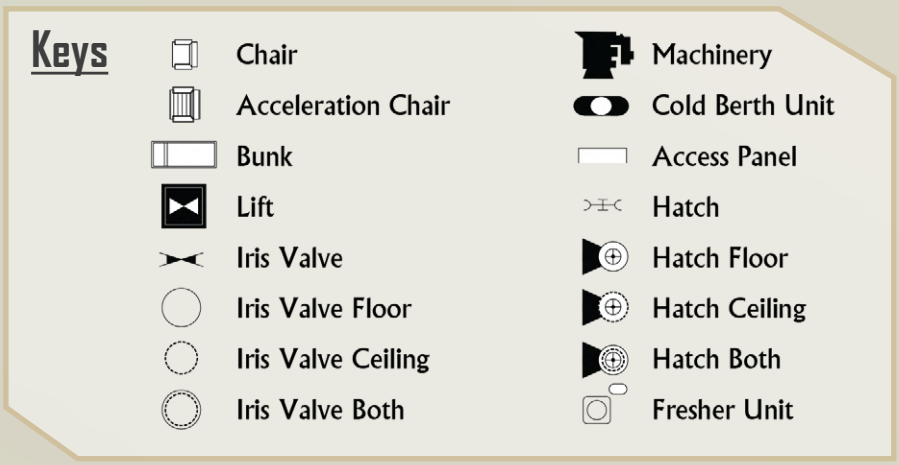
Passengers	Hull Points	Signature
12	5	Base Reflected: 1 Base Radiated: 1

Running Costs

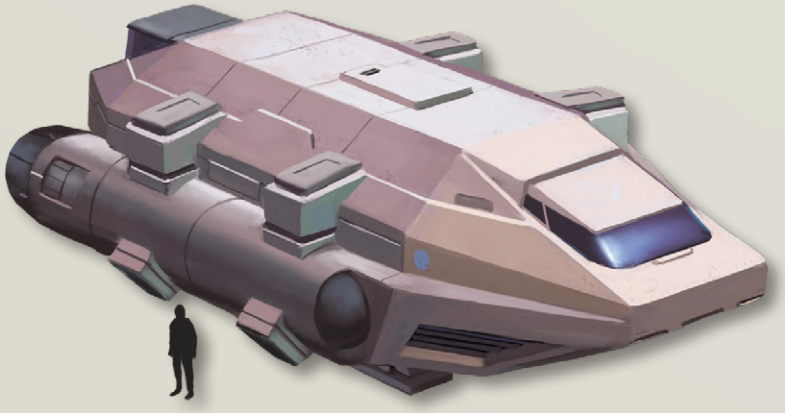
Maintenance Cost: Lv2433/month Purchase Cost: MLv 29.24

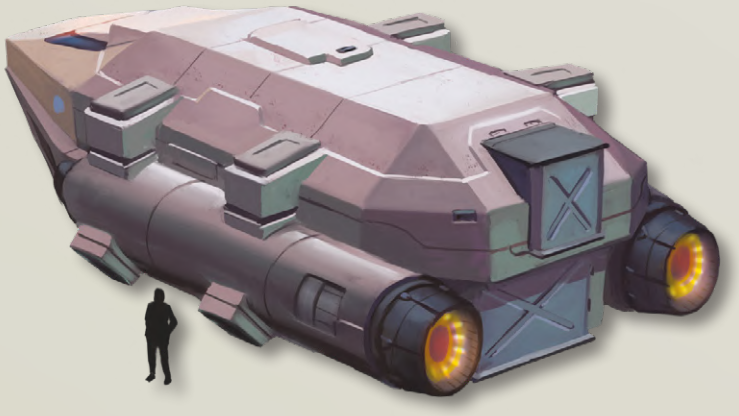
Power Requirements	Power
Basic Ship Systems	1
Reaction Drive	5
Sensors	6





KENNTNIS-CLASS LANDERS





The *Kenntnis* lander was originally designed by the American architectural firm of Robert Lawson and Son on a commission from the Astronomischen Rechen-Institut in 2292. The plans were approved and construction began on *Bayern's* brace of landers in May of 2293 by the Luna-based St. Lawrence Yards. Fifteen months later, the first of the vessels, *Kenntnis,* was completed. Tests and simulations run with the craft were all deemed an outstanding success and crew training began late in 2295.

Originally, three craft were constructed. The first of these, *Kenntnis,* was used as a test model and never intended to be placed aboard *Bayern.* During stressful evaluations, she suffered no major failures and survived some of the most gruelling experiments AR-I engineers could conceive of. In the end, she was destroyed in a crash simulation on the surface of Luna. Even then, however, she was found to have come through in better shape than expected.

The two remaining craft, *Hersaudforderung* and *Erforschen,* were designed to serve as flexible workhorses. In their development, it was required that they be able to cope with almost any environment known to exist in human space, as well as some environments theorised to be possible outside of it. All major systems are of a triply redundant design to make accidental failure all but impossible during missions. In times of crisis, these craft can be piloted by remote from *Bayern.*

The craft are designed to ferry personnel and supplies from orbit to the ground and, although streamlined, do not feature aerodynamic lifting surfaces. The craft are ungainly in the air and atmospheric manoeuvring is conducted using the VTOL engines, much like an aerodyne or jump jet. This limits the vehicles' loiter time significantly as the VTOL engines consume fuel at a prodigious rate. On a standard gravity world the craft has sufficient fuel reserves for a powered descent and ascent to orbit, plus two hours of VTOL manoeuvring. Using orbital insertion fuel this flight time can be extended by a further 10 minutes for each burn used. Maximum speed using the VTOL drives is 800 kilometres per hour. VTOL flight is noisy, uncomfortable, bumpy and, without aerodynamic surfaces, the landers do not glide if the engines fail.

Crew and passenger accommodations are crowded but comfortable. Life support systems provide complete subsistence for four weeks under normal conditions. The normal cargo storage facilities

allow the landers to carry up to 20 displacement tons, or just over 280 cubic metres, of equipment in two airtight compartments accessible from both the interior and exterior of the craft. In the event that additional cargo capacity should be required, it can be added in lieu of passengers. For every two people not carried, the lander may carry an additional one displacement ton or 14 cubic metres of equipment. However, space converted to cargo in this manner will be on the upper, passenger deck and so only items that can be manhandled in through hatchways onto this deck can be carried. Making such modifications take roughly an hour per ton and requires the removal of acceleration couches.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2297
MANUFACTURER: ROBERT LAWSON AND SONS
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 162 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 2
LENGTH: 15.25 M
WIDTH: 8.75 M
LAUNCH MASS (FULLY FUELLED): 500 TONS
POWER PLANT: BMFP AEROSPACE GMBH MT-1A 1 MW MHD TURBINE
REACTION DRIVE: BMFP AEROSPACE GMBH AS-50K2 AIR BREATHING THRUSTER, 1,500 TONS THRUST

RL&S KENNTNIS CLASS LANDER

TL12		Tons	Cost (MCr)
Hull	50 ton Aligned Crystal Steel Ballistic	—	1
Hull Features	Advanced Radiation Shielding Heat Shielding VTOL Tough Frontier Hardening	2 — — — — —	8.75 — — — — —
Reaction Drive	Air Breathing Thruster (advanced)	1.35	3.75
Power Plant	MHD Turbine (advanced), Power 11	0.92	0.51
Emergency Power	Batteries, 48 Power/hour	0.05	0.05
Fuel Tanks	Thruster (16 Burns) MHD Power Plant (96 hours)	14.4 1.584	— —
Radiators	ADHR, Capacity 11	0.55	0.275
Bridge	Flight Deck, Neural Link	3	0.375
Computer	Primary: Computer/15fib Secondary: Computer/10fib	— —	1 0.8
Sensors	Basic Nav	1	0.1
Systems	Survival Locker	—	0.05
Airlocks	Standard Airlocks, Cargo Hatch, Docking Collar	2	0.03
Accommodations	12 Acceleration Couches	3	0.36
Software	Archive, Manoeuvre, Neural Interface, Security/3	—	11
Life Support Consumables	28 days for 12 people	0.112	—
Cargo		20	—
Total: MLv28.04			

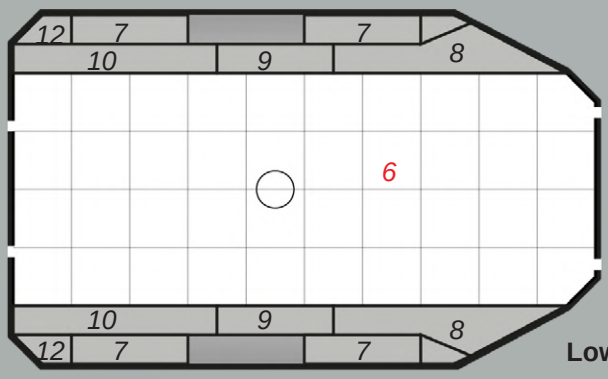
Crew
Pilot, Co-pilot

Passengers	Hull Points	Signature
12	5	Base Reflected: 1 Base Radiated: 1

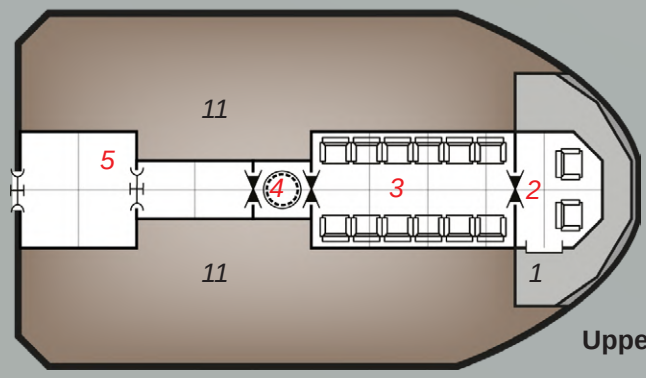
Running Costs

Maintenance Cost: Lv2333/month Purchase Cost: MLv28.04

Power Requirements	Power
Basic Ship Systems	1
Reaction Drive	5
Sensors	1

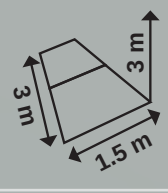


Lower Deck



Upper Deck

1. Sensors
2. Flight deck
3. Acceleration couches
4. Airlock and accessway
5. Aft cargo bay
6. Cargo bay
7. VTOL engines
8. Intake ducts
9. Power plant
10. Reaction drive
11. Fuel
12. Avionics



Keys

- Chair
- Acceleration Chair
- Bunk
- Lift
- Iris Valve
- Iris Valve Floor
- Iris Valve Ceiling
- Iris Valve Both
- Machinery
- Cold Berth Unit
- Access Panel
- Hatch
- Hatch Floor
- Hatch Ceiling
- Hatch Both
- Fresher Unit

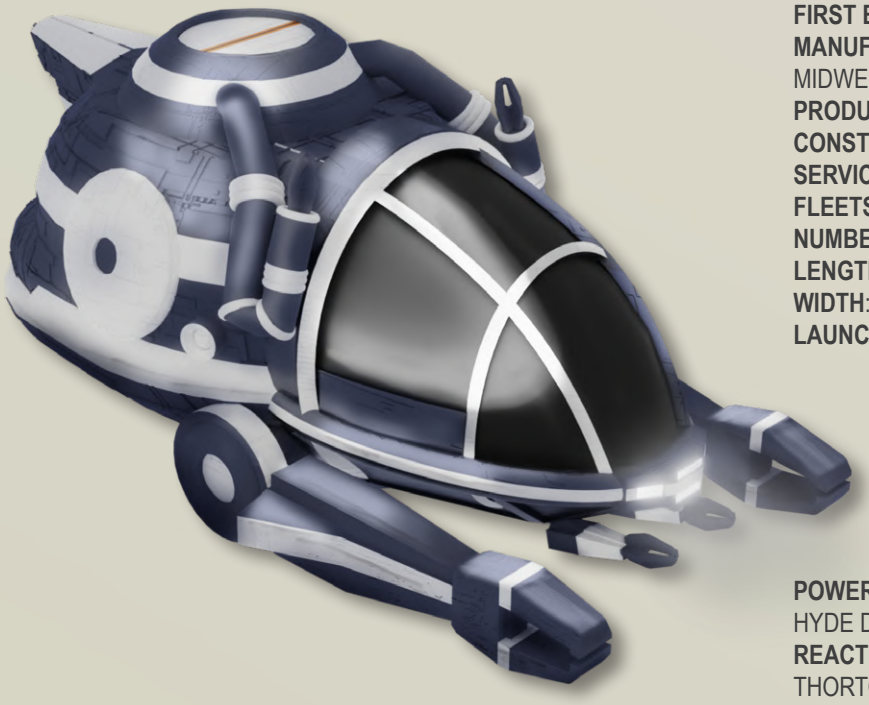
GREMLIN-CLASS EVA BUGS

Unlike *Bayern's* other auxiliary craft, the six EVA pods that she carries were not designed specifically for this mission. Instead, when the time came to outfit the ship, a decision was made to purchase modified versions of the very popular (and reliable) Midwest Technologies *Cargo Devil* freight handlers. Although a number of minor alterations have been made to these craft, they remain much the same as those that Midwest makes for numerous Foundations and nations. The first change was the elimination of the very heavy manipulator arm which, although vital in the routine transport of cargo modules, was considered to be unnecessary for *Bayern's* mission. Further modifications involved the addition of very fine manipulators which allowed the craft to be used for delicate repair work or minor adjustments of external equipment. Under the guidance of a skilled operator, these are roughly equal to human hands in manual dexterity. The software systems have been upgraded and include the enhanced security software common to all ships in the *Bayern* mission. This software is actually worth more than the vessel it runs on, more than doubling the price of the *Gremlin*.

In addition to their manipulator arms, each EVA bug has the ability to mount assorted tools for use in the repair or maintenance of *Bayern*. For instance, a laser welding torch can be easily affixed to trim replacement hull plates to fit over minor punctures, or cut off vacuum-frozen hardware on external assemblies.

As with the probes *Bayern* carries, the EVA bugs are not officially named. However, the crews who service and maintain them have given each a nickname and applied 'nose art' to individualise them. The six vessels are named Snoopy, Buster, Mutley, Laika, Balto and Argo. Each is also painted a different, but always bright and visible, colour.

In most cases, the EVA Bugs are guided by an operator seated within the craft during flight. In unusual circumstances, however, they can be piloted by remote control from *Bayern*. The remote pilot's station on either bridge can assume control of an EVA Bug in less than 15 seconds and the operator of the craft is powerless to prevent it. Standard operating procedures require that a remote pilot be on duty at all times when EVA Bugs are in use outside of *Bayern*.



NATION: AMERICA
FIRST EXAMPLE LAID DOWN: 2265
MANUFACTURER:
MIDWEST TECHNOLOGIES
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 42 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 6
LENGTH: 4.75 M
WIDTH: 1.75 M
LAUNCH MASS (FULLY FUELLED): 100 TONS

POWER PLANT:
HYDE DYNAMICS H2FC 200KW
REACTION DRIVE:
THORTON RS G.217 OMS ROCKET

Crew
Pilot

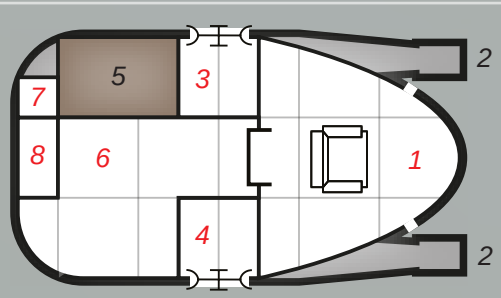
Passengers	Hull Points	Signature
—	1	Base Reflected: 0 Base Radiated: 1

Running Costs

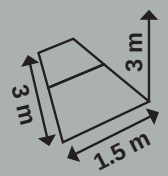
Maintenance Cost: Lv1353/month
Purchase Cost: MLv16.24

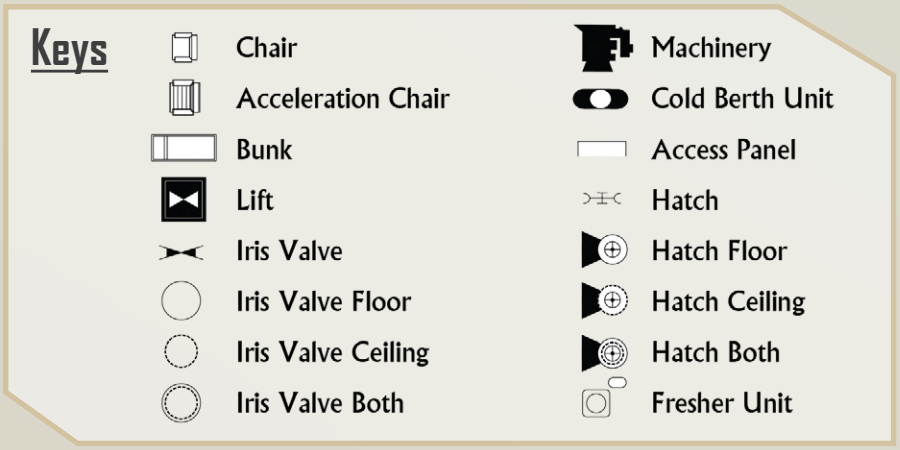
Power Requirements	Power
Basic Ship Systems	1
Sensors	1

TL12		Tons	Cost (MCr)
Hull	10 ton Aligned Crystal Steel Spaceframe	—	0.24
Hull Features	Radiation Shielding	—	0.05
Reaction Drive	OMS Rocket	0.2	0.006
Power Plant	Fuel Cell, Power 2	0.17	0.34
Emergency Power	TL 11 Batteries, 48 Power/hour	2.4	2.4
Fuel Tanks	OMS Rocket (2 Burns) Fuel Cell (48 hours)	0.7 0.04	— —
Radiators	Conventional, Capacity 2	0.2	0.01
Bridge	Cockpit	1.5	0.1
Computer	Primary: Computer/10fib	—	0.8
Sensors	Minimal Electronics	—	—
Systems	Survival Locker, Grappling Arms x 2, Manipulator Arms	4.25	1.3
Software	Archive, Manoeuvre, Security/3	—	11
Life Support Consumables	28 days for 1 person	—	—
Cargo		0.5	—
Total: MLv16.24			



1. Cockpit
2. Grappling arm
3. Survival locker
4. Cargo hold
5. Fuel
6. Emergency power
7. Power plant
8. OMS rocket





SCHUTZ-CLASS CCV

It is hoped that the *Schutz* Cryogenic Carrier Vessels will never have to leave their conformal berths on *Bayern*. As plans for the voyage to the Pleiades were drawn up, programme managers conducted path of failure studies to look at situations that could result in the failure of the whole mission. Many sessions focused on the loss of *Bayern* herself and how the crew could survive and recover. The addition of multiple stutterwarp-capable craft helped mitigate this but again and again the managers faced a problem that a sudden catastrophe could result in the loss of all of *Bayern's* hibernating crew. The *Schutz* CCV was the result. Four of these vessels are nestled into special housings outside of *Bayern's* A ring, ready to be launched into space with their precious cargo in the event of emergency.

Each CCV consists of a thick, slab-like body with a tapered rear aspect and blunt nose. They resemble a thick airfoil, like a section cut from a larger wing surface. Each vessel supports 60 cryotanks in two bays. Whilst docked the ships are fully part of *Bayern*, drawing from from her central power lines and connected to all her systems. However, in the event of power failure, ship-wide disaster or imminent loss of the ship, the four vessels are switched to their own internal power or, in extremis, ejected from *Bayern* to become self-sufficient lifeboats. The vessels are designed to be able to the support cryogenically preserved crew for extended periods. Another potential scenario following a total loss of *Bayern* is to use *Entdecker* to recover the CCV's and then attach them using her dorsal and ventral grapples so she can tow them to another destination – or potentially all the way back to human space.

The CCV has a rocket powered OMS system with sufficient fuel to exit any danger area, establish a safe course to a rendezvous point and then perform orbital insertion. They are also equipped with a ballistic re-entry package that allows them to make a parafoil-assisted soft landing, if a suitable landing zone can be found. The ship also contains survival rations and kits, so a small base camp can be established until rescue arrives, powered by a small radioisotope thermal generator with sufficient energy to last five years. There are also solar cells to run the ship's essential systems if needed. Running between the bays is a small flight deck, fresher and two rack-capsules for a flight crew. The ship also has a sophisticated autopilot, along with three remote maintenance drones to affect repair. The flight deck and rack capsules are only intended for short term use, however, and only two weeks' rations and life support supplies are provided.

Since the CCV vessels are not expected to be used independently, they are not individually named and simply referred to as CCV 1, 2, 3 and 4.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2297
MANUFACTURER: ST. LAWRENCE YARDS, LUNA
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 181 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 4
LENGTH: 15 M
WIDTH: 18 M
LAUNCH MASS (FULLY FUELLED): 550 TONS
POWER PLANT: VEN ENERGY GMBH 1MW RTG, 1 MW SOLAR ARRAY
REACTION DRIVE: KÖENIG AEROSPACE NEURAKKET R-10 OMS ROCKET, 600 TONS THRUST

Crew
Pilot or Autopilot

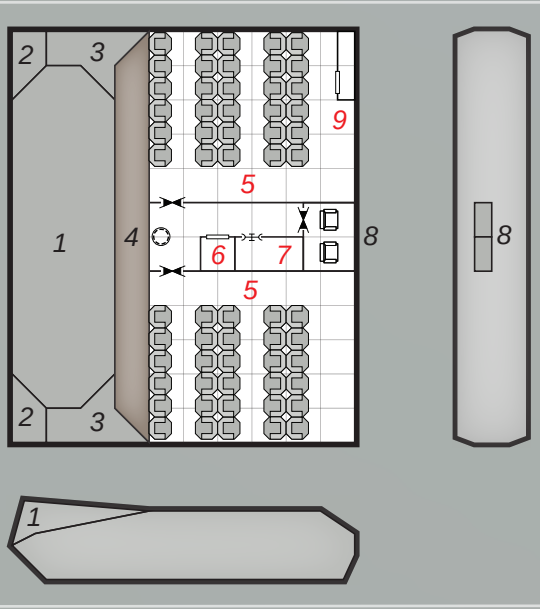
Passengers	Hull Points	Signature
60 in Hibernation Comfort -1	6	Base Reflected: 1 Base Radiated: 1

Running Costs

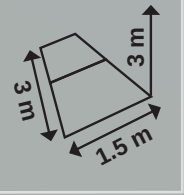
Maintenance Cost: Lv7547/month
Purchase Cost: MLv90.561

Power Requirements	Power
Basic Ship Systems	6
Sensors	1

TL12		Tons	Cost (MCr)
Hull	60 tons Synthetic, Ballistic	—	1.44
Hull Features	Radiation Shield	—	1.2
	Heat Shield	—	—
Reaction Drive	Rocket OMS (advanced)	1.2	0.036
Power Plant	Shielded RTG, Power 7	14	28
Emergency Power Plant	Solar Panels, Power 7	—	0.35
Fuel Tanks	OMS Thruster (3 Burns)	5.67	—
Radiators	ADHR, Capacity 7	0.35	0.175
Bridge	Flight Deck	3	0.25
Computer	Computer/30fib	—	10
Sensors	Minimal Electronics Suite	—	—
Systems	Recovery Package	3	12
	Repair Drones x 3	0.5	1
	Fresher	0.25	0.01
	Survival Locker	1	0.1
	Autopilot	—	0.6
Staterooms	Rack Capsules Bay (2 person)	1	0.25
	Hibernation Pods x 60	30	15
Software	Manoeuvre/0	—	—
	Archive, Auto Repair/2, Improved Robot Control, Security/3	—	20.15
Total: MLv90.561			



1. Power plant
2. OMS rocket
3. Recovery package
4. Fuel
5. Hibernation pods
6. Fresher
7. Rack capsule bay
8. Flight deck
9. Survival locker



DRONE VEHICLES

In addition to the various types of manned auxiliary craft which *Bayern* carries, she also has a small fleet of remotely piloted vehicles. These remote craft have been constructed with a great deal of commonality between them – the *Telegrafiern* courier drones use an almost identical drive section to the *Reisende* and all three use the same stutterwarp and family of power plants.

Bayern has blueprints for constructing more of these craft using her autofactories should any be lost or additional message drones be required.

The robot brains used by these drones are capable of limited decision making capabilities, within fairly narrow parameters. The interplanetary drones, for instance, are capable of interpreting sensor results for worlds with a potential for colonisation. They might even recognise atmospheric pollutants from an industrial civilisation but it would not be able to make contact with that civilisation.

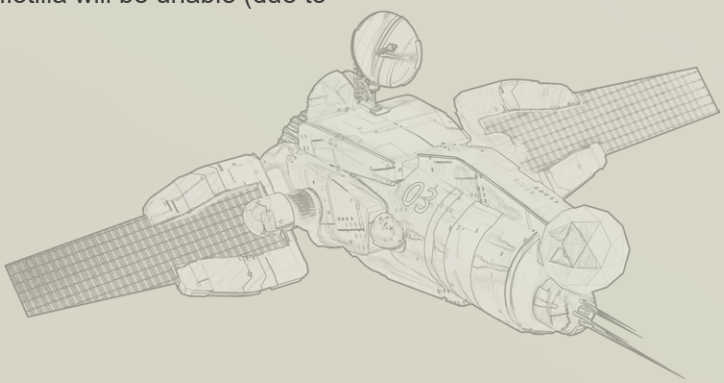
REISENDE INTERSTELLAR PROBES

Perhaps the most important of the drone vehicles are the six *Reisende-class* interstellar probes which *Bayern* will use to explore the route. Each is designated with a Roman numeral I through VI and not individually named. It has become traditional among crews of AR-I research vessels, however, to paint 'nose-art' on remote craft and give them nicknames but these are never made a matter of record and not officially sanctioned.

When *Bayern* reaches specific points along her transit, one or more of these craft will be launched to visit stars that the ships of the flotilla will be unable (due to time constraints) to explore. In addition, Commander Schmidt has complete authority to deploy one or more of the probes anytime as he sees fit. They are fully automated and will voyage to their destination star, perform a fly-by of the system and return to a rendezvous point for recovery.

These probes are large, 12 metres long and 7.5 metres in diameter stowed. The solar panels, once deployed, add a further 10 metres. Once the probes enter a target system they can use reaction drives to reach favourable discharge locations whilst cracking fuel for the return journey. The probes carry a full deep system scanner, folding sensor arrays and a sophisticated signal processing system. The robotic brain has sufficient skill to interpret the results on-site to prioritise the probe's time in-system but a detailed analysis of sensor readings requires a human operator.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2295
MANUFACTURER: NETEK INDUSTRIESTEUERUNGEN AG
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 60 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 6
LENGTH: 8.5 M
WIDTH: 5.5 M
LAUNCH MASS (FULLY FUELLED): 200 TONS
POWER PLANT: AFA GMBH VITA FC-1, 1 MW
REACTION DRIVE: AFA GMBH FALKE-600 OMS ROCKET, 600 TONS THRUST
STUTTERWARP: AFA GMBH HASE-30, 0.3 MW GEN II JEROME EFFECT STUTTERWARP



TL12		Tons	Cost (MCr)
Hull	20 ton Aligned Crystal Steel Spaceframe	—	0.2
Reaction Drive	OMS Rocket (advanced)	0.54	0.02
Stutterwarp	2.56 ly/day	0.82	4.08
Power Plant	Fuel Cell, Power 10 Solar Panels, Power 10	0.7 0.1	2.1 0.4
Emergency Power	TL 12 Batteries, 128 Power/hour	0.128	0.128
Fuel Tanks	OMS Rocket (6 Burns) Fuel Cell (19 days)	3.24 3.99	— —
Fuel Processing	Fuel Cracker	0.35	0.105
Radiators	Conventional, Capacity 10	0.98	0.05
Bridge	Autopilot	0.05	—
Computer	Primary: Computer/25fib Backup: Computer/20fib	— —	15 7
Sensors	Minimal Electronics DSS Standard, Folding Survey Sensors Telescope	— 2 5 2	— 1.5 1 5
Systems	100 kg Conventional Demolition Charge with Pulse EMP Generator	0.075	0.094
Software	Advanced Robot Control (advanced, skill 2, voice/speech recognition, interactive, personality), Security 3	—	12.1
Total: MLv48.77			

Crew
Autopilot: Pilot 2

Running Costs

Maintenance Cost: Lv4064.536/month
Purchase Cost: MLv48.77

Passengers	Hull Points	Signature
None	2	Base Reflected: 0 Base Radiated: 1

Power Requirements	Power
Basic Ship Systems	2
Stutterwarp	3
Fuel Processor	5
Sensors	3

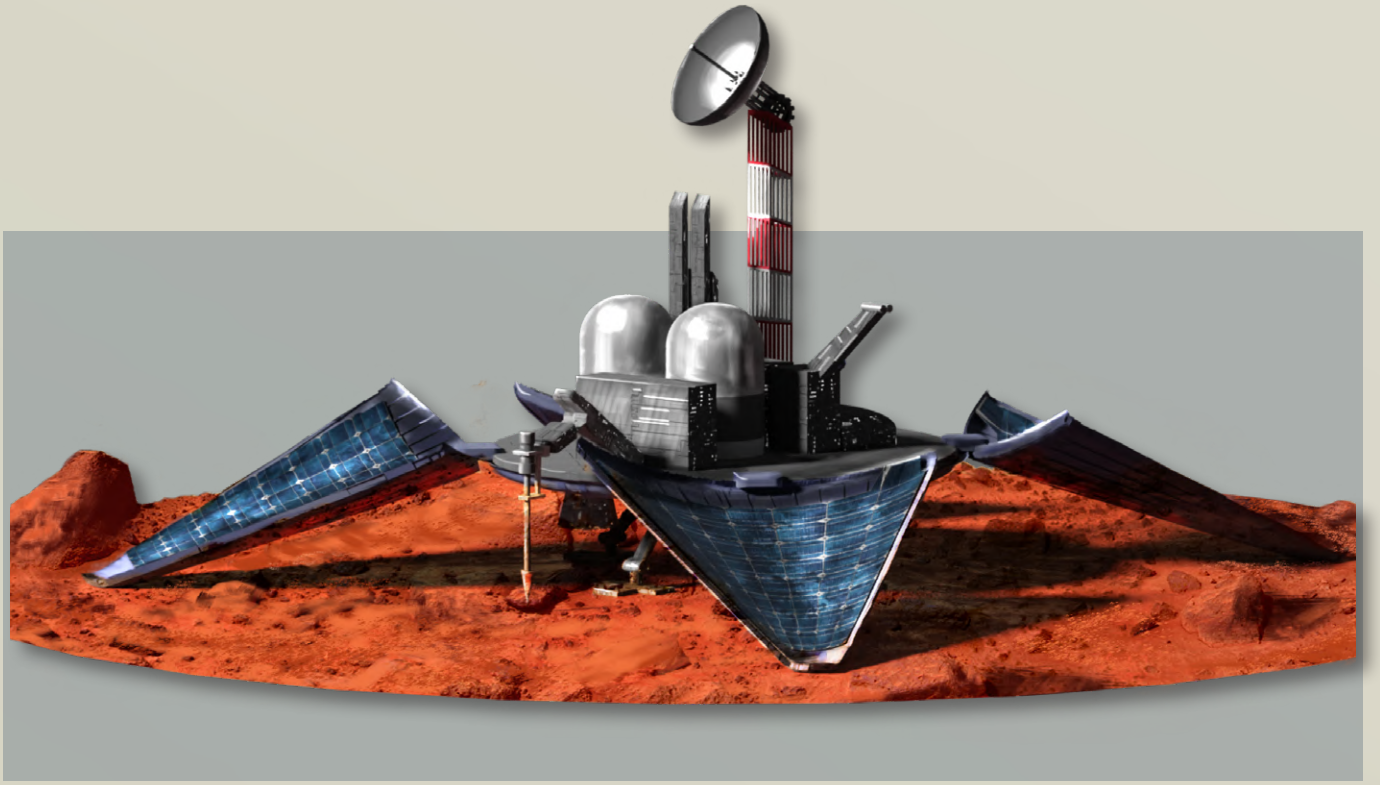
SUCHE REMOTE LANDERS

For the exploration of planetary surfaces both prior to and in lieu of manned landings, *Bayern* carries six *Suche* probes. Each craft is a squat, truncated cone with a powerful thruster package at the base. The lander is able to transit to a target world and perform cartographic scans from orbit, selecting a suitable landing site and then de-orbiting to make a soft landing. It is sealed and designed to float on a liquid surface, given standard pressures and liquid density.

Once on the surface, manipulators unfold and a wide variety of sensory devices begin to operate. The surface lab package will then begin to gather a wide variety of data on the environment. Analysis will determine composition and pressure of the atmosphere found at the landing site and the geological and chemical makeup of nearby rocks. Sensors will measure local gravitational, magnetic and radioactive fields, while physical manipulators permit the probe to take samples of the environment for return to *Bayern*.

In less than 48 hours, the drone can conduct an orbital survey and surface examination allowing it to assemble a picture of the region around the lander as well as a somewhat less exact one on the planet as a whole. The probe will also have recycled the fuel in its fuel cell and discharged the stutterwarp drive. When it has done its work, the *Suche* will use its powerful thrusters to lift off and engage its stutterwarp to rendezvous with *Bayern.*

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2295
MANUFACTURER: NETEK INDUSTRIESTEUERUNGEN AG
PRODUCTION STATUS: OUT OF PRODUCTION
CONSTRUCTION TIME: 60 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 6
LENGTH: 5.05 M
WIDTH: 6.5 M
LAUNCH MASS (FULLY FUELLED): 200 TONS
POWER PLANT: AFA GMBH VITA FC-0.5, 0.5 MW FUEL CELL
REACTION DRIVE: AFA GMBH TAUBE-600 AIR BREATHING ROCKET, 600 TONS THRUST
STUTTERWARP: AFA GMBH HASE-30, 0.3 MW GEN II JEROME EFFECT STUTTERWARP



TL12		Tons	Cost (MCr)
Hull	20 ton Aligned Crystal Steel Ballistic	—	0.2
Hull Features	VTOL, Heat Shield, Hydrodynamic Hull	1	0.3
Reaction Drive	Air Breathing Rocket (advanced)	2.24	3.4
Stutterwarp	2.56 ly/day	0.82	4.08
Power Plant	Fuel Cell, Power 10 Solar Panels, Power 10	0.35 0.1	1.05 0.4
Emergency Power	TL 12 Batteries, 128 Power/hour	0.128	0.128
Fuel Tanks	Rocket (12 Burns) Fuel Cell (21 days)	8.64 2.1	— —
Fuel Processing	Fuel Cracker	0.175	0.0525
Radiators	ADHR, Capacity 5	0.245	0.12
Bridge	Autopilot	—	—
Computer	Primary: Computer/25fib Backup: Computer/20fib	— —	7 3.75
Sensors	Minimal Electronics Surface Lab Telescope	— 2 2	— 1 5
Systems	1 KT Conventional Demolition Charge	0.075	0.094
Software	Manoeuvre, Stutterwarp Control, Advanced Robot Control (advanced, skill 2, voice/speech recognition, interactive, personality), Security 3	—	13.12
Total: MLv49.93			

Crew
Autopilot: Pilot 2

Passengers	Hull Points	Signature
None	2	Base Reflected: 0 Base Radiated: 1

Running Costs

Maintenance Cost: Lv4160.769/month
Purchase Cost: MLv49.93

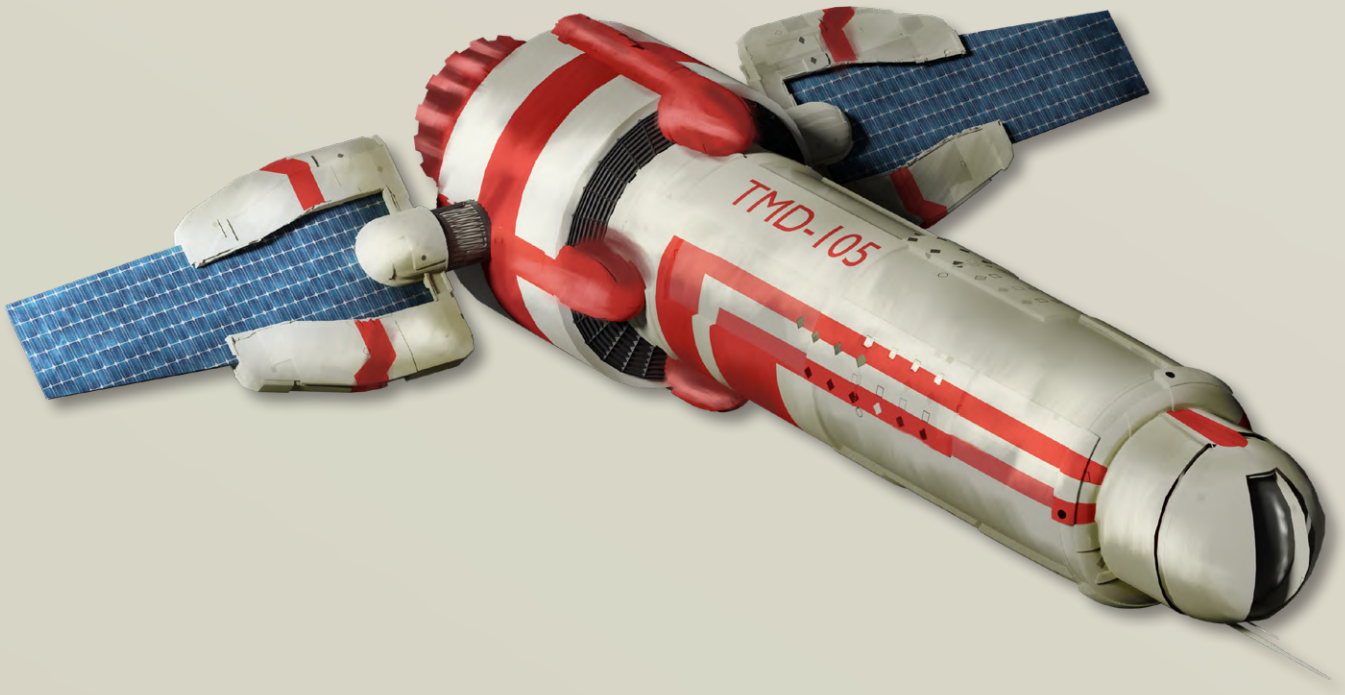
Power Requirements	Power
Basic Ship Systems	2
Stutterwarp	3
Fuel Processor	5
Sensors	2

TELEGRAFIERN MESSAGE DRONES

Bayern carries a dozen of these vital craft, which are used to keep AR-I scientists on Earth up-to-date on the progress of the mission. From time-to-time, Commander Schmidt is required to order one of these devices fired toward human space; at a minimum, one drone is to be returned every six months. Prior to its departure, all information which has been acquired since the firing of the previous drone is uploaded into its onboard computer storage systems. In addition, each crewmember that has been, or currently is, out of cryogenic suspension is permitted to record a brief communication which will be delivered to loved ones back home.

Bayern's autofactories, if supplied with sufficient materials, are capable of producing more of these drones. *Bayern* will also leave six of the message drones floating in the deep interstellar rift, to act as a relay for drones sent back by *Bayern* after she traverses the rift. These later drones will arrive within the rift with their stutterwarp drive partially charged and it would be impossible for them to complete the crossing without the drives being destroyed. Instead, they will rendezvous with the drones that *Bayern* leaves behind with un-charged drives and upload their data packets to them. The second drone will then set off and the original drone, with its charged drive, will move to a safe distance and activate its self-destruct package. The second drone will be able to traverse the rift and discharge its drive as normal for the rest of the journey back into human space.

NATION: GERMANY
FIRST EXAMPLE LAID DOWN: 2295
MANUFACTURER: NETEK INDUSTRIESTEUERUNGEN AG
PRODUCTION STATUS: IN PRODUCTION
CONSTRUCTION TIME: 32 DAYS
SERVICE STATUS: IN SERVICE
FLEETS OF SERVICE: AR-I
NUMBER IN SERVICE: 12
LENGTH: 12.5 M
WIDTH: 2.8 M
LAUNCH MASS (FULLY FUELLED): 100 TONS
POWER PLANT: AFA GMBH VITA FC-05, 0.5 MW
REACTION DRIVE: AFA GMBH FALKE-300 OMS ROCKET, 300 TONS THRUST
STUTTERWARP: AFA GMBH HASE-30, 0.3 MW GEN II JEROME EFFECT STUTTERWARP



TL12		Tons	Cost (MCr)
Hull	10 ton Aligned Crystal Steel Spaceframe	—	0.1
Reaction Drive	OMS Rocket (advanced)	0.27	0.02
Stutterwarp	2.56 ly/day	0.82	4.08
Power Plant	Fuel Cell, Power 5 Solar Panels, Power 10	0.42 0.1	01.25 0.4
Emergency Power	TL 12 Batteries, 128 Power/hour	0.128	0.128
Fuel Tanks	OMS Rocket (19 Burns) Fuel Cell (20 days)	1.71 5.4	— —
Fuel Processing	Fuel Cracker	0.21	0.063
Radiators	Conventional, Capacity 10	0.5	0.03
Bridge	Autopilot	0.05	—
Computer	Primary: Computer/25fib Backup: Computer/20fib	— —	15 7
Sensors	Minimal Electronics	—	—
Systems	100 kg Conventional Demolition Charge with Pulse EMP Generator, High Capacity Data Storage	0.575	0.094
Software	Advanced Robot Control (advanced, skill 2, voice/speech recognition, interactive, personality), Security 3	—	12.1
Total: MLv39.96			

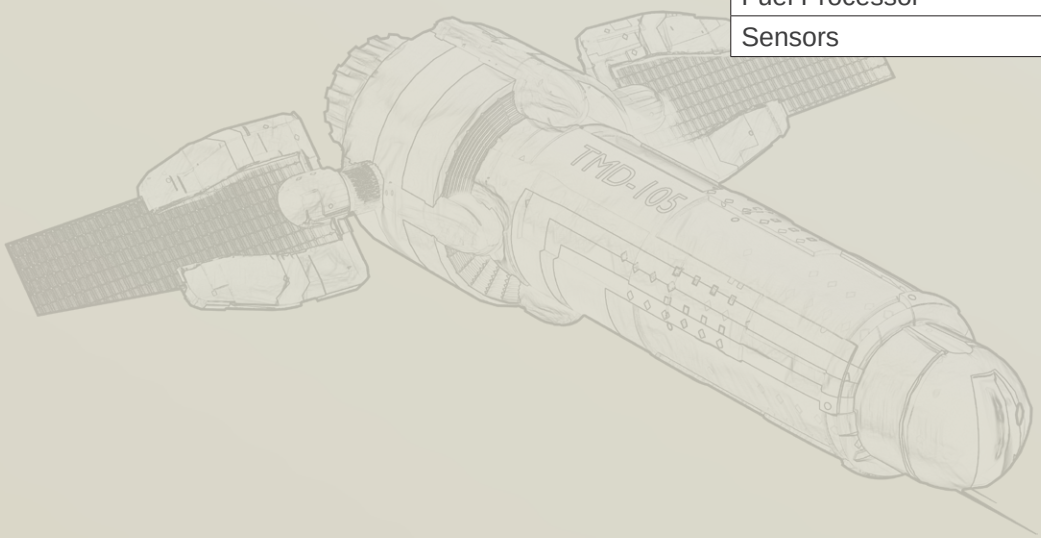
Crew
Autopilot: Pilot 2

Passengers	Hull Points	Signature
None	2	Base Reflected: 0 Base Radiated: 1

Running Costs

Maintenance Cost: Lv3329.28month
Purchase Cost: MLv39.96

Power Requirements	Power
Basic Ship Systems	1
Stutterwarp	3
Fuel Processor	4
Sensors	1



ROBOTS

There are a multitude of robots in use aboard *Bayern*, ranging from simple automated cleaning robots to sophisticated Aleph assistance drones capable of complex tasks without human supervision. Many of *Bayern's* systems are not routinely accessible from the interior of the ship and much of the routine maintenance is carried out by a fleet of 50 Königskrabbe repair robots. She also carries 20 Kolkrabe observation drones, used for a variety of simple tasks requiring a camera outside of the ship. The *George Bauer* also carries 10 MERV and three HERC mining robots.

NEOROBOTIX GMBH ALEPH ROBOTS

In addition to the repair and observation robots there are four NeoRobotix Aleph robots aboard *Bayern* to assist the crew with simple housekeeping tasks. The robots were the focus of a competition run in schools across Europe to choose names and colour schemes, and have been the focus of a great deal of the AR-I's educational output. A series of videos and promotional materials have been produced that use the robots to explain key goals and concepts of the mission to a younger audience. The four robots feature prominently throughout and exhibit individual personalities and quirks which their real world counterparts do not share.

The four robots were designated A, B, C and D; the naming competition eventually settled on Alois, Beaux, Christa and Dexter. Alois is painted yellow, features a toughened chassis and is often utilised by the engineering crew to assist in maintenance and repairs. Beaux and Dexter are purple and green, and usually found in the spinhabs where they perform routine housekeeping and maintenance functions. Christa is painted white and usually found in the galley but also has additional programming to support the medical team in an emergency.

The Aleph has a sophisticated robot brain, capable of interaction with the crew. Orders and instructions can be issued vocally and the robot will respond in kind although responses are clearly those of a machine. Unlike Aristotle (see *Technical Reference Manual* page 62), the robots have no real interactive ability beyond responding to commands or carrying messages. Conversations with them are dull. Alephs are shipped with a basic set of skills and can be programmed to perform other duties as required. Those in use on *Bayern* have sufficient memory and processor power free to support another eight levels of skills, with a maximum skill level of 2.

Robot	Hits	Locomotion	Speed	TL	Cost
Aleph	12	Walker	5 m	12	Lv65000
Skills	Electronics 0, Mechanic 1, Medic 1, Science (biology) 1, Steward 2				
Attacks	None				
Manipulators	2 x (STR 7 DEX 9)				
Endurance	72 hours				
Traits	Armour (+4), ATV, Small (-1)				
Programming	Advanced (INT 8)				
Options	4G Sensor Suite, Audible Sensor, Drone Interface, Fire Extinguisher, Light Intensifier Sensor (basic), Magnetic Grippers, Medikit (improved), Transceiver 50 km (improved), Voder Speaker, Wireless Data Link				

SORTECH MERV-213

The Sortech Mineral Extraction Remote Vehicle is a zero-G adapted mining robot used mainly for mining ring bodies, small asteroids and comets. It is designed for use in microgravit, and its orbital manoeuvring system is not strong enough to support it under gravity greater than 0.3 G. The MERV is equipped with four dexterous multipurpose, telescoping arms with sockets for interchangeable tools.

MERVs can be controlled either as remote vehicles, or be set to an autonomous mode where they will carry out a set of instructions and are able to adapt behaviour to changing circumstances on a limited basis. If, for example, instructed to mine water ice from a dirty comet and the current deposit runs dry or becomes contaminated, a MERV will secure the already mined material and move in a logical search pattern to seek new deposits.

The MERV's contain no storage of their own but can be equipped with spinners in their tool sockets which allow them to weave a cargo net to hold large chunks of ore together. Typically one MERV will weave a net whilst others mine and ferry ore to the weaver, adding additional sections of netting as required.

Robot	Hits	Locomotion	Speed	TL	Cost
MERV-213	20	Thruster	6 m	12	Lv110000
Skills	Athletics (endurance) 4, Athletics (strength) 1, Gun Combat (energy) 1, Investigate 1, Melee 0, Profession (belter) 2, Profession (labourer) 2				
Attacks	Laser Rifle (4D, Zero-G)				
Manipulators	4 x (STR 9 DEX 7)				
Endurance	16 hours				
Traits	Armour (+8), IR Vision				
Programming	Advanced (INT 8)				
Options	Audible Sensor, Drone Interface, Gecko Grippers, Geiger Counter, Light Intensifier Sensor (advanced), Mining Equipment (small), Transceiver 500 km (enhanced), Vacuum Environment Protection, Visual Spectrum Sensor, Voder Speaker, Wireless Data Link				

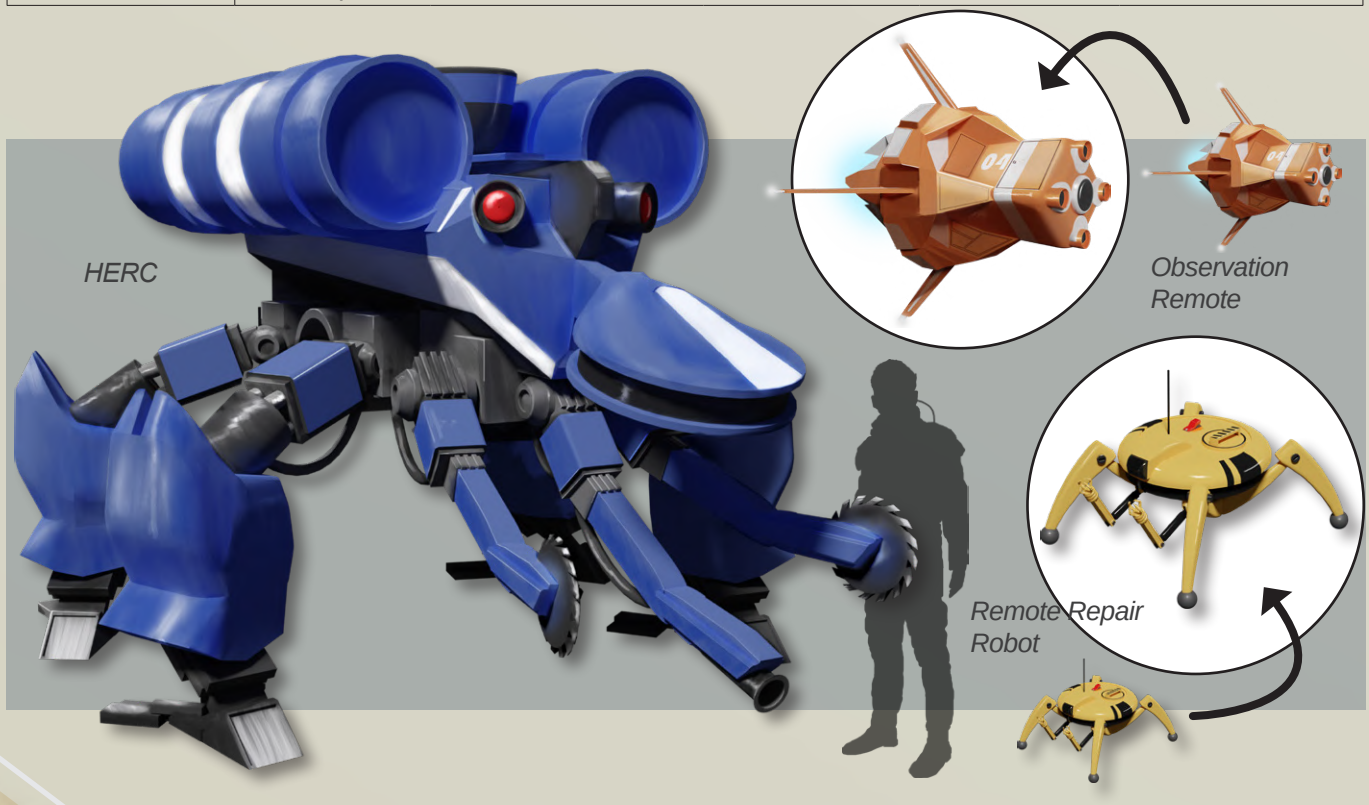
GORMAN SYSTEMS INC. GSI-89C HERC

The HERC (Heavy Extraction Remote Construct) is the big brother to the MERV. Designed for surface mining on hostile, but resource rich, worlds like Nyotekundu or Io, the HERC is a massive, rugged mining robot. The GSI-89c version is equipped for zero-G mining and eschews some internal storage for an inbuilt OMS system; rock pitons mounted in its feet anchor it to asteroids.

The HERC is equipped with a pair of diamond-tipped rotary rock cutters and a short ranged plasma torch capable of smelting rock and ore at close range. Molten ore is then collected through the extractor arm and deposited in storage bins. A set of assay tools, including ground-penetrating radar, radiation detector, microscope and a small mineral analyser, allow the HERC to perform simple geological surveys and ore-body assessments. A trio of HERCs can map the surface of a small body (<1 kilometre diameter) using their sensors in less than a day.

Like the MERV, the HERC can be operated as a remote vehicle, or left to run autonomously, seeking out minerals and extracting them in an order of preference until its storage bins are full.

Robot	Hits	Locomotion	Speed	TL	Cost
HERC	75	Walker	5 m	13	Lv740000
Skills	Athletics (endurance) 3, Athletics (strength) 3, Gun Combat (energy) 1, Investigate 1, Profession (belter) 2, Profession (labourer) 2, Science (planetology) 1				
Attacks	None				
Manipulators	3 x (STR 15 DEX 8)				
Endurance	144 hours				
Traits	Armour (+12), ATV, Large (+3), IR Vision, Secondary Propulsion (OMS, idle)				
Programming	Advanced (INT 8)				
Options	Audible Sensor, Cutting Torch (improved), Drone Interface, Gecko Grippers, Geiger Counter, Hostile Environment Protection, Light Intensifier Sensor (advanced), Mining Equipment (large), Planetology Sensor Suite, Storage Compartment (standard, 18 kg), Thermal Sensor, Transceiver 5,000 km (improved), Vacuum Environment Protection, Visual Spectrum Sensor, Voder Speaker, Wireless Data Link				



KURA/GNEISS INDUSTRIES KÖNIGSKRABBE REMOTE REPAIR ROBOT

The K/GI Königskrabbe is a standard shipboard repair robot featuring a thick, discus shaped body with four sturdy legs attached to a universal mounting below. Two manipulator arms extend from the underside of the body and an extendible sensor platform is mounted between them. The upper surface of the robot contains storage cases for specialist tools which snap on to the robot's manipulators, such as a compact laser welder and a high intensity oxy-cutter.

Bayern has dozens of these robots and they are used for all sorts of repairs around the ship. The autofactories contain blueprints for them and they are routinely recycled and replaced as they are damaged or disabled.

Robot	Hits	Locomotion	Speed	TL	Cost
King Crab	11	Walker	6 m	14	Lv120000
Skills	Athletics (dexterity) 1, Electronics (sensors) 1, Engineer (power) 1, Investigate 1, Mechanic 1, Steward 0				
Attacks	Laser Welder (3D)				
Manipulators	2 x (STR 3 DEX 8)				
Endurance	72 hours				
Traits	Armour (+4), ATV, IR Vision, Small (-1)				
Programming	Advanced (INT 7)				
Options	Audible Sensor, Cutting Torch (advanced), Drone Interface, Electronics Toolkit (enhanced), Fire Extinguisher, Geiger Counter, Magnetic Grippers, Mechanical Toolkit (advanced), Starship Engineer Toolkit (advanced), Thermal Sensor, Transceiver 50 km (improved), Vacuum Environment Protection, Visual Spectrum Sensor, Voder Speaker, Wireless Data Link				

KURA/GNEISS INDUSTRIES KOLKRABE OBSERVATION REMOTE

The Kolkrabe (Raven) remote is a typical example of a ROV/D (Remote Observation Vehicle/Drone) equipped for zero-G operations. The robot is not much more than a thruster pack, fuel and a set of sensors and spotlights. *Bayern's* crew use these robots as both remotely operated drones and as free-flying robots for any observation work up to 500 kilometres away from the ship, including observing EVA's and work pod activities, supervising activities of the Königskrabbe robots and observing *Bayern* from a distance for the media crews aboard.

Robot	Hits	Locomotion	Speed	TL	Cost
Kolkrabe	4	Thruster	6 m	12	Lv32000
Skills	Recon 1, Pilot 0				
Attacks	None				
Manipulators	2 x (STR 3 DEX 7)				
Endurance	2 hours				
Traits	Armour (+4), IR Vision, Small (-3)				
Programming	N/A (INT 3)				
Options	Audible Sensor, Drone Interface, Geiger Counter, Laser Designator, Light Intensifier Sensor (advanced), Recon Sensor (basic), Transceiver 500 km (enhanced), Visual Spectrum Sensor, Voder Speaker, Wireless Data Link				

THE SHIP'S COMPUTER

One of the most unusual members of *Bayern's* crew is Aristotle, the ship's simulated intelligence. Affectionately known as 'Ace' by the crew, this machine is one of the most advanced data processing devices ever built. Aristotle is fully voice-activated but can also receive data and instructions via video cameras (located in almost every compartment), keyboard or radio transmission. In order to activate or query the computer, ship's personnel need only address the computer by name and give instructions or ask questions. Aristotle's command of English, German and French is quite complete, and seldom (if ever) requires clarification.

Aristotle

EDU 10 | **INT 9** | **SOC 8**

SKILLS: Astrogation 0, Electronics (comms) 1, Electronics (remote ops) 1, Electronics (sensors) 1, Engineer (power) 1, Engineer (stutterwarp) 1, Intent 3*, Mechanics 0, Pilot 0, Science (all others) 1, Science (linguistics) 2

* Intent is used as a skill if Aristotle is given vague or unclear commands to see if it can interpret them correctly.

In addition, Aristotle is able to analyse the emotions of the person speaking to it and can usually detect jokes; in similar fashion, by monitoring micro tremors in a person's voice, it is normally able to tell when someone is lying to it or giving true but misleading information. Aristotle is instantly able to identify the person speaking to it, even if there is an attempt to change or disguise the voice.

Aristotle is not self-aware but puts on an incredible simulation. The French Intelligence Simulateur division of L'Crouix Renseignement Systemes went to great lengths to make it impossible for unaware users to tell whether they are speaking to a machine or an actual person.

Aristotle's personality is rather bland. Although it does have a mild sense of humour and can hold its own in light conversation, it is uninteresting in long exchanges. Its lack of creative thought also limits it in this aspect. While humans can 'free associate' ideas and thus drift from subject-to-subject when talking, Aristotle remains on a given topic until the human speaker changes it. It is certainly no substitute for human companionship.

When Aristotle speaks, its voice is not mechanical at all. Instead, it has diction which is, if anything, too perfect. Every sound is exactly pronounced and clearly enunciated. Nichole St. Nicholas, *Bayern's* chief computer officer, claims to be unable to determine why Aristotle seems to have acquired a slight French accent when speaking English or German. The majority of the crew is somewhat suspicious of her innocence in this matter.

It is possible for Aristotle to assume control over *Bayern* in a crisis but it must first have a direct verbal order from the commander or first officer. Aristotle's lack of 'hunches' and true creativity, however, would make an extended period under its control scientifically unrewarding. In simulation tests, Aristotle scored consistently lower than *Bayern's* human crew in crisis evaluations.

Likewise, if needed, Aristotle can be deactivated without affecting *Bayern's* operation; it is a separate system from *Bayern's* redundant network of flight control computers.

It is also able to quickly access vast amounts of information from the ship's library but cannot offer data on topics which it is not specifically questioned about. For example, if Commander Schmidt were to request information about the chemical composition of a planet's atmosphere, Aristotle might not include the fact that it is explosive when combined with oxygen unless specifically asked about possible reactivity.

Aristotle is able to sift through data in its memory banks extremely fast; in fact, it is this property that makes the voice-activated computer so vital aboard a starship like *Bayern.* In lieu of drafting a complex program to pull various related pieces of information, one need only say something like, 'Aristotle, give me a graph which contrasts the anomalies in the spectrum of Alcyone with its predicted behaviour.'

I Have the Greatest Enthusiasm and Confidence in the Mission

Aristotle is a learning computer able to modify its own program as the mission progresses. Part of the reason that its program seems so lifelike and sophisticated is its complexity; millions of items of holographic programming interact to produce the seemingly lifelike responses. As the mission progresses Travellers will begin to notice that it gradually seems to be adopting even more lifelike traits.

By the time *Bayern* reaches the Pleiades, Aristotle will no longer need to use its Intent skill to interpret commands and will have started to make some intuitive leaps. Travellers will also notice a marked change in its personality – or rather they will see that Aristotle has started to develop a much fuller and rounded personality. It can now hold full conversations and debate points of logic and philosophy. Nichole St. Nicholas will spend a great deal of time trying to work out why this should be but without freezing Aristotle's program to dissect it, she will make little progress – the changes to its holographic program are too complex and rapid for her to make sense of them.

The changes will continue as the mission progresses and by the time *Bayern* leaves the Hyades for the final leg of its trip home to Aldebaran, Aristotle will have effectively boosted all its characteristics and skills by +1. At this point, Nichole will be voicing her opinion that Aristotle may be on the road to becoming an emergent AI, although Aristotle will continue to assert that it is just a machine.

The final surprise will come during the events of The Gambit, when Aristotle will demonstrate its – or his – self-aware nature and ability to consider self-sacrifice.

VEHICLES AND EQUIPMENT

Bayern is well stocked with scientific, exploration and survival equipment, and her autofactories and library of designs provide the crew with the ability to fabricate any additional equipment they require. In general the referee should assume that mundane equipment from the *2300AD* box set or *Tools For Frontier Living* is available.

There are a few exceptions to this. Firstly, there are no Pentapod bio-constructs or products on board and the Travellers will not be permitted to bring any Pentapod items with them in their personal belongings. Any Traveller that has had Pentapod biotech implanted, such as a replacement limb, will have had to undergo an intensive battery of tests to ensure it is benign before they are allowed to join the crew.

Secondly, weapons are tightly restricted, as discussed in Mission Profiles, page 19. Personal weapons will be stored in *Bayern's* armoury and provided to Travellers at a senior officer's discretion. Whilst *Bayern's* autofactories have designs on file to create new weapons, these designs are under security measures that prevent them from being fabricated without permission from senior officers.

Finally, *Bayern's* limited cargo space means that she carries just a few surface exploration vehicles. Stored in her forward holds are a single Explorer ATV, a pair of Bridgeport Swift Songbirds, a pair of Bushranger Wallaby HATV's, six Metzger Aerosport hoverbikes and a single Kolibri ultralight aircraft.

BUSHRANGER WALLABY HOVER ALL-TERRAIN VEHICLE

The Wallaby Hover All-Terrain Vehicle is a large hovercraft designed for exploration, used extensively on worlds where the terrain is mostly flat or rolling, or where water and swampland is common. The Wallaby features a large, environmentally protected crew cabin with two bunks, a fresher and small galley, as well as six comfortable seats. The large cargo bed at the rear of the Wallaby is open and not covered by the environmental protection, nor is there an airlock between the two, so accessing the cargo bed in a hostile environment means exposing the cabin. The cargo bed is large enough to be used as a rear deck and features a support frame that can accept a fold-out synthetic cloth covering to protect the area from the elements somewhat. Stored above the main cabin is an inflatable shelter, a flying disk camera platform and extensive storage for tools and survey equipment can be found on the exterior and in the rear deck. A hatch and powered ring mount are installed in the roof above the front passenger seat, although no weapons are fitted as standard.

The *Bayern* mission carries two Wallabies. One is usually stored in the *Entdecker* and the other in Cargo Bay 3.

KOLIBRI ULTRALIGHT AIRCRAFT

The Bauertek-Ikarus Kolibri (Hummingbird) is a small, lightweight, utility tilt-fan aircraft. It features a somewhat cramped passenger cabin and small cargo area but has excellent visibility through the large windows and is fitted with a state of the art electronics suite. The design features a twin tail with a pair of lift fans on overhead pylons. Hover control is provided by bleed air through puffer ports in the wingtips, nose and tail. The Kolibri is made of lightweight materials throughout and as such is considered to have an open frame, despite the aircraft being sealed and pressurised.

The Kolibri can be partially disassembled with a few hours work and stowed in a surprisingly small space. Bayern carries a single Kolibri in cargo bay three.

CANARIES

Planetary Adaptation Syndrome is a catch-all term for the difficulties a human body has in adapting to the biosphere and local conditions of alien worlds. Amongst the settled worlds of space it is a relatively minor concern, since most dangerous allergens and organisms have been catalogued and appropriate drug therapies prepared. However, the crew of *Bayern* will be visiting every world for the first time. It is entirely possible that a seemingly benign world could have a deadly neurotoxin suffusing its atmosphere or pollen that is a potent psychotropic. The canary is designed to minimise the risk to *Bayern's* crew.

BUSHRANGER WALLABY HOVER ALL-TERRAIN VEHICLE

TL	12
Skill	Drive (hovercraft)
Agility	+1
Speed (Cruise)	High (Medium)
Range (Cruise)	600 (900)
Crew	1
Passengers	5
Cargo	1.125 tons
Hull	66
Shipping Size	8.25 tons
Cost	MLv1.396

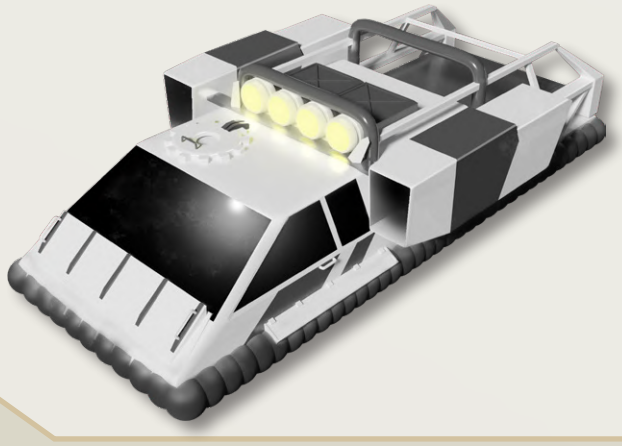
Armour

Front	3
Side	3
Rear	3

Traits	ATV
Equipment	Autopilot (enhanced), Bunks x 4, Comms System (advanced), Control System (enhanced), Entertainment System, Fire Extinguisher, Fresher, Hostile Environment Protection, Inflatable Shelter, Jump Jets (20 m), Life Support (long term), Mini-Galley, Navigation System (improved), Ring Mount, Sensor System (Improved)

Equipment

Autopilot (skill level)	+2
Communications (range)	1,000 km
Navigation (Navigation DM)	+2
Sensors (Electronics (sensors) DM)	+1
Camouflage (Recon DM)	—
Stealth (Electronics (sensors) DM)	—



KOLIBRI ULTRALIGHT AIRCRAFT

TL	12
Skill	Flyer (wing)
Agility	1
Speed (Cruise)	Very Fast (Fast)
Range (Cruise)	4,800 (7,200)
Crew	1
Passengers	3
Cargo	250 kg
Hull	5
Shipping Size	3.75 tons
Cost	Lv284200

Armour

Front	4
Side	4
Rear	4

Traits	Open Frame
Equipment	Aquatic Drive, Autopilot (enhanced), Comms System (advanced), Computer/3, Control System (enhanced), Folding Wings, Life Support (short term), Navigation System (basic), Sensor System (basic)

Equipment

Autopilot (skill level)	+2
Communications (range)	1,000 km
Navigation (Navigation DM)	+1
Sensors (Electronics (sensors) DM)	+0
Camouflage (Recon DM)	—
Stealth (Electronics (sensors) DM)	—

Realism versus Playability

2300AD is a hard science fiction game of exploration and adventure amongst the stars. The canary is a concession towards the reality that explorers of alien worlds are likely to spend much of their time walking across alien grasslands in bio-hazard suits until they have determined that the local flora and fauna are not going to be detrimental to their health. Since there are no 'biofilters' or 'life scanners' in *2300AD*, this process could take months or even years for planets with advanced ecosystems. Referees may wish to include this level of realism and ensure the Travellers use sealed environment suits whilst planetside, fearing, at worst, a rip that could bring on an alien death plague and at best, a lengthy decontamination prior to reintroduction to *Bayern's* general population. If, instead, the referee prefers to allow the Travellers to get alien wind in their hair and dirt beneath their fingernails, the canary and the Planetary Adaptation Syndrome rules provides a means of demonstrating that alien worlds have dangers other than animals with fangs.

Each canary is a cylinder 20 centimetres in diameter and 45 centimetres long. The upper quarter has a series of shuttered air intakes along the sides and on the top there are a set of diagnostic readouts. There is a sturdy, fold-out carrying handle on both sides and a set of tripod legs can be extended from the base. Rectangular cassette versions can also be plugged into external sampling racks on each of *Bayern's* atmosphere capable vehicles, including the *Suche* planetary landers.

The canary is essentially a sampling and monitoring tool hooked to a miniaturised life support and diagnostic system for tailored cell cultures. These cultures are based on genetic samples taken from the crew and modified to produce small samples of various tissues; skin, respiratory, blood and so on. The sampling system draws in air and passes it over the cultures and then monitors them for reactions. If a reaction occurs some cultures are monitored to observe the effects and others are treated with a battery of routine remedies to see which are effective. Each canary also contains a small thermal cleansing system that can be activated to destroy the cell cultures, and any pathogens, remotely.

Results from a canary using cell cultures developed from Travellers' own cells can be used to apply DM+3 to avoid Planetary Adaptation Syndrome. The results from another person's cultures can still provide some benefit, so DM+1 to the PAS check can be applied. Note that the normal DM+2 for using a drug therapy does not apply, since therapies have not been developed for worlds that *Bayern* is visiting. A fresh set of cell cultures is required for every new planet and can be grown from stored samples in one week.

MULTI-ENVIRONMENT CLOTHING

Multi-environment clothing was developed to provide a set of universal exploration gear capable of adapting to extremes of temperature and humidity. It consists of a thick, rubbery bodysuit, similar to an elastic wetsuit, with a tough, ballistic weave outer sleeve. Within the moisture wicking bodysuit there is a system of micro fine capillaries and pipes with a small temperature regulation unit in the small of the back. Heating or cooling fluid is pumped through pipes regulating the wearer's temperature. Battery life is around 20 hours under normal conditions but extremes of heat or cold can reduce this to as little as three hours. The suit effectively combines the benefits of cold climate clothing, hot climate clothing, a load bearing harness and a non-rigid armour suit. The outer sleeves are available in a variety of plain and camouflaged colours and changing them takes just a few minutes work.

TRILON 'SVALINN-6' HOSTILE ENVIRONMENT SUIT

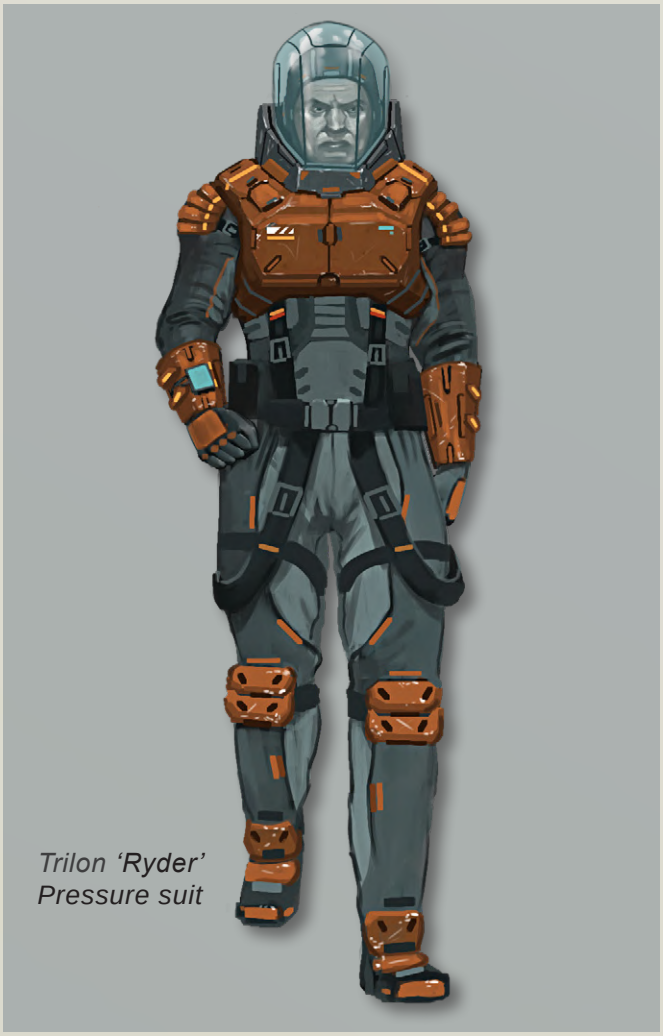
Trilon has long been at the forefront of space exploration. The Svalinn-series, named after the mythical Norse shield that protects Midgard from the sun, has been the watchword in maximum protection. The latest version, the Svalinn-6, uses a lightly augmented hard shell suit, including a solid helmet, and offers 24 hour protection in a Corrosive atmosphere, or 12 hours in Insidious. Total life support is 20 hours and an additional 8-hour oxygen supply can be added prior to donning the suit. The additional oxygen supply serves to extend life support but not environmental protection. The suit contains a 20 kilometre radio, locator beacon and basic sensors.

TRILON 'RYDER' PRESSURE SUIT

Bayern's standard EVA worksuit and surface suit is the reliable and proven Trilon 'Ryder'. Ryder suits are used in thousands of places around human

Armour Type	Protection	TL	Rads	Kg	Cost	Required Skill
Multi Environment Clothing	+7	11	0	2	Lv950	none
Trilon 'Ryder'	+7	12	80	10	Lv12000	Vacc Suit 0
Trilon 'Svalinn-6' Hostile Environment Suit	+10	12	400	25	Lv22000	Vacc Suit 0

Trilon 'Svalinn-6' Hostile Environment Suit



Trilon 'Ryder' Pressure suit

space and available in dozens of configurations. The suits in use aboard the flotilla are colour coded and have slightly different configurations depending on use but all share common characteristics. The Ryder features a tough outer covering with rigid shoulder harness that contains the built-in PLSS. Attachments points for tethers, tools and climbing equipment are found across the suit and there are plenty of pockets and pouches. Ryder suits feature protective patches at the knees, elbows and seat. The built-in PLSS provides 12 hours of life support which can be extended to 24 using additional internal supplies or indefinitely using external hook-ups. The Ryder includes a 20 kilometre range radio, personal locator beacon and built-in portacomp.

ERKUNDER EXPLORATION HARDSUIT

Inspired by the Royal Society's MADOC class light walker, the AR-I engaged KUKA/Reis GmbH to produce a lighter version that utilised the most recent advances in hardsuit technology for the *Bayern* mission. KUKA/Reis responded with the Erkunder medium hardsuit design, using the same miniaturised systems deployed on the Shirrow hardsuits in Japan and Korea to provide more functionality in a lighter, cheaper hardsuit than the equivalent MADOC.

The Erkunder is used as *Bayern's* long duration EVA suit, as well as a surface exploration suit for hazardous environments.

ERKUNDER EXPLORATION HARDSUIT

TL	12
Skill	Drive (walker)
Agility	1
Speed (Cruise)	Slow (Very Slow)
Range (Cruise)	150 (225)
Crew	1
Passengers	—
Cargo	250 kg
Hull	1.5
Shipping Size	0.75 tons
Cost	Lv123000

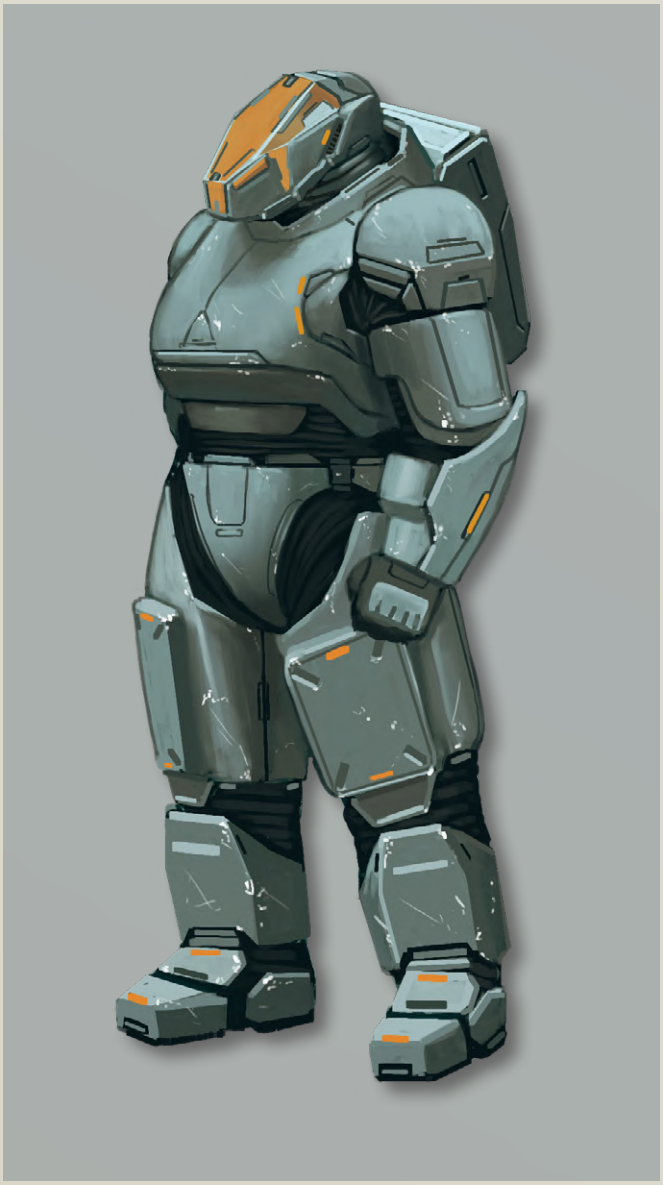
Armour

Front	14
Side	12
Rear	14

Traits	—
Equipment	Autopilot (advanced), Comfort Fittings, Comms System (advanced), Computer/4, ECM (basic), Entertainment System, Exoskeleton Controls, Fire Extinguisher, Life Support (short term), Medkit, Navigation System (basic), Rescue Ball, Sensor System (advanced), Suitlock, Toolkit (zero-g), Vacuum Protection Environment

Equipment

Autopilot (skill level)	+3
Communications (range)	1,000 km
Navigation (Navigation DM)	+1
Sensors (Electronics (sensors) DM)	+2
Camouflage (Recon DM)	—
Stealth (Electronics (sensors) DM)	—

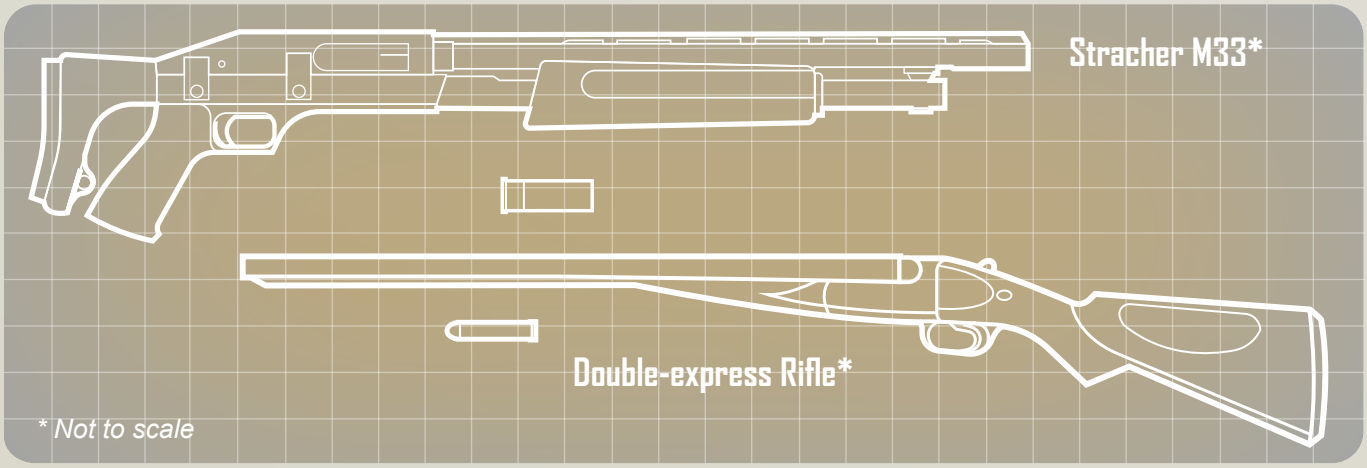


STRACHER M33 PUMP ACTION SHOTGUN

The M33 can be switched between pump action and semiautomatic with the flip of a switch. The advantage of the pump action over the gas-operated semi-automatic is the ability to fire specialised low-velocity rounds like mini-grenades and cap shells. The M33 is found with settlers and police forces all over the French Arm, although on worlds of Law Level 7+ a plug must be inserted in the magazine to reduce the capacity from eight rounds to three.

Type:	18mm semi-automatic shotgun
Country:	Austrovenia
Length:	94 cm
Mass (empty):	2.2 kg
Action:	Single shot
Ammunition:	18 x 70mm shotgun shell
Muzzle Velocity:	410 mps
Magazine:	8-round internal tube magazine
Mass of eight rounds:	0.5 kg
RoF:	80 rpm

Weapon	TL	Range	Damage	Kg	Cost	Magazine	Magazine Cost	Traits
Stracher M33	10	80	4D	2.2	Lv650	8	Lv3	—



STRACHER DOUBLE EXPRESS RIFLE

Stracher makes two variants of their ultra-heavy double express rifle, both heavy, double-barrelled rifles that fire a massive 14x120mm round. Dampeners in the stock help cushion some of the recoil. The stock 'Classik' is sold to colonists and explorers as a high-threat takedown weapon and has been used to some success against Beowulf dracoforms, even the heavily-armoured cave dragon. It is a basic weapon with polycarbonate stocks and plain blued steel barrel. The Meisterwerk version is a bespoke weapon with hand-carved furniture and engraved barrels. Each is a custom work of art.

Effective performance is identical, although the Meisterwerk receives DM+1 on attack rolls due to the custom fitting, although only for the person for whom it was made.

Type:	14mm double-barrelled rifle
Country:	Austrovenia
Length:	112 cm
Mass (empty):	4.9 kg
Action:	Single shot
Ammunition:	14 x 120mm fixed cartridge ball
Muzzle Velocity:	1,370 mps
Magazine:	2 rounds
Mass of eight rounds:	0.3 kg
RoF:	30 rpm

Weapon	TL	Range	Damage	Kg	Cost	Magazine	Magazine Cost	Traits
Double Express	10	500	6D	4.9	Lv800	2	Lv4	Bulky

QUINN OPTRONICS RESTRAINT CARBINE

The restraint carbine is used for high-risk situations where its greater power overrides its more cumbersome size.

Type:	Sonic stun police carbine
Country:	America
Length:	73 cm
Mass (empty):	4 kg
Action:	Single shot
Muzzle Velocity:	Local speed of sound
Magazine:	5MJ LMS cell (15 pulses)
Battery Mass:	1 kg
RoF:	300 rpm

STRACHER FAUSTUS CD GAS/BATON LAUNCHER

Although typically found in the armouries of colonial police forces, these weapons are seldom issued. On the rare occasions where a colony has a mass civil disturbance, it is more likely that the mother country will send military forces. This five-shot grenade launcher uses 27 mm rounds, which are both narrower and longer than standard propelled grenades, making it incompatible with military grenade ammunition.

The rounds are loaded in a five-shot rotary magazine, allowing the user to select which round to fire with a thumb switch.

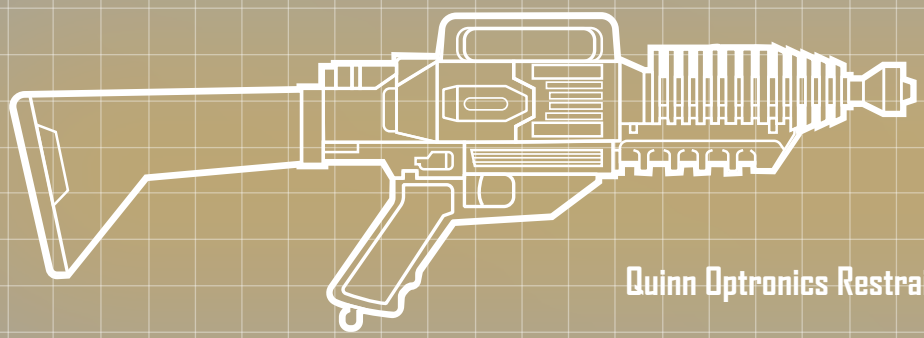
Type:	27 mm grenade launcher
Country:	Austrovenia
Length:	84 cm
Action:	Single shot
Mass (empty):	2.6 kg
Ammunition	27mm propelled grenade
Muzzle Velocity:	250 mps
Magazine:	5 rounds
Mass of five rounds:	1.5 kg
RoF:	30 rpm

As the Faustus is incompatible with conventional 30mm grenades, the most commonly available rounds are CD (Crowd Dispersal) Gas, Rubber Batons and Shock Batons.

Some Frontier manufacturers have started to make military grade ammunition for the Faustus, allowing it to be used by local militias as an ersatz grenade launcher. So far, only conventional HE (High Explosive) is available, but High Explosive Armour Piercing (HEAP) grenades are likely on the way.

Weapon	TL	Range	Damage	Kg	Cost	Magazine	Magazine Cost	Traits
Faustus	9	100	Varies	4.8	Lv950	5	Varies	Scope
Restraint Carbine	10	25	3D	3.6	Lv1200	100	Lv15	Stun

Ammuntion	TL	Range	Damage	Kg	Cost	Magazine	Magazine Cost	Traits
CD Gas	9	—	Special	0.1	Lv10	—	—	Blast 8, Stun
Rubber Baton	9	—	3D	0.1	Lv12	—	—	Stun
Shock Baton	9	—	4D	0.1	Lv20	—	—	Stun
HE (after market)	9	—	3D	0.1	Lv30	—	—	Blast 4



Quinn Optronics Restraint Carbine*

JASCHONEK PANZERFAUST 93

The Panzerfaust 93 fires an explosive warhead, using a binary explosive mixture that is considerably more powerful than a conventional warhead of the same size.

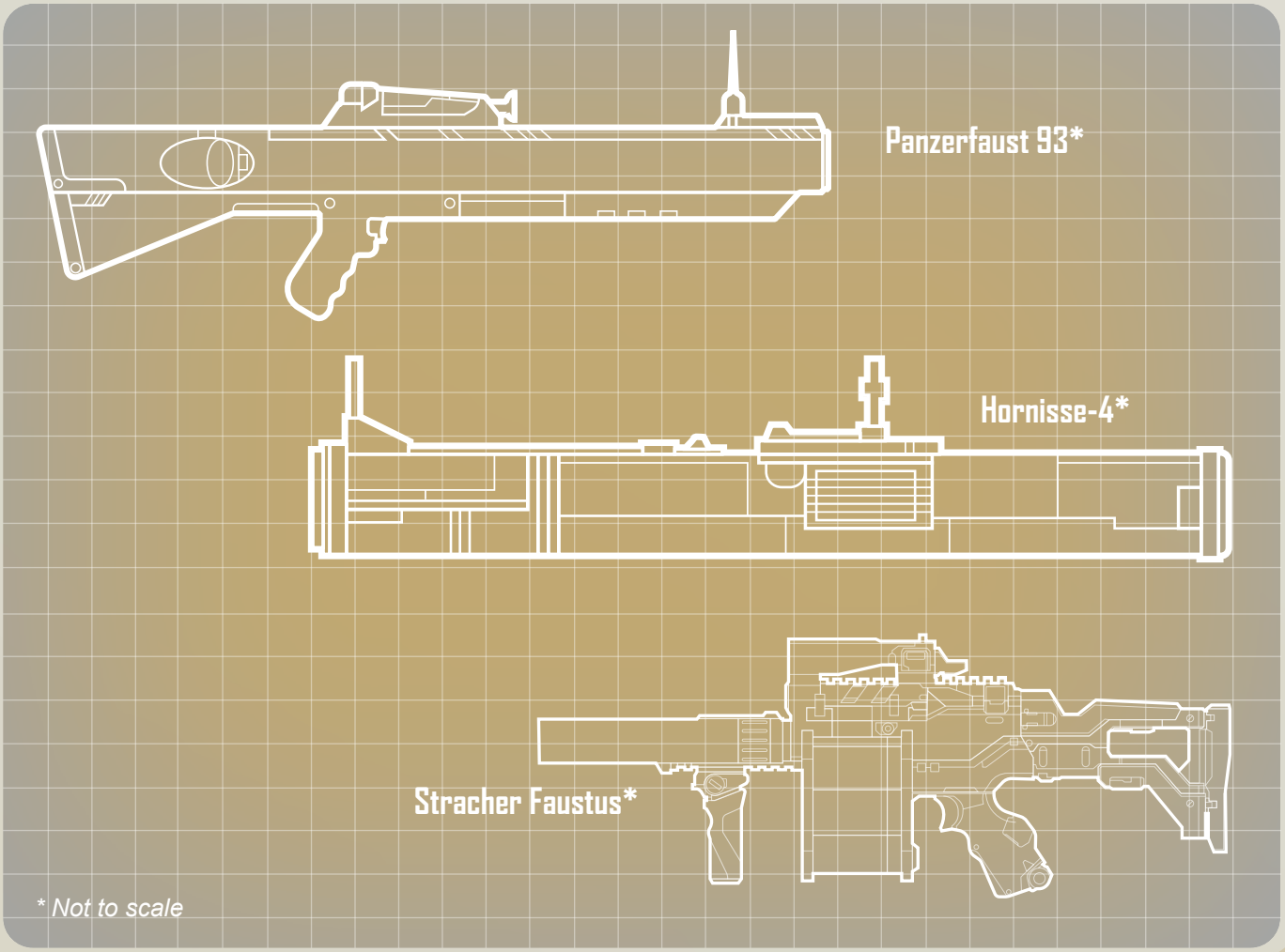
Type:	Hand carried anti-vehicle missile
Country:	Germany
Range:	1,000 m
Guidance	Automatic following gunner lock-on
Launcher Mass:	12 kg
Missile Mass:	11 kg

JASCHONEK HORNISSE-4

Using a smart targeting system, the Hornisse is more effective than its French counterpart when targeting unknown aircraft.

Type:	Man-carried light air defence missile
Country:	Germany
Range:	2,500 m
Guidance	Automatic or automatic following gunner lock on
Launcher Mass:	6 kg
Missile Mass:	17 kg

Weapon	TL	Km	Damage	Kg	Cost	Magazine	Magazine Cost	Traits
Hornisse	12	2.5	6D	23	Lv6000	1	Lv21000	Smart
Panzerfaust 93	12	1	1DD	23	Lv9000	1	Lv9000	AP 30, Bulky, Smart



INDEX

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