

TRANSHumanTM SPACE

SPACECRAFTTM OF THE SOLAR SYSTEM



Written by Kenneth Peters
Illustrated by Christopher Shy

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GURPS[®]



STEVE JACKSON GAMES

TransHumanTM **S P A C E**

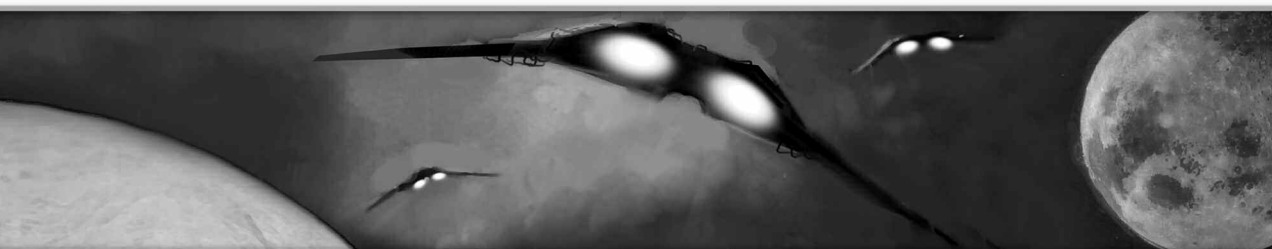
SPACECRAFTTM **OF THE** **SOLAR SYSTEM**

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ABOUT GURPS

Steve Jackson Games is committed to full support of the **GURPS** system. Our address is SJ Games, Box 18957, Austin, TX 78760. Please include a self-addressed, stamped envelope (SASE) any time you write us! Resources include:

Pyramid (www.sjgames.com/pyramid/). Our online magazine includes new **GURPS** rules and articles. It also covers *Dungeons and Dragons*, *Traveller*, *World of Darkness*, *Call of Cthulhu*, and many more top games – and other Steve Jackson Games releases like *In Nomine*, *Illuminati*, *Car Wars*, *Toon*, *Ogre Miniatures*, and more. *Pyramid* subscribers also have access to playtest files online!

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Internet. Visit us on the World Wide Web at www.sjgames.com for an online catalog, errata, updates, Q&A, and much more. **GURPS** has its own Usenet group, too: rec.games.frp.gurps.

GURPSnet. This e-mail list hosts much of the online discussion of **GURPS**. To join, e-mail majordomo@io.com with “subscribe GURPSnet-L” in the body, or point your web browser to gurpsnet.sjgames.com.

The *Spacecraft of the Solar System* web page is www.sjgames.com/transhuman/spacecraft/.

Page References

Rules and statistics in this book are specifically for **GURPS Basic Set, Third Edition Revised**. Any page reference that begins with a B refers to **GURPS Basic Set** – e.g., p. B102 means p. 102 of **GURPS Basic Set, Third Edition Revised**. Page references that begin with CI indicate **GURPS Compendium I**; TS is **Transhuman Space**. For a full list of abbreviations, see p. CI181 or the updated list at www.sjgames.com/gurps/abbrevs.html.

INTRODUCTION



In the silence of space, there is movement. Thousands of shapes glide between worlds in a stately dance, propelled by fires hotter than any sun, seeing with eyes of light. These new chariots, with skins of metal and diamond, allow man to move among the planets and seek his fortune in the dawn of a new century.

Spacecraft provide the means by which humanity has spread from Earth to the far reaches of the solar system. From NASA's ill-fated *Horus I* to the strange *Nadezhda* bioship, *Transhuman Space: Spacecraft of the Solar System* describes dozens of vessels, as well as the organizations that use them.

ABOUT THE AUTHOR

The bioroid known as Kenneth L. Peters has been playing roleplaying games since emerging from his exowomb. Since serving with the USMC as a MAGTF Planner, he has been observed playing *GURPS*, *Shadowrun*, and *2300AD* while infiltrating the local educational facilities to acquire training in anthropology.

ABOUT TRANSHUMAN SPACE

The *Transhuman Space* series presents a unique hard-science and high-biotech universe for roleplaying. Set in the solar system in the year 2100, it is a setting rich in adventure, mystery, and exploration of the possibilities of existence. The core book in the line is *Transhuman Space*, written by David Pulver. It presents an overview of the solar system of 2100.

1

LOCAL SPACE VEHICLES



Local space vehicles are designed for short-range operations rather than interplanetary flight. They range from powerful heavy lift vehicles that boost hundreds of tons of cargo into orbit to tiny

workpods that busily swarm around orbital spaceports. Local space vehicles are the most common vessels in the solar system; many do not receive official names, only numbers.

SURFACE- TO-SPACE TRANSPORT

Spacecraft built to lift payloads into Earth, Venus, or even Mars orbit, or to perform sustained suborbital flights, are very different designs from deep-space craft. Escaping the relatively high gravity is not easy, and requires engines capable of sustaining multi-G burns for minutes at a time.

MERCURY-CLASS HEAVY LIFT VEHICLE

The Columbia Aerospace *Mercury* is a common laser-lift passenger transatmospheric vessel in use on Earth and Mars. Although overshadowed by sleek TAVs such as the *Pegasus* (p. TS192), these HLVs are used for the majority of heavy lift and personnel transport, and are the most economical way to lift large numbers of passengers into low Earth orbit. The *Mercury* is not particularly sophisticated, but it is reliable and cheap – a prime concern given the tight margins of the space transport business.

The *Mercury* is quite large, with a conical streamlined hull measuring 55' wide and 95' high when ready for launch. The craft cannot take off or move under its own power – it is towed to the launch site, and a vertical gantry is used to raise it to an upright position, with crew and passengers boarding through a tower gate. The tight passenger accommodations and overworked environmental systems can make trips uncomfortable if there are significant delays, although most orbital flights are over relatively quickly. After the craft disembarks its cargo and passengers, it gets a maintenance check, boards passengers and cargo that are headed back to the surface, and glides down to a spaceport – sometimes the same one it lifted from, but just as often a different port.

For security and space reasons, passengers are rarely allowed carry-on luggage, but each passenger is allowed up to 10 cubic feet and 250 lbs. in the cargo area as part of the ticket price, with extra space or mass available for a fee. Total payload is approximately 1,576.3 tons, including 800 passengers and a full cargo load. A launch on Earth requires 140 spaces of ablative plastic reaction mass, all of which is used before entering orbit – effectively doubling its delta-v. Performance for the hydrogen-oxygen maneuvering rockets assumes all of the ablative plastic has been expended. There are 23.33 spaces available for future modifications. Batteries can power all systems for 16.7 hours.

Common Local Space Vehicle Classes

Heavy Lift Vehicle (HLV): A single-stage laser rocket (or sometimes a chemical rocket) designed to transport a load of cargo into space.

Orbital Transfer Vehicle (OTV): A cheap “space truck” for short-range hops between adjacent orbital facilities, or for quick voyages such as from Earth orbit to Lunar orbit or L4/L5.

Transatmospheric Vehicle (TAV): A single-stage-to-orbit or hypersonic suborbital cargo or passenger vehicle.

Workpod: A cheap one- or two-person spacecraft with manipulator arms and a simple chemical or fission rocket.

These are civilian vessels; see p. 25 for *military* spacecraft classes.

Crew: Pilot (Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Aerospace), Piloting (Low-Performance Spacecraft)). NAI-run cybershells usually suffice as stewards, as flights rarely last more than a few hours and passengers are restricted in their movements.

TRAVELING AS A PASSENGER

The biggest concern of passenger carriers in 2100 is *security*. Deadly accidents and crashes caused by air hijackers in the early 21st century prompted draconian policies for the first commercial spacecraft. There have been several cycles of easing and tightening security in the wake of various real or perceived threats; in particular, tensions following the Pacific War and the attack on the Mars space elevator have led to heightened levels of alertness. In 2100, fairly strict security precautions are a fact of life on both aerospace and local space transports, especially in Mars and Earth-Lunar space, and around Mercury.

Security starts before passengers are permitted to board the craft. Passengers are subjected to a battery of tests to check for weapons and contraband. Major spaceports in the inner solar system (Mercury to Mars) have especially tight security, as everyone knows just how much damage a suicidal TAV could cause. Chemsniffers and surveillance dust are everywhere, and an attempt to evade or disrupt the monitoring will result in a cavity search and HyMRI scan; airport and spaceport security are *extremely* unsympathetic toward anyone who does not play by the rules. Most ports also conduct biological spot testing of the environment and random

passengers in order to control the possible spread of disease and detect known criminals. An airport or spaceport should be considered CR 4 in the receiving area, CR 5 in the boarding area.

Civilian port security personnel are usually unarmed, or armed only with electrolasers (p. TS155), but are backed up by armed guards or cybershells, and – in large or sensitive ports – by specialized paramilitary forces or even nearby military garrisons.

Aboard the craft, the most important security precaution is that the passengers and pilot (living or infomorph) never interact directly. On aerospace vehicles, the crew compartment is only accessible through a separate external entryway. It is completely isolated from the rest of the craft, and includes its own food-preparation equipment and restrooms. The bulkhead separating the two areas is often armored for additional protection.

Except on long-duration trips, passengers are restricted in their movements. It only takes one clumsy individual to upset a lot of people, never mind injure himself or others. Dedicated NAIs keep an eye on passengers, alert for suspicious behavior. On space vessels, passengers are usually asked to strap in for burns of 0.05 G or more.

Design: Streamlined cylinder (459.8 spaces, foamed alloy, medium frame); cDR/cPF 3/1F, 1/1S, 1/1B (aluminum armor).

Modules: Old cockpit; small PESA; small fixed radar [F]; 25 compact laser rocket; 0.5 compact hydrogen-oxygen rocket; 45 tanks (hydrogen-oxygen); 6 luxury cabin; 50 passenger seats; 2 small entry module; 2 large entry module; 0.5 battery; 300 cargo (1,500 tons).

Statistics: EMass 1,105; CMass 2,900; LMass 3,819. Cost M\$30.5. cHP 338. Size Modifier +6/+8. HT 12. Maintenance Interval: 3.62 hours. RRA 0.

Performance: *Laser Rocket:* sAccel: 2.59 G. Burn Endurance: 0.09 hours (5.4 minutes). Burn Points: 840. Delta-

V: 2.56 mps. No air speed. *HO Rocket:* sAccel: 0.09 G. Burn Endurance: 0.091 hours (5.46 minutes). Burn Points: 30. Delta-V: 0.09 mps. No air speed.

MOLNIYA BALLISTIC RAMJET TAV

The RKK Livanov *Molniya* (Russian for “lightning”) is a large transport designed for hypersonic flights through Earth’s upper atmosphere. It can fly from Los Angeles to Beijing in under an hour, or connect New York City to Paris in half an hour.

Ballistic transports face stiff competition from transonic turbofan transports, especially as telepresence has eroded the need for fast transportation, but they

remain in use for business travelers and fast package delivery. Ruthless market pressures make travel on ballistic transports relatively inexpensive, although accommodations are spartan and perks are few. In this cutthroat market, Livanov is one of the few companies that produce ballistic liners in any quantity.

The *Molniya* is a 200'-long, 120'-wide streamlined delta. With a full load of 320 passengers and 25 tons of cargo, the payload is 55.3 tons.

Crew: Pilot and Copilot (Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Aerospace)); 2 Stewards (Diplomacy, Savoir-Faire (Servant)).

Design: Streamlined delta (512 spaces, carbon composite, light frame, smart, responsive, lifting body); cDR/cPF 1.4/1F, 1/1S, 1/1B (carbon composite armor).

Modules: Old basic bridge; small fixed radar [F]; 30 compact turbo-scamjet; 450 tanks (ultralight, jet fuel); 20 passenger seats; small entry module; 2 large entry module; 1 battery; 5 cargo (25 tons).

Statistics: EMass 640; CMass 3,125; LMass 5,555. Cost M\$166.09. cHP 240. Size Modifier +9. HT 12. Maintenance Interval: 3.1 hours. RRA 0.

Performance: No space performance. Fuel Endurance: 10 hours. Air Speed: 6,635 mph (1.84 mps). Stall Speed: 356 mph.

WORKHORSES

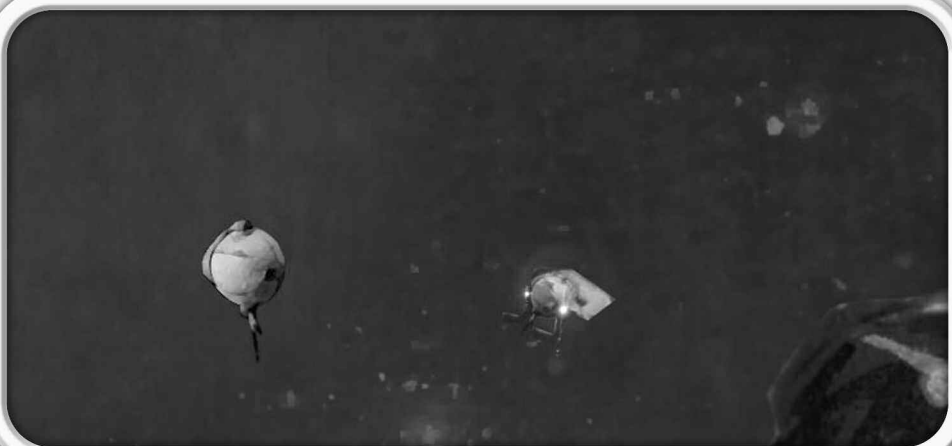
In terms of sheer numbers, these vessels are the most common spacecraft in the solar system. The equivalent of tugs, shuttle buses, and pickup trucks, they are as indispensable as they are unglamorous.

BUMBLEBEE WORKPOD

The Vosper-Babbage *Bumblebee* is a small, one-man spacecraft designed to assist in orbital construction projects. Dozens of these craft can be seen around most large construction facilities. Eurospatiale and Tenzan Heavy Industries manufacture similar designs. It is rare to see a Bumblebee that is not personalized to some extent, with the owner's name hand-painted on the hull or animated corporate logos playing on the surface.

The workpod is a simple sphere, 15' in diameter. Its liquid-crystal surface displays a safety-yellow pattern by default, but most operators replace sections of this pattern with colorful designs to differentiate the craft visually. Behind the pilot are the fuel tanks holding water for the fission drive. All but the most foolhardy pilot wears a vacc suit, as accidents around crowded habitats can occur even with AI traffic management.

Crew: Pilot (Electronics Operation (Communications), Piloting (High-Performance Spacecraft)).



CERTIFICATIONS AND LICENSES

Hundreds of thousands of people live and work in space, but only a fraction have the skills needed to crew a space vessel. To weed out unqualified personnel, businesses and insurance companies often require prospective crews to possess appropriate certifications and licenses from recognized testing facilities.

The following licenses are common. The GM is encouraged to make up his own; it is a convenient way of listing qualifications for NPCs. Licensing and certification fees vary by location and testing facility; a typical charge is \$1,000, with a yearly retest costing \$200.

S-License: The most basic space license. It certifies that the individual is not a hazard to those around him. It is a *prerequisite* for all other space certifications and licenses. Requires Free Fall-10 and Computer Operation-10 – and Vacc Suit-10 for biosapients incapable of operating unprotected in vacuum.

Pilot's License: Certification in a particular Piloting specialty. Requires Piloting-11 in that specialty. Most licensing agencies also require familiarity with the specific craft the pilot would be flying.

Host Services: Sometimes called the “good cookie,” this certification is generally required for anyone who works as a steward or flight attendant aboard a spacecraft. Requires First Aid-9, Savoir-Faire (Servant)-11, and 100 hours (1/2 point) of training in Freight Handling.

Operations License: Requires Electronics Operation (Communications)-12 and Electronics Operation (Sensors)-12. *Habitat* operations licenses usually require some level of Administration skill as well.

Certified Medical Technician (CMT): Requires Diagnosis-12, Electronics Operation (Medical)-12, and First Aid-12.

Design: Sphere hull (3.375 spaces, foamed alloy, light frame); cDR/cPF 1/1 (titanium alloy armor). Liquid-crystal skin.

Modules: Old cockpit; small radar; 0.25 compact fission drive (water reaction mass); 1.7 tanks (ultralight, water); 2 small robot arms; 0.5 battery.

Statistics: EMass 23; CMass 36; LMass 49. Cost M\$2.91. cHP 5. Size Modifier +3. HT 12. Maintenance Interval: 11.73 hours. RRA 0.

Performance: sAccel: 0.84 G. Burn Endurance: 0.08 hours (4.8 minutes). Burn Points: 240. Delta-V: 0.74 mps. No air speed.

SCHAFER ORBITAL TRANSFER VEHICLE

An upgraded version of a NASA design, the Columbia Aerospace *Schaffer* was one of the first mass-produced

OTVs, and played a significant role in the early colonization of Earth-Lunar space. The first chemical rocket-powered *Schaffer* entered service in 2020 with NASA and the ESA. Production ceased in 2076, after decades of service and a multitude of upgrades. Most of the original operators replaced these vehicles with more advanced craft, such as the *Kagoshima* (p. TS191). Many were sold off into private hands and to businesses; a handful were transported to Mars.

Today, these craft are extremely common in LEO and the L5 Junk Jungle, often operated by independent cargo haulers or by the “vacuum cleaners” who sweep out orbital debris. Many have undergone modifications, ranging from the installation of more advanced drives and cockpits to “meteor-defense” weaponry; it's rare to see an original factory model. The version listed here is

representative of the most common combination of modifications.

The hull is a cylinder 45' long and 22' wide. The two solar panels are 45' × 45', and help recharge the batteries, which can power the vessel for 49.6 hours. Typical payload is 148.5 tons. There are 3.6 spaces remaining for additional modifications.

Crew: Pilot/Navigator (Astrogation, Piloting (Low-Performance Spacecraft)); Communications/Sensor Operator (Electronics Operation (Communications), Electronics Operation (Sensors)); Steward/Cargo Master (Freight Handling, Savoir-Faire (Servant)).

Design: Cylinder hull (34.848 spaces, titanium alloy, light frame); cDR/cPF 1/1F, 1/1S, 1/1B (titanium alloy armor).

Modules: Old basic bridge; small PESA; fixed medium radar [F]; 1 HI fusion torch (water); 15 tanks (water); cabin; 2 passenger seats; small entry module; 5 battery; external cradle (125 tons); 4 ksf solar panels; 4 cargo (20 tons).

Statistics: EMass 179; CMass 440; LMass 553. Cost M\$12.26. cHP 30. Size Modifier +4/+5. HT 12. Maintenance Interval: 5.71 hours. RRA 0.

Performance: sAccel: 0.003 G. Burn Endurance: 625 hours. Burn Points: 6,750. Delta-V: 20.6 mps. No air speed.

Variant: Salvage operators unable to afford a more expensive purpose-designed salvage vessel often settle for the "Angry Schaffer." Replace the two

passenger seats with a 2.5-MJ light laser tower, an additional 2 cargo spaces, and a 1-space power pack (18 shots). They usually do not load their external cradle. EMass 195; CMass 338; LMass 450. Cost M\$14.97. sAccel: 0.004. Burn Points: 9,000. Delta-V: 27.5 mps.

TAHMAS INTERSTATION TRANSPORT POD

The *Tahmas* (Hebrew for "nighthawk") transport is a Columbia Aerospace design that dates back almost 20 years, with the first model entering production in 2081. It is a utilitarian craft that shuttles small cargoes of people and goods between the teeming orbital habitats in Earth-Lunar space. The forward cockpit is directly connected to the passenger compartment, and a standard bulkhead door leads right into the storage area.

The transport is a cylinder only 20' long and 10' wide, so there is little room to exercise or relax. The air filtration units are notoriously unreliable if used for long periods of time. Many owners replace the entire life-support system with new modules to make lengthy trips more comfortable. Typical payload is 3.4 tons. The batteries can power all systems for 8 hours.

Crew: Pilot (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Low-Performance Spacecraft)).

Design: Cylinder hull (3.2 spaces, titanium alloy, heavy frame); cDR/cPF 0.5/1F, 0.2/1S, 0.2/1B (titanium alloy armor).

Modules: Old cockpit; small fixed radar [F]; 0.25 HI fusion torch; 1 tanks (hydrogen); 0.5 passenger seats; small entry module; 0.2 battery; 0.5 cargo (2.5 tons).

Statistics: EMass 15; CMass 19; LMass 19. Cost M\$1.41. cHP 6. Size Modifier +2/+3. HT 12. Maintenance Interval: 16.8 hours. RRA 0.

Performance: sAccel: 0.005 G. Burn Endurance: 100 hours. Burn Points: 1,800. Delta-V: 5.5 mps. No air speed.

Salvage operators often settle for the "Angry Schaffer."

2

CIVILIAN DEEP-SPACE VESSELS



Civilians own the vast majority of the hundreds of space vessels active in the solar system. Post-Pacific War advances in vessel construction and the development of relatively cheap fusion pulse drives have reduced the cost of operating and maintaining interplanetary craft to the point where moderately wealthy individuals can

afford space flight. Large corporations (often with government subsidies) operate fleets of heavy transports that move goods and people between Earth and its colonies. Meanwhile, independent entrepreneurs, research foundations, and the extremely rich own or lease a growing number of vessels.

DEEP-SPACE TRANSPORTS

The independent cargo haulers receive most of the media's attention, but large corporations are responsible for over 90% of all shipments. The largest of these firms, Mars Interplanetary and Triplanetary Lines, are responsible for the majority of bulk space transport in 2100. However, small independent companies and even crew-operated "freehaulers" abound. Sometimes operating out of remodeled vessels whose original hulls date back to the "second age of sail," they perform jobs the big companies will not touch – even if that means transporting illegal or restricted goods.

GOLUB-CLASS UTILITY SPACE VEHICLE

AVPK Moiseyev's *Golub*-class USV is one of the few vessels to use mass-driver propulsion. Originally designed for near-Earth asteroid mining operations in the 2050s, various refurbished examples remain in use today. Its main users are fringe asteroid, Lunar-orbit, and L5 communities who have bought second- or third-hand vessels. Many serve as glorified interstation transports, although the craft is also popular with survivalists thanks to its lack of a visible drive signature. "Golub" is Russian for "dove," and vessels in the class were originally named after birds; however, their current owners have renamed most of those still in service.

Constructed from materials readily available in the asteroids and translunar space, the vessel is a cylinder 250' long and 40' wide. Much of the length is dedicated to the mass-driver engine and

equipment that feeds rock dust from the cargo bays. Typical payload (excluding rock dust) is 252.3 tons, while 200 spaces of cargo are dedicated to rock dust (5,200 tons). Trade goods and other spacecraft are carried on external cradles, for a total payload of 502.3 tons. There are 24.5 spaces remaining for additional expansions.

Crew: Pilot/Navigator (Astrogation, Piloting (Low-Performance Spacecraft)); Communications/Sensor Operator (Electronics Operation (Communications), Electronics Operation (Sensors)); Cargo Master (Freight Handling).

COMMERCIAL SPACECRAFT CLASSES

Deep-Space Operations Vehicle (DSOV): A long-endurance vessel used to establish outposts or conduct scientific expeditions.

Executive Space Vehicle (ESV): A small, privately operated vessel optimized for high delta-v and comfort.

Heavy Space Transport Vehicle (HSTV): A heavy, deep-space cargo vessel.

Passenger Space Vehicle (PSV): A fusion-drive "fastliner" with spin gravity and lots of cabins.

Utility Space Vehicle (USV): A generic "freighter" used to carry people, haul cargo, and perform other workhorse tasks. Often operated by corporate fleets.

Design: Cylinder hull (640 spaces, titanium alloy, light frame); cDR/cPF 5/2F, 1/1S, 1/1B (foamed alloy armor). Hull radiators (4 ksf). Liquid-crystal skin.

Modules: Old basic bridge; small PESA; small fixed radar [F]; 2 2.5-MJ light laser towers [S]; 15 mass driver engine (rock dust); 4 bunkroom; large entry module; minifac workshop; 2 rock crusher; 33 old fission reactor (64 MW); 1 battery; 1 power pack; 2 external cradles (250 tons each); 550 cargo (rock dust, 14,300 tons).

TRIPPLANETARY LINES

Triplanetary Lines is a comparatively old space transport company, founded in 2056 by a consortium of forward-thinking investors from the United States, Norway, Korea, and the Gulf States. They were the first to offer regular scheduled service between Earth, Mars, and Mercury (hence the company name). In the 2080s, they pioneered commercial service to the larger Main Belt stations and Saturn. Triplanetary Lines was also the first major carrier to use fusion pulse drives. Their early investment in this technology gave them an edge, especially in the Deep Beyond market – although in recent years, aggressive competition from Mars Interplanetary has eroded their share of the lucrative Earth-Mars route.

In 2095, Triplanetary Lines' space crews voted to unionize in the face of possible replacement by infomorphs and bioroids. Organized as the Farhauler's Guild, they consolidated employee-held stock, giving them much influence with the board of directors. Employee benefit programs are generous, even by 2100 standards; the health package goes so far as to cover some performance-enhancing nanomods. On the other hand, employees are expected to work more hours over a longer period than is usual in 2100.

Triplanetary Lines has been attempting to regain its share of the Earth-Mars trade, which is presently dominated by Mars Interplanetary.

They are offering generous discount packages to businesses and individuals willing to sign long-term shipping agreements for business worth \$5,000,000 or more a year.

Shipping contracts require an upfront payment of at least \$20,000,000, which is set aside as credit. All shipping rates are then 5% or more below normal, with charges coming off the credit before additional billing. Unofficially, the company also offers a "streamlined bureaucracy" ("no questions asked") policy for certain clients who request "discretion" about what they want carried.

Triplanetary primarily operates PSVs and USVs, with a handful of HSTVs for the Earth-Saturn and Earth-Mercury runs.

Typical Triplanetary vessels include the *Sudbury* (p. TS191) and *Meizi* (p. TS193) classes, as well as a few *Spokane* (pp. 14-15) and *Zhongguang* (p. 16) craft. For shipping cargo on relatively unprofitable routes (such as Venus and some Belt colonies), it operates low-cost automated slowhaulers such as the *Parus* plasma sail craft (pp. 13-14). The company has considered purchasing an anti-matter pulse drive craft as a passenger flagship for the Earth-Saturn route, but no decision has been made. It currently uses freelancers and independents for any trips that require faster travel times than those attainable with its existing fleet. These subcontractors must use Farhauler's Guild crews.



Statistics: EMass 1,036; CMass 8,688; LMass 15,838. Cost M\$36.68. cHP 259. Size Modifier +5/+10. HT 12. Maintenance Interval: 3.31 hours. RRA 4.

Performance: sAccel: 0.00017 G. Burn Endurance: 1,833.33 hours. Burn Points: 1,120. Delta-V: 3.428 mps. No air speed.

MOCHI-CLASS PASSENGER SPACE VEHICLE

Manufactured in 2085 by South African aerospace concern MDB Integrated Systems, the *Mochi* class (named

after African mountains and rivers) is popular with independents looking for a relatively inexpensive craft that can be used for a wide variety of tasks. Its most common role is as a fast, cheap passenger transport and cargo hauler, where it fills a niche between the *Sudbury* class and the *Meizi* class. The largest operator is Triplanetary Lines, with nine *Mochi*-class vessels in service on mixed cargo-passenger runs to Mercury, the Main Belt, and Saturn, where the full capacity of a *Meizi* would be excessive.

The *Mochi*'s hull is a cylinder 200' long and 45' wide. At the midsection, two 120' spin arms connect two identical 30'-long, 15'-wide cylinders. These spin capsules can generate up to 0.4 G at maximum rate, but a more comfortable level of 0.12 G is usual. A typical payload is 806.5 tons. There are 13.4 empty spaces in the main hull – often used to install additional passenger quarters or amenities such as zero-G pools.

Crew: Commander/Pilot (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Low-Performance Spacecraft)); 6 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic skills as appropriate)); Medic (Diagnosis, Physician, Surgery); Cargo Master (Administration, Freight Handling).

Design: [Hull] Cylinder hull (648 spaces, carbon composite, heavy frame, smart); cDR/cPF 5/1F, 2/1S, 3/1B (metal matrix composite armor). [Pod #1 and #2] Cylinder hull (10.8 spaces, metal matrix composite, medium frame); cDR/cPF 1/1F, 1/1S, 1/1B (metal matrix composite armor). Hull radiators (25 ksf).

Modules: [Hull] New basic bridge; medium PESA; medium radar; 50 HI fusion pulse drive; 400 tanks (ultralight, nuclear pellets); 2 cabin; 4 luxury cabin; 2 passenger seats; 2 large entry module; small entry module; minifac workshop; light storm shelter (2-space: encloses passenger seats, cPF 100);

**Parus are
unmanned
craft, as trip
times of two
years or more
per AU are not
unheard of.**

5 battery; surgery; 150 cargo (750 tons). [Pods] 5 cabin; 5 cargo (25 tons).

Statistics: EMass 2,026; CMass 5,233; LMass 7,633. Cost M\$148.22. cHP [Hull] 961, [Pods] 27. Size Modifier [Hull] +5/+9, [Pods] +3/+4. HT 12. Maintenance Interval: 3.29 hours. RRA 25.

Performance: sAccel: 0.04 G. Burn Endurance: 200 hours. Burn Points: 28,800. Delta-V: 88 mps. No air speed.

PARUS-CLASS HEAVY SPACE TRANSPORT VEHICLE

The *Parus* (Russian for “sail”) was one of the first deep-space transports – although it would likely be classified as an USV rather than as an HSTV by 2100 standards. It played a crucial role in colonization and development programs during the “second age of sail.”

These are unmanned craft, as trip times of two years or more *per AU* are not unheard of. Over two dozen of the craft were constructed at great cost by 2050. Only a half-dozen remain in service today, hauling cargo from Mars to the Belt and back. Individual craft are named after famous sailing vessels.

CARGO CONTAINERS

Cargo is never simply piled up in a vessel. To ensure proper stowage and protection, it is either palletized or loaded into sealed containers for shipment. This can be assumed without further elaboration when cargo is carried internally; however, when cargo is carried externally, it can be useful to have statistics for the containers themselves.

Design: All containers are built as steel box hulls with ultra-light frames (see *High Frontier*). They are armored with 0.2 cDR of steel armor. They can fold down to 5% of their original height. Accessing a container normally means unsealing it. To avoid this, install an airlock.

Very Small: 4' × 8' × 6'. 0.384 spaces (192 cf). 1 ton. M\$0.001. cHP 0.

Small: 10' × 8' × 8'. 1.28 spaces (640 cf). 2 ton. M\$0.002. cHP 1.

Average: 10' × 10' × 8'. 1.6 spaces (800 cf). 3 tons. M\$0.003. cHP 1.

Large: 20' × 8' × 8'. 2.56 spaces (1,280 cf). 4 tons. M\$0.004. cHP 1.

Very Large: 40' × 8' × 8'. 5.12 spaces (2,560 cf). 8 tons. M\$0.008. cHP 2.

Containers can be given climate controls (-30°F to 230°F) for M\$0.0005 and 0.0025 MW *per space*. All climate-controlled containers include a rechargeable D-cell (5 kWh) as a backup power supply.

Containers can be fitted with airlocks and life support and used as sealed lab modules, or equipped with modules such as rock crushers (p. TS184) and loaded onto a vessel as needed. They can even be unloaded and modified into housing and storage – which is not uncommon in L5's Junk Jungle. Military units often deploy connected containers to form an “instant base,” using earthmoving equipment and armor plates to add reinforcement.



The 30'-by-17' cylinder hull is dwarfed by the plasma sail, and is practically invisible within the plasma trail produced. The sight is quite breathtaking, and is often featured in educational programs dealing with the early days of space travel. A typical payload is 125 tons carried on the external cradle.

Crew: Unmanned. Infomorph occupies unmanned controls and uses Electronics Operation (Communications), Electronics Operation (Sensors), and Piloting (Plasma Sail).

Design: Cylinder hull (13.872 spaces, carbon composite, light frame); cDR/cPF 1/1F, 1/1S, 1/1B (carbon composite armor).

Modules: Old unmanned controls; small PESA; 1 plasma sail; 8 tanks (ultra-light, hydrogen); 0.1 battery; 1.5 old fission reactor (1 MW); 1 external cradle (125 tons).

Statistics: EMass 46; CMass 175; LMass 179. Cost M\$11.79. cHP 16. Size Modifier +4/+4. HT 12. Maintenance Interval: 5.82 hours. RRA 0.

Performance: sAccel: 0.00006 G. Burn Endurance: 8,000 hours. Burn Points: 1,730. Delta-V: 5.28 mps. No air speed.

SPOKANE-CLASS HEAVY SPACE TRANSPORT VEHICLE

Designed in 2092 by Columbia Aerospace, the *Spokane* class is a new HSTV concept that departs from the design philosophy used in older heavy transports. Rather than hauling cargo in internal holds, most of its payload is carried on external cradles. Four of the cradles, located near the front of the craft, have entry modules incorporated for easy access to the attached payload. This results in a smaller hull that is far cheaper than many comparable heavy transports. Twenty vessels have been purchased to date, primarily by the large shipping cartels. Individual vessels are usually named after Native American tribes.

Crews appreciate the fact that the *Spokane* has enough cabins for individual occupancy, and that its common areas are roomier than most. However, some operators dislike the fact that the passage tube leading from the habitation section to the engineering access room at the rear of

the vessel is not pressurized, and regard the fact that this tube tends to be rendered impassible by any unrepaired combat damage to the side of the hull as the design's one real flaw.

The hull is 390' long and 50' wide, studded with external cradles. Each cradle can carry up to three loaded Very Large cargo containers. The *Spokane's* retractable radiators are longer than they are wide, measuring 50' x 450'; their angle can be adjusted slightly to accommodate different cargo pod layouts.

To assist in loading and unloading external cargo, the *Spokane* is outfitted with several robotic arms that can travel the entire length of the hull on rails. These are often used in conjunction with several *Naga* snakebots (p. TS124) to position small cargo containers or help secure large ones. Most *Spokanes* carry one or two *Bumblebee* workpods (pp. 7-8) for assistance in moving larger cargo. Total payload, including fully loaded cradles and 100 tons of small craft, is 5,351.5 tons. There are 9.65 spaces available for additional modifications. Should the main drive fail, the batteries can power all systems for 4.8 hours.

Crew: Pilot/Navigator (Astrogation, Piloting (Low-Performance Spacecraft)); Communications/Sensor Operator (Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Cargo Masters (Administration, Freight Handling).

Design: Cylinder hull (1,560 spaces, carbon composite, heavy frame, smart); cDR/cPF 5/1F, 3/1S, 5/1B (carbon composite armor). Hull radiators (10 ksf), folding radiator wings (40 ksf).

Modules: New basic bridge; small PESA; medium radar; 100 HI fusion pulse drive; 850 tanks (ultralight, nuclear pellets); 6 cabin; 6 large entry module; 2 large robot arms; 2 medium robot arms; minifac workshop; light storm shelter (1-space: encloses bridge, cPF 100); spacedock hangar (40' long, 20' wide, 20' high: 32 spaces); 22 external cradles (125 tons each); surgery; 1 battery; 500 cargo (2,500 tons).

MARS INTERPLANETARY

Partially owned by the Xiao Chu Corporation, Mars Interplanetary (MIp) was responsible for moving the vast majority of the current Mars and Mercury colonists to their new homes. Thanks to its role in the spread of humanity to other planets, the company enjoys considerable prestige, especially in China.

Members of the Farhauler's Guild do not share this favorable opinion. In 2079, Mars Interplanetary replaced most of its human employees with bioroids and NAIs. MIp maintains that it simply could not operate at its previous staffing levels and remain competitive, especially since demand for its large colony transports was falling as the Mars colony became more self-sufficient. The Farhauler's Guild disputes these claims, while attempting to convince people that Mars Interplanetary vessels are less safe than human-crewed vessels.

Mars Interplanetary is the largest operator of HSTVs and PSVs in the solar system, with a dozen *Zhongguang-* and *Meizi-*class transports. The bulk of its business is still shipping cargo and personnel between Earth and Mars, but it has been recruiting independents to expand its operations to Mercury and Saturn. These contracts often cover a set number of trips; only proven independents are offered long-term associations or the possibility of incorporation into the Mars Interplanetary fleet. Farhauler's Guild members refuse to work for Mars Interplanetary, and consider any independent who signs up with MIp to be a traitor.

Statistics: EMass 3,964; CMass 14,415; LMass 19,515. Cost M\$282.08. cHP 1,992. Size Modifier [Hull] +6/+10, [Radiators] +9. HT 12. Maintenance Interval: 2.38 hours. RRA 50.

Performance: sAccel: 0.03 G. Burn Endurance: 212.5 hours. Burn Points: 22,950. Delta-V: 70.125 mps. No air speed.

ZHONGGUANG-CLASS HEAVY SPACE TRANSPORT VEHICLE

The MAST-designed *Zhongguang* ("China")-class HSTV is the largest space vessel ever built, designed to transport immense amounts of high-value cargo (such as robofac or pods of colonists in nanostasis) across interplanetary distances. The vessel was introduced in 2083, but early examples were plagued with design problems, including defects in the life-support and fire-suppression systems that led to several deaths. These have since been fixed, and the vessel is now the standard by which all other fusion-driven HSTVs are measured.

The vessels retain certain quirks, however. Perhaps the most vexing is that the engine and neck sections have underpowered temperature and humidity control systems. Parts of the engine room often feel like a sauna, while fungal growths in isolated areas of the vessel are fairly common due to condensation. Some crews install their own workarounds, which can give *Zhongguang* interiors the appearance of mechanical jungles filled with tubes, pipes, and homebuilt air conditioners.

The *Zhongguang* is a three-part combination hull design. The front portion is the crew quarters, consisting of a 25'-diameter sphere connected to a box 40' long by 10' wide by 10' high that houses the main access hatches and workshops. Attached to the rear of this is a much larger box hull measuring 200' long by 80' wide by 50' high that serves as the cargo hold. Immediately behind that area is the drive and fuel module: a massive cylinder 110' wide

and 100' long. Total actual surface area is 109.9 ksf. A typical payload mass-
es 8,001.5 tons.

Crew: Commander (Leadership, Piloting (Low-Performance Spacecraft)); Second Officer/Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Low-Performance Spacecraft)); 15 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic skills as appropriate); 4 Cargo Masters (Administration, Freight Handling).

Design: [Crew] Sphere hull (15.63 spaces); [Neck] box hull (8 spaces); [Cargo] box hull (1,600 spaces); [Engine] cylinder hull (1,936 spaces); [All] foamed alloy, medium frame, smart; [All] cDR/cPF 1/1 (metal matrix composite armor). Hull radiators (20 ksf).

Modules: [Crew] Old basic bridge; medium radar; 2 bunkroom; cabin; light storm shelter (2-space: encloses bunkrooms, cPF 100). [Neck] 2 fixed small PESA [F/S]; 4 large entry module; 2 minifac workshop. [Cargo] 1,600 cargo (8,000 tons). [Engine] 36 HI fusion pulse drive; 1,900 tanks (ultra-light, nuclear pellets).

Statistics: EMass 4,172; CMass 23,574; LMass 34,974. Cost M\$387.55. cHP [Crew] 29, [Neck] 27, [Cargo] 900, [Engine] 818. Size Modifier [Crew] +4, [Neck] +5, [Cargo] +7/+9, [Engine] +8/+8. HT 12. Maintenance Interval: 2.03 hours. RRA 18.

Performance: sAccel: 0.006 G. Burn Endurance: 1,319.44 hours. Burn Points: 28,500. Delta-V: 87 mps. No air speed.

PERSONAL SPACECRAFT

The prices and availability of high-performance spacecraft put them in reach of wealthy individuals or small groups. Many private spacecraft are refitted or

second-hand models dating back to the Pacific War or the “second age of sail.”

MOJAVE EXECUTIVE SPACE VEHICLE

Scaled Composites’ flagship design, the *Mojave*, sets the standard for luxury personal spacecraft. Fast yet relatively economical, the craft can reach Mars in less than a month at an operating cost of under half a million dollars. An Earth-Mars-Earth round trip can be done on one load of nuclear pellets in approximately two months. In case of attack, or for meteor defense, it has two tower-mounted light lasers.

Mojave craft are named much like sailboats, without any particular rhyme or reason. The design is popular among the idle rich, and Scaled Composites has sold nearly 30 of the craft since the design was introduced in 2093.

The hull is a streamlined cylinder 95’ long and 25’ wide. The craft has the distinctive Scaled Composites organic styling: absolutely no rough edges, and tasteful pre-programmed color patterns for the liquid-crystal coating. The light laser towers retract into blisters on the “top” and “bottom” of the craft so as not to present an unsightly militaristic profile, and can fire four shots each before the power pack needs to recharge. Typical payload is 11.1 tons.

Crew: Pilot/Navigator (Astrogation, Piloting (Low-Performance Spacecraft)); Communications/Sensor Operator (Electronics Operation (Communications), Electronics Operation (Sensors)). As a practical matter, the owner of the vessel usually directs an informorph pilot, with the bridge serving more as a lounge area and safety zone in case of high radiation levels.

Design: Streamlined cylinder (95 spaces, metal matrix composite, extra-heavy frame, smart); cDR/cPF 14/1F, 5/1S, 5/1B (diamondoid armor). Hull radiators (5 ksf). Liquid-crystal skin.

INDEPENDENTS

Dozens of independent cargo vessels operate in the solar system. These “free-haulers” work outside the carefully managed and calculated schedules and routes of the big commercial carriers – and often outside the law. There is no system-wide law-enforcement organization. It’s all just a matter of finding buyers and locating what they want.

The oldest independent outfits are owned by individuals and companies that took advantage of the initial expansion into space. Newer independents are often the result of these older companies going out of business, their former employees striking out on their own and acquiring second-hand spacecraft or forming partnerships with colonial businesses. Still other independents are colonial entrepreneurs, often hailing from the asteroids or the Lagrange colonies.

Many independents belong to the Farhauler’s Guild (p. TS98), but just as many do not. Emotions often run high over the Guild, and there is a lot of bitterness on both sides. Non-Guild members complain of being harassed if they refuse to join, and some accuse the Guild of biochauvinism or racism. The Guild sees unaffiliated freehaulers as a threat to its ability to negotiate collectively with the big companies and governments, and some Guild members insist they would have no problem with companies using bioroids or AIs if they had the same rights and pay as humans. Some Guild and non-Guild crews are friendly rivals, but regular dockside brawls, “accidents,” and the occasional armed confrontation are more typical of the conflict.

Modules: New basic bridge; medium PESA; medium radar; 2 2.5-MJ light laser towers [S]; 10 HI fusion pulse drive; 50 tanks (ultralight, nuclear pellets); 4 luxury cabin; light storm shelter (1-space: encloses bridge, cPF 100); hall; large entry module; minifac workshop; 0.5 power pack; 2 cargo (10 tons).

Statistics: EMass 803; CMass 1,114; LMass 1,414. Cost M\$186.77. cHP 528. Size Modifier +4/+8. HT 12. Maintenance Interval: 2.93 hours. RRA 5.

Performance: sAccel: 0.04 G. Burn Endurance: 125 hours. Burn Points: 18,000. Delta-V: 55 mps. No air speed.

Variant: The *Chihuahuan* is a “budget” version of the *Mojave*. Change armor to metal matrix composite. Remove liquid-crystal skin and reduce luxury cabins to normal. Structure is no longer smart. Add an additional 4 cargo. EMass 941; CMass 1,272; LMass 1,572. Cost M\$77.48. sAccel: 0.03. Burn Points: 13,500. Delta-V: 41.25 mps.

SUNLANCE EXECUTIVE SPACE VEHICLE

The Vosper-Babbage *Sunlance* is one of the fastest spacecraft in the system, breaking several records since its introduction in 2095. Solar Express (p. TS96) is the primary user of the design; images of their 10 yellow-and-purple vessels are featured in virtually all of their advertising. SOLEX permits each pilot to give an unofficial name to his vessel, and allows a limited amount of custom detailing for some long-term employees.

The *Sunlance* is a spartan design, stripped down to the barest essentials. The pilot's compartment is an extremely cramped cockpit with a crawlway leading back to a fairly roomy cabin. The craft usually operates with a living crew, but it is fully capable of unmanned operation. An access hatch at the back of the cabin leads to an even more cramped crawlway that

stretches 50 feet to the engineering section. There is no internal access to the cargo bays, which are electronically sealed and monitored during the trip.

The hull is a cylinder 100' long and averaging 25' wide, tapered toward the front (near the cockpit) to give it a streamlined appearance. The designers did their best to give the craft a distinctive aesthetic that makes it look fast even when docked, although the unglamorous truth is that the vessel is 70% fuel tanks. Typical payload is 85.3 tons – usually high-value cargo to justify the fuel expenses.

Crew: Pilot (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors), Piloting (Low-Performance Spacecraft)). Most pilots are assisted and accompanied by one or more infomorphs and cyber-shells that handle maintenance.

Design: Cylinder hull (100 spaces, diamondoid, light frame, smart); cDR/cPF 5/1F, 2/1S, 1/1B (diamondoid armor). Hull radiators (5 ksf).

Modules: New cockpit; small PESA; small fixed radar [F]; 10 HI fusion pulse drive; 70 tanks (ultralight, nuclear pellets); cabin; small entry module; minifac workshop; 0.5 battery; 17 cargo (85 tons).

Statistics: EMass 108; CMass 613; LMass 1,033. Cost M\$73.24. cHP 68. Size Modifier +4/+8. HT 12. Maintenance Interval: 4.67 hours. RRA 5.

Performance: sAccel: 0.07 G. Burn Endurance: 175 hours. Burn Points: 44,100. Delta-V: 134.75 mps. No air speed.

Variant: The Japanese Space Self Defense Force converted one vessel into a propulsion test bed for an antimatter pulse drive. It is currently used by JSSDF as a fast deep-space courier. The *Rei* uses a HI antimatter pulse drive in place of the fusion pulse drive, and adds a 2-gram antimatter bay. EMass 109; CMass 614; LMass 1,034. Cost M\$79.25. sAccel: 0.08 G. Burn Endurance: 175 hours. Burn Points: 50,400. Delta-V: 154 mps.

The Sunlance is one of the fastest spacecraft in the system.

INTERNAL FITTINGS AND SYSTEMS

Access crawlways allow the maintenance of remote parts of the vessel. On most craft, these spaces are only big enough for one person at a time, and connect the habitation section to the engineering area. Vessels largely maintained by cybershells have smaller, unpressurized spaces, while some designs – especially those with compact drives – have tunnels just large enough to admit microbots.

Bridge systems serve as the nerve center of the vessel, and as compact workspaces that are easily shielded from radiation. On-duty crews usually interact with each other and the vessel via virtual-reality simulations; these simulations are often tailored to the tastes of individual crewmembers, and are sometimes idiosyncratic. A modern bridge is a decidedly spooky place to visit, with the crew jacked in and silent much of the time.

Bulkheads, are the main load-bearing structures of the vessel, divide it into major airtight sections. Interior bulkheads have DR equal to hull cDR \times 10.

Computers are ubiquitous on a vessel. The vessel's *systems management agent* – a basic NAI-4 or NAI-5 – controls all of the hundreds of distributed systems, and helps manage the bulk of the data that is sent to the vessel's crew or more powerful infomorphs. It is *very* limited in how it can develop, in order to prevent potential viral infestation (see *Fifth Wave*).

Emergency panels are installed throughout the vessel, notably in crew and passenger quarters, the bridge, and the engineering sections. Each panel includes space for a battery (usually a D cell) for emergency power, at least two air masks, a small medical kit, an optical hookup to the vessel's data network, and a physical connection to the craft's power systems. Military vessels can lock out an

individual panel's access to the network and power – in extreme cases by severing its physical links to the rest of the vessel!

External markings are common, although they are more a matter of taste than utility.

Smaller vessels, notably those that operate close to habitats and move at low relative speeds, always incorporate high-visibility additions such as lights, radio beacons, and custom paint jobs. Larger vessels keep individual markings to a minimum unless they have a liquid-crystal skin – in which case they can be programmed with all manner of logos or animations. Military vessels, even those with chameleon surfaces, tend to remain matte black, and have only a handful of identification signs. In all cases, integral IFF systems provide the information that

local traffic-control networks use to manage traffic.

Floors and walls are usually metal or composite grates secured by pins. These provide convenient handgrips and attachment points, as well as easy access to emergency systems and engineering panels. Most spacers wear footwear that can “lock” into the grates for anchoring. Handguides and Velcro panels can also be attached to the grates, at the convenience of the crew.

Handguides are small, motorized handgrips, or even pulleys, attached to tracks in the walls. They are placed where distances or obstacles are a handicap (such as down the long axis of a vessel), and provide quick transportation without the danger of clumsily colliding with walls or systems. Handguides normally operate at Move 5, but can accelerate to Move 10 during emergencies.

Continued on next page . . .



INTERNAL FITTINGS AND SYSTEMS (CONTINUED)

Hatches are pressure-tight doors set into interior partitions and bulkheads. Most have removable pins and emergency manual controls so that they do not become impassable in the event of power failure. They have DR 25 and 50 hit points.

Hives are omnipresent aboard most vessels, with many craft having dozens. Most-house *cleaning* and *repair* cyberswarms that control corrosion, destroy fungal growths, and perform routine maintenance. Military vessels will also have *bughunter* and *sentry* swarms. The hives are free, but the swarms must be purchased separately; see pp. TS168-171.

Interior partitions divide the ship into smaller airtight sections. Partitions have DR 8 on civilian craft. Those on military vessels incorporate extra ballistic and spall protection, and have DR 15.

Safety displays are found in every compartment, and provide information on radiation shielding, location of emergency systems, and atmospheric status, as well as a communications link with the bridge. Displays on transnational company vessels show information in English and Chinese, and are visible from any orientation and in low-light conditions. Embedded v-tags broadcast the same information in dozens of other languages.

UNUSUAL DEEP-SPACE VEHICLES

Some designs don't fit into neat classifications. These spacecraft either have historical significance or are simply too strange to categorize.

SHEPARD-CLASS DEEP-SPACE OPERATIONS VEHICLE

The *Shepard*-class DSOV's heritage stretches back to the earliest days of space colonization, when America's *Horus I* became infamous due to the failed attempt to land a manned mission on Mars. However, the *Horus I* design was fundamentally sound, and was refined to produce the *Shepard* design, which went on to become highly successful in the mid-21st century. The *Shepard* class is named for Alan B.

Shepard, the first American in space. Vessels of this class originally bore the names of astronauts from the Mercury, Gemini, and Apollo programs.

Spacecraft of this class participated in many landmark events, including the Martian Exodus to Silas Duncan Station, the first manned voyage to Titan, and the Shezbeth Expedition. Between the 2040s and 2070, 23 vessels were built for NASA, the USAF, and the Titan Consortium. Numerous variants appeared as new technologies were incorporated into the design. The earliest models used nuclear light bulb or ion drives. Some examples had more cabins and less lab space. Starting in 2064, the majority of *Shepards* were rebuilt by Columbia Aerospace as long-range research vessels, to support operations near Saturn and in the outer system. This refit included the installation of a modern high-impulse fusion pulse drive, which drastically improved performance.

Most of the *Shepards* were eventually sold off, to various corporations, foundations, and governments, or were scrapped. However, at least eight vessels remain in service in 2100, almost all of which have the fusion pulse drive upgrade. The United States Astrographical Survey

operates four of these for exploration in the Deep Beyond.

These vessels have small crews and modest cargo capacities by 2100 standards, but they are extremely reliable, and capable of long voyages. One reason the *Shepard* is so reliable is its amazing number of redundant systems and safety measures, many of them added in reaction to the loss of the *Horus I*. These features allow the craft to survive damage that would otherwise be catastrophic. For example, access to the spin pod arms is restricted at both ends by access modules (one on the main hull, one on the pod), which helps to contain any damage. In an emergency, both pods can be jettisoned, with pod #1 functioning as a lifeboat.

Shepard-class vessels are cylinders 300' long and 50' wide, with two 150' long arms holding 30'-long, 20'-wide spin cylinders. The spin apparatus can provide up to 0.5 G, although this tends to be somewhat uncomfortable over long periods. Only two of the four large entry modules in the main hull allow external access; the other two give internal access to the spin arms. Typical payload, including 500 tons of carried craft, is 599.7 tons.

Crew: Commander/Pilot (Leadership, Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors), Gunner (Beams)); 5 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic skills as appropriate); Medic (Diagnosis, Physician, Surgery); Cargo Master (Administration, Freight Handling).

Design: [Hull] Cylinder hull (1,200 spaces, foamed alloy, medium frame); cDR/cPF 1/1F, 1/1S, 1/1B (titanium alloy armor). [Pod #1 and #2] Cylinder hull (19.2 spaces, foamed alloy, light frame); cDR/cPF 1/1F, 1/1S, 1/1B (titanium alloy armor). Hull radiators (10 ksf).

Modules: [Hull] Old basic bridge; 2 large PESA; 2 large radar; small radar; 2.5-MJ light laser tower [S]; 15 HI fusion pulse drive; 1,010 tanks

(ultralight, nuclear pellets); 4 cabin; 4 large entry module; 2 minifac workshop; hall; heavy storm shelter (1-space; encloses bridge, cPF 1,000); 5 battery; 14 old fission reactor (26 MW); 25 ksf solar cells (2 MW at 1 AU); 2 spacedock hangar (30' long, 35' wide, 20' high: 42 spaces each); surgery; 15 cargo (75 tons). [Pod #1] 8 cabin; 2 lab; large entry module; 1 battery; 5 cargo (50 tons). [Pod #2] 4 lab; small entry module; large entry module; 9 cargo (27 tons).

Statistics: EMass 3,618; CMass 10,278; LMass 16,338. Cost M\$240.46. cHP [Hull] 780, [Pods] 19. Size Modifier [Hull] +6/+10, [Pods] +3/+4. HT 12. Maintenance Interval: 1.29 hours. RRA 8.

Performance: sAccel: 0.006 G. Burn Endurance: 1,683.33 hours. Burn Points: 36,360. Delta-V: 111.1 mps. No air speed.

Variant: The original *Horus I* was closely related. Delete light laser, one large PESA, and radar. Change shelter to light (cPF 100). Remove batteries in hull. Reduce fission plant to 10 spaces (18 MW). Drive becomes a nuclear light bulb and tanks are increased to 1,040 spaces. Of interest to historians is that the accident that crippled the *Horus I* is one that the design was specifically designed to handle. Recreations of the event have left many puzzling questions unresolved, resulting in occasional calls to salvage the hulk for analysis. EMass 2,698; CMass 3,818; LMass 4,338. Cost M\$217.71. sAccel: 0.02 G. Burn Endurance: 11.56 hours. Burn Points: 830. Delta-V: 2.543 mps.

NADEZHDA BIOSHIP

Named *Nadezhda* (Russian for "hope") by her designers, this vessel is actually *alive* – an amazingly crafted organic machine assembled from a multitude of specialized bioroid components. *Nadezhda* is a cyborg as opposed to a true biological organism, with some systems consisting of electro-mechanical implants, albeit with many biological elements.

BIOSHIPS

Fully biological spacecraft are not possible in 2100. Ships such as *Nadezhda* require extensive technological assistance to survive. Treat bioships in *Transhuman Space* as bioshells (p. TS73) with the following template (-5 points):

Advantages: Acceleration Tolerance [10]; Bioroid Body [0]; High Pain Threshold [10]; Injury Tolerance (No Neck) [5]; Internal Senses* [20]; Sanitized Metabolism [5]; Vacuum Support [40].

Disadvantages: Inconvenient Size (Large) [-10]; Lamé (Legless) [-35]; No Manipulators [-50].

* The Internal Senses advantage lets the bioship see, hear, taste, and speak internally. Without this advantage, the vessel is completely unaware of activities inside it.

Nadezhda also has Radiation Tolerance 100 [28] (p. TS132), Increased Life Support 2 [-20], and Short Lifespan 3 [-30].

Build a bioship hull as a nanocomposite structure with a $\times 1.5$ price multiplier. This makes the vessel biomechanical and gives it the template above, as well as the ability to heal itself. Hull armor cannot be biomechanical and does not regenerate.

Certain modules can also be made biomechanical, at double cost. These include tanks, all crew quarters and seats, all accessories, and surface features. When determining Maintenance Interval (p. TS189), do not include the cost of biomechanical components in the calculation.

Bioships do not *necessarily* have to pay character points for their HT or cHP, or for technological devices built into them, such as radars, communications gear, and armor plates. If the GM requires it, ST is purchased with the No Fine Manipulators limitation (-40%).

Current bioships require immense quantities of nutrients to function properly. If they are not fed, starvation will result in the craft falling apart (reduce HT by one per *day* of starvation). Food requirement in man-days per day is equal to $6 \times$ (cube root of EMass). Increased Life Support will multiply this requirement.

For more information about living ships, see pp. BIO106-110.

MacroTech Genetics and Manticore Genetics designed *Nadezhda* both for publicity and to test radical new biomod technology that they hope will let them break out into the expanding space parahuman-design business. The craft was mostly designed on Earth, but the full-scale prototype was grown and assembled in orbit under tight security. It has only appeared outside of its testing area twice, and its creators have yet to announce its completion publicly. Even so, it has ignited a firestorm of controversy among pan-sapient rights organizations.

The vessel is a massive and extremely complex bioshell composed of many different nanofactured and engineered organisms working in concert. Its designers have refused to state which of their researchers are behind this seemingly impossible creation, but many rival biotech companies are engaged in a mad scramble to find out.

Nadezhda vaguely resembles a giant orca in profile – an aesthetic choice calculated to give the vessel a strong visual impact. The hull appears to be manufactured but is actually a chitinous nanocomposite carapace. Airlocks and cargo doors are modified sphincters, while sections of the hull bend and flex dynamically in response to structural stress. The inside of the craft borders on the bizarre: fleshy pockets hold computer terminals, while the walls periodically ripple and change color. Internal compartments are formed from bone and cartilage, with some nanocomposite bracing.

The crew monitors the bioship from a specially constructed bridge near the front, and can tap into its consciousness via slinky feed. The bioship processes the crew's waste; in turn, the crew uses some of the bioship's waste products. Waste that cannot be recycled is encapsulated and either ejected or stored for later removal. (Rival biotech companies may send agents to recover these capsules to get some insight into the vessel's metabolism!).



Nadezhda is an amazing achievement, but certain problems may preclude further development. First, *Nadezhda* has an astronomical metabolic requirement, primarily due to the need to generate a living environment for the crew. As well, some serious difficulties with the custom bioroid subsystems have yet to be worked out, notably cancerous growths in the living flesh beneath the carapace. Despite these drawbacks, it may be years before other companies can match this accomplishment.

The vessel is built as a biomechanical cylinder 75' long and 35' wide. The onboard mass driver, a cybernetic implant, has 100 spaces of rock dust to use as reaction mass, stored as cargo. The vessel's metabolic requirements are equivalent to 108 people; each space of food will feed it for 115 days. Typical payload, not including rock dust, is 41.1 tons, and includes 2 spaces of food.

Crew: Commander/Pilot (Leadership, Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); Engineer (Mechanic (Mass Driver), Mechanic (Robotics), other

Mechanic skills as appropriate); 4 Medical Technicians (Biochemistry, Diagnosis, Physician, Surgery); Cargo Master (Administration, Freight Handling). An infomorph directs the various bioroids on board and handles the majority of maintenance tasks.

Design: Cylinder hull (1,267.2 spaces, nanocomposite, extra-heavy frame, smart, biomechanical); cDR/cPF 0.2/1F, 0.2/1S, 0.2/1B (nanocomposite armor). Chameleon surface (biomechanical).

Modules: New basic bridge; large PESA; medium radar; 10 mass driver engine (rock dust); 4 cabin (biomechanical); 2 large entry module (biomechanical); 2 battery; 4 new fusion reactor (12 MW); 2 external cradles (125 tons each, biomechanical); surgery; 105 cargo (525 tons).

Statistics: EMass 222; CMass 1,563; LMass 2,863. Cost: unknown (one-of-a-kind prototype). cHP 625. Size Modifier +5/+7. HT 12. Maintenance Interval: 7.57 hours. RRA 0.

Performance: sAccel: 0.00064 G. Burn Endurance: 500 hours. Burn Points: 1,150. Delta-V: 3.52 mps. No air speed.

3

MILITARY VESSELS



It might not yet be the world-crushing war machine of popular science fiction, but the military space vessel of 2100 is still a harbinger of destruction, bristling with multi-megajoule lasers and carrying an arsenal of suicidal robotic missiles.

EUROPEAN SPACE CONTROL AGENCY (ESCA)

Largely an outgrowth of the civilian European Space Agency (ESA), ESCA has evolved into an effective multinational defense force. Despite being plagued by differences between its constituent space forces, it has managed to standardize the tactics, equipment, and support infrastructure of its members, and to fund joint research and development.

ESCA controls European Union space assets. This includes the defense platforms in Earth orbit that were once maintained by the individual member nations. The main focus of ESCA is indeed defense; however, the major powers also maintain deep-space forces that are capable of projecting power across the solar system. These exist primarily to protect E.U.-dominated corporate interests on Mercury and in the asteroids, and secondarily to provide a flexible intervention capability for operations such as police actions and humanitarian relief efforts, often in the chaotic L5 and Main Belt regions.

ESCA's main wartime combat experience was fending off stray missiles and orbital debris during the Pacific War. However, its forces have had plenty of involvement in "operations other than war" (see p. TS100) in L5 and the Main Belt. ESCA has also provided orbital support for E.U. peacekeeping operations in Africa and other trouble spots.

A FRACTURED FLEET

The strength of the ESCA deep-space fleet is estimated at approximately 36 SDVs and almost 50 support vessels, as well as a bewildering array of orbital facilities and defense platforms. Control of these assets is divided between independent

national space forces, with 75% of them belonging to France, Germany, and the United Kingdom. National governments, especially those of France and the U.K., have opposed the full integration of their fleets. As a result, ESCA's authority extends primarily to orbital defense, where the brief time scales and the threat to the entire European Union demand a unified command structure.

The space forces have attracted many nationalists who are disgruntled with the perceived homogenization of their homelands by the European Union. These factions are especially prominent in the Royal Navy Space Service and Force aérospatiale. Officers and enlisted personnel within these cliques have a Sense of Duty to their country; some even have Fanaticism. They promote like-minded officers (counting as a Patron) and quietly influence defense policy to ensure the continued independence of the space forces. In other space forces (notably Germany and Poland), nationalist factions enjoy less overt support; being a nationalist there is a Secret that can lead to serious embarrassment.

Common MILITARY SPACECRAFT CLASSES

Light Space Dominance Vehicle (LSDV): A smaller warcraft that sacrifices firepower or armor for increased delta-v.

Microgravity Assault Vehicle (MAV): An armored shuttle designed to convey boarding parties to enemy vessels – either by docking or by ramming.

Space Control Vehicle (SCV): An assault carrier designed to support space-to-surface combat missions.

Space Defense Platform (SDP): An orbital battle station.

Space Dominance Vehicle (SDV): A heavily armored warcraft.

Transatmospheric Combat Air Vehicle (TCAV): An orbital or suborbital military spaceplane.

DOCTRINE, ORGANIZATION, AND DEPLOYMENT

The French, German, and United Kingdom space forces are the largest in ESCA, and operate the majority of its deep-space vessels. Despite the occasional nationalistic officer, the individual forces that make up ESCA exercise and plan together. Vessels may operate in national or multinational task forces, but operations with only one or two deep-space vessels are typical. It is common for an officer in one force to do a tour of duty in another; thus, a French SDV might have a British weapons officer serving aboard.

Bundesraumwaffe

Germany's space force is modern: new *Hermann Oberth*- and *Gram*-class vessels make up over half its SDV fleet. In addition to operating orbital assets, the *Bundesraumwaffe* is tasked with coordinating E.U. operations in and around Luna and L4, and has a high proportion of local space vehicles for these purposes. As well, it routinely assists *Force aérospatiale* in operations in L5. Finally, it controls deep-space assets, and shares responsibility for Near-Earth Asteroid and Venus patrols with the Royal Navy – sometimes venturing into the Main Belt to assist the latter force in the suppression of bioroid trafficking.

The *Bundesraumwaffe* often undertakes humanitarian missions; therefore, it operates a *Zhongguang* HSTV that has been

converted into a mobile hospital. The *Bundesraumwaffe* has a close relationship with Systems Technologies AG.

Force Aérospatiale

Like the USAF, France's *Force aérospatiale* is a joint air and space force. Roughly half its budget is devoted to Earth-based combat and transport aircraft, including a sizable force of TCAVs. In space, it is in charge of coordinating ESCA operations in L5 and Mercury, and provides the majority of E.U. vessels for patrols and contingencies in these regions. *Force aérospatiale* is fully capable of large-scale independent operations where French interests or prestige are at stake, and its vessels often carry Foreign Legion ground troops.

France has expended much financial and political capital on its space force, going so far as to break with its European Union partners by refusing to participate in the SDV-90 program in favor of its own homegrown design. However, *Force aérospatiale* maintains a close professional relationship with other ESCA members, and French space forces are prominent in multinational ESCA exercises and deployments.

Royal Navy Space Service and Royal Air Force

Royal Navy Space Service: The RNSS is a component of an older military service, the “wet” Royal Navy, and its personnel must compete with their surface counterparts for promotion and funding. Unlike the French and German space forces, it does not operate any orbital weapons systems or



TCAVs. This has given the RNSS an unusual focus on deep-space operations, which has served it in good stead during recent police actions in the Main Belt. The RNSS works closely with the Royal Marine Commandos (Commachio Group), the U.K.'s elite "microgravity assault" unit.

Royal Air Force: The RAF operates the U.K.'s share of ESCA's orbital and ground-based space-defense systems, as well as conventional (mostly unmanned) combat aircraft and TCAVs, such as the *Tempest*.

Other Contingents

The French, German, and United Kingdom contingents dominate ESCA, but some of the smaller European Union countries also have a presence in space – even if that means little more than contributing funding or the occasional engineer or scientist. All European Union nations contribute to ESCA's space-defense system. Multinational contingents of technicians man ground- and space-based command-and-control centers, service cybershell space-defense platforms, and operate ground-based defenses. A few nations have small, independent deep-space forces as well, notably Italy, Poland, and Spain.

LSDV-5 (HERMANN OBERTH CLASS)

Designed by System Technologies AG and MedAir SpA, the LSDV-5 first flew in 2096, and is presently the cutting edge of the European Union's SDV fleet, representing the majority of new German, Italian, French, and Spanish acquisitions. Unlike Chinese and U.S. SDVs, it is optimized for operation in the inner system – and in Earth-Lunar space in particular. Vessels are named after European aerospace pioneers and industrialists; e.g., *Gianni Caproni*, *Marcel Dassault*, *Henri Farman*, and *Wernher von Braun*.

The LSDV-5's HT antimatter pulse drive gives it exceptional acceleration, and hence excellent maneuverability. Its antimatter bay contains a 66.7-hour supply of antimatter – enough for more than four

full burns. The bay is buried deep inside the hull, and can be ejected in an emergency. In reality, this option does more for the crew's morale than it does to improve safety, as an accident would result in an explosion long before the bay could be safely disconnected.

The LSDV-5 is a much smaller design than the SDV-90, measuring a mere 160' long and 45' wide. The hull is sharply sloped on the front to make maximum use of its armor, with sensors and communications equipment placed in rounded blisters along the hull. The living quarters and bridge are located at the front of the ship, followed by the tanks and the antimatter pulse drive. The folding radiators are somewhat unusual, extending out from the hull to measure 80' wide, but gracefully curved to 375' in length. Typical combat payload is 538.2 tons, including 4 *Predator* AKVs on external cradles and 10 munitions packages. There are 1.72 spaces left for additional modules and expansions.

OTHER ESCA NATIONS

Finland: The *Suomen Ilmavoimat* (Finnish Air Force) operates a squadron of *Tempests* (p. 30). A Finnish crew also maintains a single old SDV located in Earth orbit, which is used for ESCA training.

Italy: The Italian Aerospace Force operates one LSDV-5 (with two under construction) and several support craft, as well as various TAVs and TACVs.

Poland: Has a mid-sized aerospace force of TAVs plus two elderly SDVs. It is considering the purchase of two new LSDV-5's to replace them.

Québec: A squadron of eight *Tempest* TACVs are operated by *la Force aérospatiale du Québec*.

Turkey: Turkey has embarked on an ambitious building program and intends to field four SDVs by 2112. Currently they operate two dozen TACVs and contribute crews to various SDPs.

Crew: Commander (Leadership, Ship-handling, Tactics); Pilot (Piloting (High-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Weapons Officers (Gunner (Beams), Gunner (Railgun)); 20 Engineers (Mechanic (Antimatter Drive), Mechanic (Robotics), other Mechanic as appropriate); Medic (Diagnosis, Physician, Surgery). As living quarters are sparse, most of the crew is usually cybershells or infomorphs.

Design: Streamlined cylinder (518.4 spaces, metal matrix composite, extra-heavy frame, smart); cDR/cPF 70/10F, 10/2S, 5/1B (metal matrix composite armor). Hull radiators (15 ksf), folding radiator wings (60 ksf). Chameleon surface.

Modules: New basic bridge; 2 medium ladar; large PESA; 2 medium radar; 120 HT antimatter pulse drive; 300 tanks (ultralight, nuclear pellets); 0.08 antimatter bay (8 grams); 4 10-MJ heavy laser towers [S]; 4 2.5-MJ light lasers [S]; coilgun [F]; 2 cabin; heavy storm shelter (1-space: encloses bridge, cPF 1,000); 4 external cradles (125 tons each); minifac workshop; large entry module; surgery; 5 cargo (25 tons).

Statistics: EMass 4,411; CMass 6,749; LMass 8,549. Cost M\$798.59. cHP 1,616. Size Modifier [Hull] +5/+9, [Radiators] +9. HT 12. Maintenance Interval: 1.42 hours. RRA 60.

Performance: sAccel: 0.17 G. Burn Endurance: 15.63 hours. Burn Points: 9,570. Delta-V: 29.23 mps. No air speed.

Variant: The manufacturers originally hoped for foreign sales, but the high cost of antimatter and the specialized nature of the design discouraged most buyers. In 2094, MedAir announced the development of a less-expensive export version, the LSDV-6 *Soldati*, which replaced the HT antimatter pulse drive with a more conventional HI fusion pulse drive. The Japanese

Space Self Defense Force purchased three LSDV-6s, while the Indian Aerospace Force acquired two, and has two more on order. Remove the antimatter bay and reduce side armor to cDR/cPF 5/1. EMass 3,833; CMass 6,121; LMass 7,971. Cost M\$572. sAccel: 0.08 G. Burn Endurance: 62.5 hours. Burn Points: 18,000. Delta-V: 55 mps.

KÖNIGSBERG-CLASS SPACE DOMINANCE VEHICLE

This System Technologies design is actually a “pre-SDV,” since the first members of the class were built in 2081, before the influence of the new Chinese SDVs. It is the best example of the *sphere* school of warcraft design: a sphere lacks any specific weak point in its armor and is somewhat easier to maneuver. This is useful for short-range engagements of the kind that ESCA believes is most likely to occur in the congested L4 and L5 zones patrolled by the German and French space forces. The drawback is that the armor mass slows the vessel down, despite the use of advanced nanocomposites and an antimatter pulse drive.

Vessels in this class are named after European cities – mostly in France and Germany, since those nations operate the majority of these craft, although Italy and Spain also use them. Multinational ESCA crews operate two vessels, including the *Königsberg* itself. There is usually a vessel of this class on patrol near Mercury to protect European antimatter production facilities.

The spacecraft is a 95’-diameter sphere studded with laser towers. The crew quarters, bridge, and spacedock are located in the front of the vessel, with the antimatter bay buried deep inside the hull. When deployed, the radiator wings are only 95’ × 95’. The original design called for a much larger antimatter drive and 215’ radiator arrays, but structural limits forced a redesign. Payload is 252.7 tons, including 200 tons of carried craft. The



power pack provides enough energy for two volleys. The drive has 99 MW of excess power if not used to power the weapons. The antimatter bay holds enough antimatter for 167 hours of operation, reducing the need for frequent refueling.

Crew: Commander (Leadership, Shiphandling, Tactics); Pilot (Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Weapons Officers (Gunner (Beams), Gunner (Railgun)); 20 Engineers (Mechanic (Antimatter Drive), Mechanic (Robotics), other Mechanic as appropriate); 2 Medics (Diagnosis, Physician, Surgery). Often carries 6 battlesuit-equipped soldiers.

Design: Sphere hull (857.375 spaces, nanocomposite, extra-heavy frame, smart); cDR/cPF 55/5 (nanocomposite armor). Hull radiators (27 ksf), folding radiator wings (18 ksf). Chameleon surface.

Modules: New command bridge; 2 large ladar; large PESA; 2 large radar; 90 HT antimatter pulse drive; 600 tanks (ultra-light, nuclear pellets); 0.15 antimatter bay (15 grams); 8 10-MJ heavy

laser towers [S]; 12 2.5-MJ light laser towers [S]; 8 cabin; bunkroom; heavy storm shelter (2-space: encloses bridge, cPF 1,000); minifac workshop; large entry module; spacedock hangar (20' long, 20' wide, 25' high: 20 spaces); 5 power pack; surgery; 10 cargo (50 tons).

Statistics: EMass 7,666; CMass 11,518; LMass 15,118. Cost M\$1,444.73. cHP 1,692. Size Modifier [Hull] +8, [Radiators] +8. HT 12. Maintenance Interval: 1.05 hours. RRA 45.

Performance: sAccel: 0.08 G. Burn Endurance: 41.67 hours. Burn Points: 12,000. Delta-V: 36.67 mps. No air speed.

Variant: France still favors the sphere concept, and pulled out of the SDV-90 project in favor of a modified *Königsberg* design optimized for higher delta-v. Vessels presently constructed include the *Cyrano de Bergerac* (after which the class is named) and *Jules Verne*. Replace the HT antimatter pulse drive with an HI antimatter pulse drive. Cost M\$1,354.73. Maintenance Interval: 1.09 hours. sAccel: 0.04 G. Burn Endurance: 166.67 hours. Burn Points: 24,000. Delta-V: 73.3 mps.



EUROFIGHTER TEMPEST TCAU

The *Tempest* is a multi-role unmanned combat vehicle fielded by nearly all European Union aerospace forces. It was part of the same long-term set of requirements formulated in 2081 that led to the SDV-90 (p. TS192). The program was plagued with accusations of corruption, but the final production design by Vosper-Babbage is considered the best of the contenders. Production began in 2087, with 87 vessels currently in service (six have been lost in training accidents and other mishaps).

The *Tempest* can travel at Mach 8.3, skim the very edge of space, and safely reenter atmosphere, but it is incapable of entering orbit – which has led to grumbling among the space forces that wanted a craft capable of entering LEO and engaging targets in higher orbits. Constant upgrades to the SAI infomorph packages continue to extend the design's operational life; ESCA plans to field the *Tempest* until at least 2120.

Being unmanned, the *Tempest* is significantly smaller than the PLAN-SF *Diaoche* (p. 36). It is a diamond-shaped delta

55' long, 33' wide, and 17' high. Its lasers are powered by an onboard power pack (nine volleys), while most other systems run off the battery (eight hours).

Crew: Unmanned. Infomorph uses Electronics Operation (Communications), Electronics Operation (Sensors), Gunner (Beams), and Piloting (Aerospace). Infomorph occupies the mainframe in the unmanned controls.

Design: Streamlined delta (10.648 spaces, carbon composite, heavy frame, smart, responsive, lifting body); cDR/cPF 7/1F, 5/1S, 5/1B (carbon composite armor). Liquid-crystal skin.

Modules: New unmanned controls; small PESA; small fixed radar [F]; 2 compact turbo-scramjet; 5 tanks (ultralight, jet fuel); 2 2.5-MJ light lasers [F]; 0.2 battery; 1 power pack.

Statistics: EMass 138; CMass 165; LMass 192. Cost M\$21.25. cHP 73. Size Modifier +6. HT 12. Maintenance Interval: 8.68 hours. RRA 0.

Performance: No space performance. Fuel Endurance: 1.67 hours. Air Speed: 5,975 mph (1.66 mps). Stall Speed: 240 mph.

MAV-IIB Puma MICROGRAVITY ASSAULT VEHICLE

The Vosper-Babbage *Puma* MAV is a “boarding pod” designed for high-threat attacks on orbital facilities, space colonies, asteroid bases, and space vessels. A boarding action is *dangerous*; a target that appears to have surrendered might still have hidden weapons or self-destruct charges. As such, after the majority of the target’s weapons are disabled or suppressed, the MAVs are launched from a safe distance (typically 10-50 miles) at bone-crushing accelerations, then rapidly decelerate, allowing an assault force to perform the boarding action without risking the mother ship.

The basic design is a streamlined cylinder 25’ long and 10’ in diameter, with a heavily armored “nosecap” (which can punch through light armor, if the MAV rams its target), followed by a troop compartment, and then fuel tanks and rocket nozzles. There are 40 *Pumas* in ESCA service. Individual craft do not have official names, but their passengers usually take the time to give them a nickname and paint various slogans on the nose.

Crew: Pilot (Piloting (High-Performance Spacecraft)). In many cases, the craft is entirely automated, running an LAI infomorph on the cockpit mainframe. Can carry up to 16 battlesuited or cybershell marines.

Design: Streamlined cylinder (4 spaces, metal matrix composite, extra-heavy frame); cDR/cPF 14/2F, 5/1S, 2/1B (metal matrix composite armor).

Modules: Old cockpit; small PESA; small fixed ladar [F]; 1 compact kerosene-oxygen rocket; 1 tanks (ultralight, kerosene-oxygen); passenger seats; small entry module.

Statistics: EMass 42; CMass 51; LMass 58. Cost M\$9.03. cHP 60. Size Modifier +2/+4. HT 12. Maintenance Interval: 6.66 hours. RRA 0.

Performance: sAccel: 9.75 G. Burn Endurance: 0.003 hours (11 seconds). Burn Points: 110. Delta-V: 0.322 mps. No air speed.

AVSKÈRMAR SPACE DEFENSE PLATFORM

Designed by Hvide Stjerne A/S in Denmark, the *Avskèrmar* (“shield”) SDP has been the standard European Union space defense platform design since 2070. It is used mainly in the inner system (especially Earth, Luna, and Mercury orbit) due to its reliance on solar power.

The hull is a simple 25’-diameter sphere with two 71’ × 71’ folding solar panels. Its power pack provides enough power for 5 shots, and the battery powers all other systems for 8.8 hours. The platform remains in low-power mode (allowing the solar cells to recharge the batteries and power pack) until alerted or attacked.

Crew: Unmanned. Infomorph uses Electronics Operation (Communications), Electronics Operation (Sensors), and Gunner (Beam). Infomorph occupies the mainframe in the unmanned controls. Maintenance is performed by cyberswarms.

Design: Sphere hull (15.625 spaces, titanium alloy, heavy frame, smart); cDR/cPF 25/5 (metal matrix composite armor). Chameleon surface.

Modules: Old unmanned controls; small fixed radar [F]; small PESA; 0.25 compact metal-oxygen rocket; 7 tanks (metal-oxygen); 10-MJ heavy laser [F]; 0.1 battery; 1.2 power pack; 10 ksf folding solar panels.

Statistics: EMass 319; CMass 392; LMass 466. Cost M\$32.59. cHP: 59. Size Modifier +4. HT 12, Maintenance Interval: 7.01 hours.

Performance: sAccel: 0.15 G, Burn Endurance: 0.187 hours (11.2 minutes), Burn Points: 10, Delta-V: 0.31 mps. No air speed.

PEOPLES' LIBERATION ARMY NAVY SPACE FORCE (PLAN-SF)

From its humble beginnings as an arm of the PLA Navy to its baptism of fire during the Pacific War, China's PLAN-SF has continually adapted to shifting strategic and political requirements. Now, almost two decades after the Pacific War, the largest military space fleet is undertaking a bold plan to completely reinvent itself, shaking the delicate balance of power among the major space forces.

DOCTRINE

Prior to the Pacific War, PLAN-SF strategy was to maintain complete control of various "strategic nexuses" around Mars and Earth. War plans concentrated on fixed defenses, heavily armed satellites, and agile, short-range orbital combatants, such as AKVs. Only a few deep-space vessels were in service – the emphasis was on orbital battle.

In the Pacific War, the PLAN-SF proved successful in sweeping the TSA out of Earth's skies and then supporting ground operations with orbital strikes. However, things did not go so well in deep

space. The TSA's use of pre-positioned AKVs to attack interplanetary and translunar shipping came close to cutting off Mars, as well as interdicting helium-3 energy supplies that were supposed to arrive from Luna. The U.S. energy embargo on gas-giant helium-3 caused further shortages.

After the conflict, China resolved to repair its weaknesses in deep space, embarking on an extensive modernization program. Lessons learned in the Pacific War were applied to the ongoing *Gang Shou* SCV and the *Xingzhai* SDV programs, resulting in the first of a new breed of deep-space combatants. During this time, the PLAN-SF developed many of the tactical doctrines and technologies now taken for granted by other space forces.

RANKS

The PLAN-SF rank structure is identical to that of the PLA Navy. It is common practice for both officers and enlisted personnel to attach *taiko* ("space") to their rank in order to differentiate themselves from their surface counterparts.

Enlisted personnel (Rank 0-2) are common on Chinese vessels, in marked contrast to the USAF and ESCA, where most such positions are filled by infomorphs. However, officers fill all bridge positions. At least Rank 6 is needed to command a large military vessel, but Rank 3-5 officers often command smaller craft. A Rank 2 NCO typically commands noncombat craft. China does not use sapient infomorphs in its military vessels (including its AKVs), preferring to use NAIs and LAIs.

Political reliability is still important to promotion, which leads to a distressing number of mediocre leaders. Special "cadre" infomorphs monitor all officers (Rank 3+) in order to ensure that they are performing their duties efficiently. These infomorphs answer only to the Central Military Commission (China's central military command) and its General Political Division (GPD); as such, officers do not trust them. However, the infomorphs do not actively work against those they monitor; rather, they exist to testify as to an officer's political loyalty and professional conduct, should these things come into question.

A cadre infomorph is an LAI-7 with Fanaticism (Loyalty to China) [-15] loaded onto a wearable or implanted virtual interface (p. TS142) assigned to the officer.

BASES

PLAN-SF facilities are heavily defended, with dozens of AKV bays and beam-weapon emplacements, as well as various automated defense platforms and cybershells. Friendly vessels are expected to maneuver within this defensive network and support weak points as necessary.

Phobos (Mars): Headquarters to the Deep Space Fleet, and perhaps the single most heavily defended facility outside of Earth-Luna space. Rumors abound that the PLAN-SF may relocate its headquarters to Phobos in the next decade.

Shi Yusheng Station (Earth-Luna): This military habitat is the primary orbital training facility for the PLAN-SF. The station itself is an unremarkable torus design, and only lightly armed. Roughly 2,000 permanent personnel and trainees are stationed at the facility.

Jiuquan Launch Facility (Earth): Half of this aerospace complex serves as the PLAN-SF boot camp, technical training facility, and command center for the Earth Fleet.

Beijing Aerospace Command and Control Center (Earth): Technically controlled by the Chinese civilian space agency, the China National Space Administration (CNSA), this facility houses a large PLAN-SF detachment responsible for tracking and identifying potentially hostile targets in orbit.

Jiangli Station (Saturn): The PLAN-SF maintains a small detachment at the station, ostensibly to advise on defensive matters and liaison with Deep Space Fleet vessels. Growing tensions over U.S. reconnaissance missions may lead to increased PLAN-SF involvement.

DEPLOYMENT

The PLAN-SF invented the modern concept of space dominance vehicles, and has the largest inventory of any single space power – more than 30 – as well as dozens of smaller craft. Some 90% of these vessels are in Earth-Luna and Mars space, and operate in three “named” fleets: the Deep Space Fleet, the Earth Fleet, and the Reserve Fleet. Organization is copied from the PLA Navy, with some changes to reflect PLAN-SF’s much smaller size.

Each fleet is divided into *dadui* (“groups”) of up to five vessels, roughly equivalent to USAF or ESCA squadrons. These detach *jiangting* (“individual

vessels”) for patrols and other routine tasks. During the Pacific War, the Earth Fleet became large enough to form *zhidua* (“flotillas”) of up to 30 vessels.

The PLAN-SF does not have its own infantry force. Instead, it “borrows” elements of the PLAN *Haijun Luzhandui* (“Marine Corps”). The *haijun kongjian-zhandui* (“space marine”) units are a special branch, drawn from the elite 67th Space Infantry Division (SID). The Division’s three brigades (1,500 troops) are well trained and motivated; service in the unit is considered an honor, and reflects well on one’s family. Training focuses on hands-on exercises rather than relying on slinky or InVid simulations.



RIGUANG-CLASS LIGHT SPACE DOMINANCE VEHICLE

Designed by MAST in 2096 and set to enter mass production by Hsaio Ch'u at the Phobos shipyards, the *Riguang* ("Sun")-class LSDV is the most advanced military vessel in PLAN-SF service, and the first Chinese warcraft to use an antimatter pulse drive. Originally designed simply as an adjunct to the expensive *Gang Shou*-class SCVs (see *In The Well*), it has proven to be an outstanding design – perhaps even a successor to the *Xingzhai* class (pp. 35-36) if the problems with powering all of its weapons in combat can be resolved. The first examples of the class, the *Riguang Qiang* ("Sun Spear") and *Riguang Dao* ("Sun Sword") are currently conducting a shakedown cruise between Mars and Earth. Full production is expected to start in early 2101 to fill out the requirement for 10 vessels by 2108.

The 200'-long, 50'-wide cylinder is noticeably sleeker than earlier PLAN-SF

designs – Hsaio Ch'u took great care to make the vessel aesthetically pleasing as well as combat effective. The design was the first to make extensive use of *feng shui* advisors, making the interior unique. The bridge has a large fish tank, and access hallways are carefully placed to facilitate the flow of *chi* through the vessel. The radiators are small (89' × 89'), but have patterns embossed on the surface to give them the appearance of giant butterfly wings. Typical payload is 364 tons, including 5 extra munitions packs and 300 tons of carried craft.

Crew: Commander (Leadership, Shiphandling, Tactics); Pilot (Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Weapons Officers (Gunner (Beams), Gunner (Railgun)); 20 Engineers (Mechanic (Antimatter Drive), Mechanic (Robotics), other Mechanic as appropriate); Medic (Diagnosis, Physician, Surgery). Usually, all but the bridge crew and medic are cybershells.



Design: Cylinder hull (800 spaces, nanocomposite, extra-heavy frame, smart); cDR/cPF 65/5F, 10/1S, 5/1B (nanocomposite armor). Hull radiators (32 ksf), folding radiator wings (16 ksf). Chameleon surface.

Modules: New basic bridge; 2 fixed medium ladar [F/S]; large PESA; large radar; 95 HI antimatter pulse drive; 555 tanks (ultralight, nuclear pellets); 0.14 antimatter bunker (14 grams); 6 10-MJ heavy lasers [S]; 3 10-MJ heavy lasers [F]; 8 2.5-MJ light laser towers [S]; coilgun [F]; 150' new particle beam [F]; 6 cabin; heavy storm shelter (1-space: encloses bridge, cPF 1,000); minifac workshop; 2 small entry module; spacedock hangar (40' long, 20' wide, 25' high: 40 spaces); surgery; 5 cargo (25 tons).

Statistics: EMass 3,873; CMass 7,767; LMass 10,897. Cost M\$703.72. cHP 2,160. Size Modifier [Hull] +6/+9, [Radiators] +7. HT 12. Maintenance Interval: 1.51 hours. RRA 47.

Performance: sAccel: 0.06 G. Burn Endurance: 146.05 hours. Burn Points: 31,550. Delta-V: 96.39 mps. No air speed.

XINGZHAI-CLASS SPACE DOMINANCE VEHICLE

The *Xingzhai* ("Star")-class SDV makes up the bulk of the PLAN Deep Space Fleet, although some earlier pre-SDVs remain in service. Twenty vessels have been constructed. It is one of the earliest "second-generation" SDV designs, but it has proven very reliable, and is expected to remain in front-line service until at least 2120.

The *Xingzhai* program started in 2073, and included the concept – at the time unheard-of in a dedicated deep-space design – of abandoning spin capsules in favor of microgravity-adapted crews. There were several changes in the wake of the Pacific War, including a higher-impulse drive and modified armament. The prototype, *Jiuxing Hao* ("Eternal Star"), was

completed in 2086, and production begun in 2088.

The *Xingzhai* class has undergone a number of upgrades over its history, intended to keep it competitive against newer craft such as the SDV-90 and DFS-3. Its basic design is now standard for SDVs: a 350'-long, 60'-wide cylinder with 141' × 141' folding radiator wings. In addition to the six *Zhenyang* AKVs in launch bays, the spacedock usually carries an additional 500 tons of AKVs or support equipment for the marine detachment. Typical payload is 1,456 tons. There are 6.1 spaces available for expansion.

Crew: Commander (Leadership, Shiphandling, Tactics); Pilot (Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Weapons Officers (Gunner (Beams)); 20 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic as appropriate); 3 Medics (Diagnosis, Physician, Surgery). Most vessels carry 24 battlesuit-equipped marines.

Design: Cylinder hull (2,016 spaces, carbon composite, extra-heavy frame, smart); cDR/cPF 65/20F, 15/2S, 5/1B (metal matrix composite armor). Hull radiators (70 ksf), folding radiator wings (40 ksf). Chameleon surface.

Modules: Old command bridge; 3 medium ladar; 2 large PESA; 2 medium radar; 200 HI fusion pulse drive; 1,500 tanks (ultralight, nuclear pellets); 6 10-MJ heavy laser towers [S]; 4 10-MJ heavy lasers [F]; 8 2.5-MJ light lasers [S]; 2 2.5-MJ light lasers [B]; 300' old particle beam [F]*; 4 cabin; 6 bunkroom; passenger seats; heavy storm shelter (2-space: encloses bridge, cPF 1,000); light storm shelter (1-space: encloses passenger seats, cPF 100); minifac workshop; 2 large entry module; spacedock hangar (55' long, 20' wide, 25' high: 55 spaces); 20.5 new fission reactor (80 MW); 6 vehicle bays (*Zhenyang* AKV: 150 tons, 0.08 ksf, 6 spaces each); surgery; 10 cargo (50 tons).

Statistics: EMass 11,768; CMass 22,224; LMass 31,224. Cost M\$927.39. cHP 4,378. Size Modifier [Hull] +6/+10, [Radiators] +9. HT 12. Maintenance Interval: 1.32 hours. RRA 105.

Performance: sAccel: 0.04 G. Burn Endurance: 187.5 hours. Burn Points: 27,000. Delta-V: 82.5 mps. No air speed.

* If the particle beam is powered, the vessel may not fire 6 heavy lasers that turn.

DIAOCHE-CLASS TCAV

The *Diaoché* ("Crane")-class TCAV entered production in 2090 after a heated design competition that lasted only a single year. The *Diaoché* is in service with the PLAN-SF and PLA Air Force, but to date, no version has been offered for export. Only 45 of these craft are in PLAN-SF service; the much smaller *Ying* ("Hawk") TCAV (see *In The Well*) has proved adequate for most missions. However, the Air Force possesses 240 of these craft, with squadrons located throughout China.

The *Diaoché* does not require external boosters to enter orbit, unlike earlier TCAV designs. Instead, it uses advanced turbo-scamjets for atmospheric travel and high-thrust chemical rockets for high-altitude maneuvering. It is not designed for prolonged engagements, and is vulnerable to conventional aerospace assets, but it can engage LEO targets from within the atmosphere, deploy small satellite systems or cyberswarm networks, and possibly engage enemy vessels in higher orbits with its laser. Unfortunately, the craft's combat endurance is limited: the power pack only provides enough energy for 6 full-power shots from the dorsal laser array, and rocket fuel endurance is measured in minutes at full burn.

At 70' in length, this is the largest TCAV in service. In fact, the main reason the *Gang Shou* has such a large spacedock is because of the requirement to carry at least one full flight of these craft. Typical payload is 15.1 tons – usually additional ASAT weapons or microsatellites.



Crew: Pilot (Electronics Operation (Communications), Electronics Operation (Sensors), Gunner (Beams), Piloting (Aerospace), Piloting (High-Performance Spacecraft)).

Design: Streamlined delta (21.952 spaces, carbon composite, light frame, responsive, lifting body); cDR/cPF 7/1F, 5/1S, 5/1B (metal matrix composite armor).

Modules: Old cockpit; small PESA; small fixed radar [F]; 2 compact turbo-scamjet; 0.25 compact kerosene-oxygen rocket; 7 tanks (ultralight, jet fuel); 3.5 tanks (ultralight, kerosene-oxygen); 10-MJ heavy laser [F]; 0.1 battery; 1.5 power pack; 3 cargo (15 tons).

Statistics: EMass 160; CMass 237; LMass 300. Cost M\$21.98. cHP 29. Size Modifier +7. HT 12. Maintenance Interval: 4.27 hours. RRA 0.

Performance: sAccel: 0.52 G. Burn Endurance: 0.043 hours (2.58 minutes). Burn Points: 80. Delta-V: 0.246 mps. Fuel Endurance: 2.33 hours. Air Speed: 4,695 mph (1.30 mps). Stall Speed: 235 mph.

UNITED STATES AEROSPACE FORCE (USAF)

After a successful campaign to protect U.S. space assets from stray Chinese and TSA weapons during the Pacific War, and operations against Gypsy Angel pirates afterwards, the USAF is riding high on its stored political capital and public support. This has enabled it to grab the lion's share of the national defense funding, much to the chagrin of the other services.

DOCTRINE

Compared to ESCA, the PLAN-SF, or the TSA, the United States Aerospace Force is spread very thin, with assets scattered

throughout the system. Rather than defend fixed locations, the USAF expects to move rapidly onto offensive operations during any conflict, using its qualitative edge in mobility and technology to form ad hoc combat units wherever they are needed most.

DEPLOYMENT

The USAF attempts to keep at least half of its vessels out on patrol at all times. Some vessels are sent on unannounced "tours" to other Space Wings or out-of-the-way colonies, as fuel budgets permit. Most of these missions are intended to disrupt any long-term analysis of fleet dispositions, but they do broaden the perceived presence of the United States in space and provide crews with useful experience.

The USAF cooperates very closely with the U.S. Army's 82nd Spaceborne, but its relationship with the rest of the Army, and with the Navy, is cooler. The Army resents the USAF emphasis on space-control and deep-strike operations over air-lift and close air support, while the Navy (and its congressional lobby) still bears a grudge over having been denied a chance to operate deep-space vessels.

RANKS

Habitat and vessel crews are organized much like miniature squadrons. The Commanding Officer (Rank 6) and Executive Officer (Rank 5) are in overall command, with captains (Rank 4) in charge of the lieutenants (Rank 3) that man most of the vessels' systems. Enlisted personnel are largely technical specialists in the Aerospace Command, and are practically nonexistent on space vessels and facilities.

USAF officers often joke that in Deep Space Command, "a captain is a corporal and a colonel is a sergeant." Rank divisions are very strict on space vessels, as the human crew consists entirely of officers (infomorphs may be NCOs). Promotion can be painfully slow, which can be a shock for officers from other services or from Aerospace Command. To represent this, USAF officers may spend up to 3 character points to establish time-in-grade and time-in-service. This seniority only counts for the current Military Rank, but GMs may allow the player to simply buy off the difference when purchasing a higher Military Rank.





DEEP SPACE WINGS

The “wing” is the largest combat unit in the USAF. A *Space Wing* can consist of up to 20 large vessels and a dozen or more auxiliaries (cargo transports, large shuttles, executive space vehicles, etc.). Wings generally consist of three to five squadrons. Each squadron has a few large vessels or stations (in Deep Space Wings, typically two SDVs) and several smaller ones, plus supporting personnel.

30th Space Wing: Based out of Rhea (p. TS47), the 30th is responsible for defending U.S. interests in the Deep Beyond, including ensuring the safety of helium-3 shipments; protecting U.S. bases and colonies at Cassini Station, Rhea, Titan, and Hyperion; and assisting vessels in distress. Four Block C *Archangel* SDVs and various other vessels patrol the region around Saturn and make occasional sorties as far out as Neptune. See **Deep Beyond** for additional information.

90th Space Wing: This wing’s area of responsibility is deep-space patrol in the inner system, in particular to protect U.S. deep-space commerce in the “triangle trade” between Earth-Lunar space, Mercury, and Mars. In peacetime, this often involves rendering aid to vessels or near-Earth asteroid bases. It is also tasked to assist the 91st in the defense of Mercury, and its inner-system patrols near the sun often double as science missions for the U.S. Astrographical Survey. The 90th fields six *Angel* SDVs, one *Grizzly* SCV, and eight auxiliary vessels.

91st Space Wing: Assigned to defend Mars and patrol the inner system, the 91st Space Wing has the distinction of the worst safety record of all the Deep Space Wings, despite numerous maintenance standdowns. Both the USAF and SIA are investigating potential Chinese or terrorist sabotage. The wing consists of six *Angel* SDVs, three *Grizzly* SCVs, and almost two dozen auxiliaries. As a heavily transport-oriented wing, it is expected to support contingencies that require interplanetary troop deployments (including reinforcing Mercury and Titan). For more information, see **In The Well**.

341st Space Wing: The 341st Space Wing is based out of Columbia Station in Earth orbit. In peacetime, it supports the orbital SDP network in close cooperation with the 21st Space Wing (Aerospace Command), and is also tasked with handling contingencies at Luna, L4, and L5. The 341st currently fields two *Angel* SDVs, with another two undergoing refit to the Block C upgrade, plus a large number of local space vessels (OTVs, MAVs, etc.).

50th Space Wing: Not officially acknowledged to exist, the 50th Space Wing is sometimes credited with testing (and perhaps operating) a variety of experimental or prototype vessels, or special operations craft (such as modified civilian vessels used for electronic surveillance or black operations). Conspiracy theorists claim they use technology salvaged from alien relics on Mars and Pluto.

DCS-4 GRIZZLY SPACE CONTROL VEHICLE

Designed as the fast transport and AKV carrier counterpart to the DFS-3, the Columbia Aerospace DCS-4 can carry an entire battalion of Army personnel and their associated support equipment, or enough AKVs to seriously threaten a fleet. It represents a major increase in the USAF's ability to project force across the solar system. It was approved in 2088, with the first vessel completed in 2090.

Fifteen vessels were planned, but only seven are currently in active service, with the pathfinder vessel being used alternately for training and for testing new technologies for later installation on production models. Vessels in service are named after bears, including those from myth; e.g., the *Kodiak*, *Sunbear*, and *Ghost Bear* of the 91st Space Wing.

The DCS-4 is a 450'-long, 50'-wide cylinder. Not designed to go toe-to-toe with other combat vessels, it cannot retract its 224' × 224' radiator wings and carries relatively little armor. Typical payload includes 8 *Predator* AKVs on external cradles, and various other craft in the space-dock, for a total of 3,407.6 tons. There are 56 spaces available for future upgrades.

Crew: Commander (Leadership, Shiphandling, Tactics); Pilot (Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); Weapons Officer (Gunner (Beams), Gunner (Railgun)); 35 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic skills as appropriate); 8

BASES

For reasons known only to the USAF command, all facilities located on planetoids or planets are "Air Force Bases," while those in orbit are "Aerospace Force Bases." Both on Earth and elsewhere, local contractors largely operate the facilities. This makes the bases more cosmopolitan, but it is also a potential security hazard. Counterintelligence is a rapidly expanding occupational field in the USAF . . .

Some examples:

Cassini AFB (Rhea): The HQ of the 30th Space Wing. The posting is relatively boring, but increased tension with the Chinese colony on Titan has many worried.

Titan AFB (Saturn): A large spaceport serving mainly as a staging area for military landings on Titan. Only a single squadron of UCAVs and a handful of support personnel are present to "show the flag." The Joint Chiefs are considering expanding the base to support a permanent Army detachment despite objections by some USAF generals.

Mars Orbit AFB (Mars): Commanded by the colorful Brigadier General Gendo Tobikuma, "Blue Star" is the HQ of the 91st Space Wing. The facility is earmarked for expansion, to the relief of the overcrowded and overworked crew.

Vandenburg AFB (Earth): Shared with NASA, Vandenburg AFB is the site of the world's largest concentration of TCAVs, with 74 in various states of readiness. As operations at Vandenburg expand under Lieutenant General Gloria Silvas' command, the base has become a popular target for groups opposing the weaponization of space and atmospheric damage from TCAV and shuttle launches.

Medics (Diagnosis, Physician, Surgery). The DCS-4 can carry 200 battlesuited infantry in its bunkrooms, or over 1,000 cybershell troops in cargo. Most of the spacedock is usually given over to UCAVs and drop capsules.

Design: Cylinder hull (1,800 spaces, metal-matrix composite, heavy frame, smart); cDR/cPF 25/2F, 8/1S, 5/1B (diamondoid armor). Hull radiators (55 ksf), radiator wings (100 ksf). Chameleon surface.

USTRANSCOM

The United States Transportation Command, based out of Scott AFB on Earth, is responsible for *all* transportation and logistics for the U.S. military – from contracting mag-lev transport of Army tanks around the United States to moving Navy assets on chartered space transports to Titan and Mars. In an era where national holdings can be on other *planets*, the role of transportation in logistics is absolutely critical.

Currently, most U.S. military transport in space is handled by contracted shipping companies, a fact that has many U.S. policy makers worried, as it places a lot of power in the hands of the independent Farhauler's Guild and the large shipping cartels. The USAF has scoffed at such fears, and points to the successful transportation of Navy assets to Mars as proof it can be done without expanding USTRANSCOM control of their vessels.

Modules: New command bridge; 2 large ladar; 2 large PESA; 2 large radar; 300 HI fusion pulse drive; 1,000 tanks (ultralight, nuclear pellets); 4 10-MJ heavy laser towers [S]; 6 2.5-MJ light laser towers [S]; 10 cabin; 50 bunkroom; heavy storm shelter (2-space: encloses bridge, cPF 1,000); minifac workshop; 2 large entry module; spacedock hangar (120' long, 40' wide, 20' high: 192 spaces); 8 external cradles (125 tons each); 3 surgery; 100 cargo (500 tons).

Statistics: EMass 5,822; CMass 15,230; LMass 21,230. Cost M\$1,766.32. cHP 2,280. Size Modifier [Hull] +6/+10, [Radiators] +10. HT 12. Maintenance Interval: 0.95 hours. RRA 150.

Performance: sAccel: 0.08 G. Burn Endurance: 83.33 hours. Burn Points: 24,000. Delta-V: 73.33 mps. No air speed.

DFS-3 ANGEL SPACE DOMINANCE VEHICLE

The Columbia Aerospace YDFS-3 was the winner of the USAF's Large Deep Space Combatant Program, which was

initiated in response to the discovery of China's *Xingzhai* SDV by U.S. intelligence. The final design is considered typical of most advanced SDVs: a 375'-long, 50'-wide streamlined cylinder bristling with AKV bays and laser towers. The first three production vessels saw combat almost immediately after their construction – notably in the post-war "Snark Hunt" against rogue AKVs. Today, these powerful vessels are the embodiment of American military power, and are often featured in USAF recruitment ads.

The DFS-3 is heavily armed, but vessels on patrol are also expected to gather signals intelligence (SIGINT), and the most distinctive feature of the vessel is the advanced passive

sensor array from Nanodynamics. Mission specialists from the SIA and NTIB are often attached to DFS-3 crews, and travel routes are arranged to fill reconnaissance requirements that cannot be conducted by sensor networks or drones.

There are now 20 DFS-3s in USAF service, with another five under construction. All current vessels are of the Block B design (instituted in 2093) with the exception of four Block C *Archangel* upgrades (see *Deep Beyond*). Current DFS-3s are named after minor angels from the Bible, Koran, and Kabbalah; e.g., the 91st Space Wing's *Dina*, *Gaghiel*, *Qamiel*, *Ramona*, *Tabris*, and *Zafire*.

Typical payload is 1,067 tons, including 4 AKVs in bays, 500 tons of carried craft, and 10 munitions packages. The radiator wings are 187' × 187' when fully extended. The DFS-3 is incapable of powering all of its weapons systems using the drive's MHD system alone. For this reason, a power pack is installed to provide power for two volleys; the vessel is then limited to firing either the lasers or the particle beams in any given turn. The drive produces 199 MW of excess power when the weapons are not being used.

Crew: Commander (Leadership, Shiphandling, Tactics); Pilot (Piloting (Low-Performance Spacecraft)); Navigator (Astrogation, Electronics Operation (Communications), Electronics Operation (Sensors)); 2 Weapons Officers (Gunner (Beams), Gunner (Railgun)); 24 Engineers (Mechanic (Fusion Drive), Mechanic (Robotics), other Mechanic skills as appropriate); 2 Medics (Diagnosis, Physician, Surgery); Mission Specialist (Electronics Operation (Sensors), Intelligence Analysis, SIGINT Collection/Jamming, Traffic Analysis). The DFS-3 has enough room to carry up to 20 infantry and associated equipment.

Design: Streamlined cylinder (1,500 spaces, metal-matrix composite, extra-heavy frame, smart); cDR/cPF 98/10F, 10/1S, 10/1B (nanocomposite armor). Hull radiators (60 ksf), folding radiator wings (70 ksf). Chameleon surface.

Modules: New command bridge; 2 medium ladar; 2 large PESA; large fixed PESA +4 [F]; 2 large radar; 250 HI fusion pulse drive; 920 tanks (ultra-light, nuclear pellets); 8 10-MJ heavy laser towers [S]; 2 10-MJ heavy lasers [B]; 6 2.5-MJ light laser towers [S]; coilgun [F]; 2 350' new particle accelerator [F/F]; 8 cabin; 5 bunkroom; heavy storm shelter (2-space: encloses

bridge, cPF 1,000); minifac workshop; 2 large entry module; spacedock hangar (75' long, 20' wide, 12' high: 36 spaces); 4 vehicle bays (*Predator* AKV: 110 tons, 0.112 ksf; 6 spaces each); 10 power pack; surgery; 10 cargo (50 tons).

Statistics: EMass 7,565; CMass 14,152; LMass 19,672. Cost M\$2,108.96. cHP 3,888. Size Modifier [Hull] +6/+10, [Radiators] +9. HT 12. Maintenance Interval: 0.87 hours. RRA 125.

Performance: sAccel: 0.07 G. Burn Endurance: 92 hours. Burn Points: 23,180. Delta-V: 70.84 mps. No air speed.

Variant: The competing Nanodynamics Space Systems YDFS-2 design was functionally similar to the basic DFS-3. Remove one particle beam and the power packs, and add an additional 4 10-MJ heavy laser towers [S] and 4 2.5-MJ light laser towers [S]. Replace the fusion drive with an HI antimatter pulse drive engine (same drive spaces and tanks). Add an additional 5 cargo and a 0.24-space antimatter bay (24 grams); 4.46 empty spaces remain. EMass 7,410; CMass 14,023; LMass 19,543. Cost M\$2,166.38. sAccel: 0.09 G. Burn Points: 29,810. Delta-V: 91.08 mps.



SEM-23B PEREGRINE REMOTE SURVEY VEHICLE

Vosper-Babbage's *Peregrine* is a purpose-built reconnaissance and survey vehicle, designed to extend the range of a larger vessel's sensor network. It grew out of a failed attempt to develop a long-range AKV, but has since proven its worth in U.S., French, and South African service. Its main limitation is that if the main drive is not active, it has only limited battery endurance. For this reason, the craft does not utilize its radar unless something unusual is detected on the PESA, or it is ordered to start scanning.

The *Peregrine* is a 35'-long, 10'-wide cylinder, and does not carry cargo or mount radiators. Kits allowing installation in launch bays designed for the SIM-7 *Predator* are common.

Crew: Unmanned. Infomorph uses Electronics Operation (Communications), Electronics Operation (Sensors), and Piloting (High-Performance Spacecraft).

Design: Cylinder hull (5.6 spaces, titanium alloy, light frame); cDR/cPF 5/1F, 1/1S, 1/1B (carbon composite armor). Chameleon surface.

Modules: Old unmanned controls; medium fixed PESA [S]; medium fixed radar [F]; 1 compact HI fusion pulse drive; 2.55 tanks (ultralight, nuclear pellets); 1 battery.

Statistics: EMass 44; CMass 59; LMass 74. Cost M\$6.47. cHP 10. Size Modifier +2/+5. HT 12. Maintenance Interval: 7.87 hours. RRA 0.

Performance: sAccel: 0.1 G.
Burn Endurance: 42.5 hours. Burn Points: 15,300. Delta-V: 46.75 mps. No air speed.

AC-425 SEMINOLE MICROGRAVITY ASSAULT VEHICLE

Sometimes referred to as an "assault boat" by Army personnel, the AC-425 is a small spacecraft designed for the rapid insertion of combat personnel onto hostile planetoids or space vessels. Not particularly popular with troops, it has gained a variety of nicknames, ranging from "suicide hot-dog" to "CSP-1: Coffin, Self Propelled." Most of the concern centers on the MAV's inability to hide when moving to its target. Attempts at emissions cloaking have proven ineffective, but rumors persist of SIA and Special Forces variants with advanced drive-masking technology.

The AC-425 was funded by the U.S. Army in 2085 as part of its Force 2100 program, and was heavily influenced by lessons learned during the Hyperion campaign. The Army contracted Vosper-Babbage to produce five vessels for testing between 2087 and 2093. The test design was modified to better accommodate cyber-shells, and limited production began in 2098. The production models are named after famous Native American warriors.

The craft can carry an entire platoon of battlesuited or cybershell personnel in its spacedock, ready for instantaneous deployment. It can also provide limited fire support from its own 2.5-MJ laser, and in an emergency can even be used as an impromptu AKV. It is 35' long and 15' wide, dominated by the spacedock and grappling equipment. Typical payload is 5 tons. Due to its size, the craft is usually carried on external grapples, loading passengers through the spacedock rather than the entry module.

Crew: Unmanned. Infomorph uses Electronics Operation (Communications), Electronics Operation (Sensors), Gunner (Beams), and Piloting (High-Performance Spacecraft).

SHIPBOARD COMBAT

Boarding actions are fairly common. They rarely occur in the middle of a space battle, but military and paramilitary forces often need to board a relatively defenseless merchant vessel to search for contraband, or to seize control of a vessel that has surrendered or been disabled, or to capture a space station.

Most boarding actions involving spacecraft are one-sided affairs, since the boarding party usually has the option of retreating to its mother ship and destroying the target. Of course, the defenders may know this – which may drive them to desperate measures. Boarding with MAVs or other small craft ensures that even if the defender has rigged the vessel to self-destruct, he cannot do much more than destroy the boarding party itself.

Fighting is only likely to occur when boarding a large space station (which the defender knows is too big or too valuable to be destroyed); when the defenders are not fanatical enough to self-destruct, but wish to make the attackers pay a price; or, most commonly, when the defenders panic (for example, after a military boarding party discovers contraband).

A defending force may also hope to exact enough of a price to force the boarders to negotiate . . . or even to capture unwary intruders as hostages. Cybershells and cyberswarms add additional uncertainty: a small transport vessel known to be rated for minimal life support could hold hundreds of combat cybershells or cyberswarms that have no compunction about sacrificing themselves.

Spacecraft are fairly sturdy, but a firefight taking place *inside* a vessel may damage it! One way to determine the effects is to roll damage done for weapons fired inside the craft, subtract the DR of interior partitions, and keep a running total of the results. Every time total damage reaches a multiple of (cHP/10), roll on the *Major Damage Table* (p. TS203).

Example: A hijacker fires a 10mm PDW on board a *Sudbury*. A PDW does 3d damage per shot, averaging 10.5 points of damage. Interior partitions are DR 8 on civilian vessels (p. 20), so the final damage per shot is 2.5 points – or 30 points for a burst of 12 rounds. A *Sudbury* has 1,320 cHP, so 5 bursts (150 damage) cause a major damage result.

Design: Streamlined cylinder (12.6 spaces, nanocomposite, medium frame); cDR/cPF 35/2F, 15/1S, 5/1B (diamondoid armor). Chameleon surface.

Modules: New unmanned controls; small fixed ladar [F]; small PESA; 1 compact kerosene-oxygen rocket; 3 tanks (ultra-light, kerosene-oxygen); 2.5-MJ light laser [F]; 2 small robot arms; small entry module; 0.5 power pack; 0.1 battery; spacedock hangar (25' long, 10' wide, 10' high: 5 spaces); 0.5 cargo (2.5 tons).

Statistics: EMass 126; CMass 152; LMass 173. Cost M\$39.18. cHP 32. Size Modifier +3/+5. HT 12. Maintenance Interval: 6.39 hours. RRA 0.

Performance: sAccel: 3.25 G. Burn Endurance: 0.009 hours (32 seconds). Burn Points: 110. Delta-V: 0.322 mps. No air speed.



TRANSPACIFIC SOCIALIST ALLIANCE (TSA)

The TSA Aerospace Forces suffered a resounding defeat by the Chinese PLAN-SF during the Pacific War. By the end of the war, over 95% of their orbital assets and several of their ground facilities had been destroyed. Their command and control system was in complete chaos – resulting in a loss of control over their extensive network of AKVs and SDPs – and dozens of their highest-ranking officers were killed.

In the wake of the peace agreement, the TSA has slowly rebuilt its fleet, careful to hide its true strength and spread its few assets far apart to avoid any possibility of a quick defeat.

DOCTRINE

The TSA's various nations operate a space force that is only a shadow of its former self. Its few surviving warships are archaic, and production of new craft is limited by the lack of TSA-owned orbital construction facilities and trade restrictions. To circumvent this, Indonesia hopes to expand its trade with the Duncanites, exchanging technical information and hard currency for use of Duncanite space facilities and construction expertise. Partly as a result of this, the TSA has moved some of its vessels into the Deep Beyond – ostensibly as part of an effort to disable rogue AKVs, but in reality to ensure that they are not static targets for any future Chinese strikes. This move has alarmed some Duncanite communities, who fear it may escalate ongoing Chinese harassment into a full-scale war, but those who choose to deal with the TSA see the benefits as justifying the risk.

DEPLOYMENT

The TSA does not possess a unified aerospace force; each country has a completely independent military that cooperates on matters of mutual defense and equipment contracting. Peru and Indonesia maintain the TSA's strongest space forces, with the remaining members providing funds and bases of operation.

The TSA's current deep space fleet consists of five LSDVs and a dozen smaller craft (mostly converted commercial vessels). Most combatants are refurbished survivors of the Pacific War and inferior to any modern design – at least officially. The agreement with the Duncanites has created much uncertainty about their current strength and capabilities.

The TSA no longer has a large force in orbit – at least, not publicly. Its members do have a few hundred communication and surveillance satellites, but most space defenses are ground-based lasers, backed up by a few dozen TAVs and TACVs which are mostly used to service satellites and provide strategic airlift. However, there are suspicions that the TSA has some commercial satellites that are actually disguised SDPs or AKV bases.

**The
TSA
does
not
possess
a unified
aero-
space
force.**

SALAHUDIN SAMBOJA-CLASS UNMANNED SPACE DOMINANCE VESSEL

Designed in 2009, the *Salahudin Samboja* class of vessels reflects a dramatically different design paradigm from the other space powers. While other military space vessels use extensive automation to reduce crew sizes, all but the smallest

craft are still expected to have a living being responsible for their operation. The TSA military saw the opportunity to save money and mass by removing living beings entirely – everything a human or bioroid crew can do is easily accomplished with AIs, ghosts, and cybershells. This reflected the TSA's view of its warcraft: they were intended solely for offensive space-superiority or raiding operations against enemy commerce and bases. With few extraterrestrial holdings to support, the TSA saw little need to design the vessels for peacekeeping, gunboat diplomacy, or other tasks that required a trusted human being on the bridge.

The *Salahudin Samboja*-class is purely a warship, designed with the maximum feasible amount of armor and firepower in a vessel of its size. It does not carry troops or cargo and has no accommodations for crew of any kind (in fact, most components are designed with minimal access space, relying on cyberswarms and small cybershells for maintenance). Externally the ship does not appear wildly different from other SDV designs. The hull is a flattened streamlined cylinder 220' long and 60' wide, bristling with laser arrays and sensor panels. The retractable radiator arrays are extremely large for the vessel's size, however, extending to an impressive 212' × 212'. Typical payload is 1,420 tons, including 10 munitions packs and 12 *Amazon* AKVs (p. TS192).

The first vessel of the class is not being produced in a TSA facility. Instead, the majority of the work is being done by the Red Duncanites at Liang Mountain. The TSA is providing the weapon systems, sensors and technical personnel, shipped in through intermediaries. The first vessel, named for a famous Indonesian naval commander during the Pacific War, will be completed by July of 2100. The Chinese have become aware of the project, and the PLAN-SF may stage a second attack at Liang Mountain to destroy the *Salahudin Samboja* before it is fully operational.

Crew: Unmanned. The vessel usually maintains two or three infomorphs: a ghost or SAI in the new

BASES

The TSA no longer has any large deep-space facilities in Earth-Lunar space, although there are rumors of pre-War automated facilities in the Junk Jungle and the Belt. Several AKV launch facilities remain unaccounted for, as their command and control facilities were destroyed in the early days of the conflict. Most surviving bases are small and either mobile or *extremely* well hidden, and may include small observation and depot facilities on Venus and in the Deep Beyond.

unmanned controls and one or two NAIs responsible for controlling the various cybershell and cyberswarm maintenance units.

Design: Streamlined cylinder (1,267.2 spaces, metal matrix composite, heavy frame); cDR/cPF 112/50F, 15/2S, 15/2B (metal matrix composite armor). Hull radiators (35 ksf), folding radiator wings (90 ksf). Chameleon surface.

Modules: New unmanned controls; old unmanned controls; 2 large radar; 2 large PESA; large fixed ladar [F]; 160 compact HI fusion pulse drive; 850 tanks (ultralight, nuclear pellets); 10 10-MJ heavy laser towers [S]; 4 10-MJ heavy lasers [F]; 3 2.5-MJ light lasers [B]; 200' new particle beam [F]; 2 coil-guns [F/F]; 1 heavy storm shelter (0.1 space; encloses both unmanned controls, cPF 1,000); 2 minifac workshop; 12 vehicle bays (*Amazon* AKV: 110 tons, 0.08 ksf; 6 spaces each); 7.5 new fusion reactor (40 MW); 5 cargo (25 tons).

Statistics: EMass 8,221; CMass 14,741; LMass 19,841. Cost M\$1,271.86. cHP 1,475. Size Modifier [Hull] +6/+10, [Radiators] +10. HT 12. Maintenance Interval: 1.12 hours. RRA 122.

Performance: sAccel: 0.07 G. Burn Endurance: 88.54 hours. Burn Points: 2,231. Delta-V: 68.17 mps. No air speed.

ROGUE AKVs

Years after the end of the Pacific War, relics of the conflict continue to pose a danger to space navigation. Most infamous are the various AKVs deployed by the TSA before the war. During the conflict, many of these deadly machines lost contact with their control sites. They continue to operate as if the war continues. All were built to ignore civilian vessels, but since IFF standards have changed and many designs have entered service over the years, the AIs on rogue AKVs – lacking updates – often come to the conclusion that civilian vessels are unidentified combat craft. The jumbled commands issued during the Pacific War and the loss of the command codes are sources of distress even with the TSA, who are no more safe from rogue AKVs than anyone else. Despite several campaigns to

locate and destroy them, dozens are suspected to be hiding in the L5 Junk Jungle or the Deep Beyond in 2100.

Another problem is that the adaptive learning algorithms of the LAI software used on the early AKVs were not particularly stable: the LAIs tended to learn many unanticipated and undesired thinking patterns. As the TSA never expected the AKVs to be deployed for this long, this was deemed to be a minor problem that could be corrected with periodic updates. For this reason, many rogue AKV infomorphs have the following digital entity lens:

Rogue AKV: An AKV AI that has become dangerously unstable. Delete Honesty, Reprogrammable Duty, and all Taboo Traits. Increase cost by 35 points. Some are simply cunning; others display disadvantages such as Bloodlust, Delusions (“Everyone is my enemy!”), and Extreme Fanaticism.



The final complication is that these AKVs are well hidden. Most were placed before there was any coordinated system of monitoring interplanetary flights. The PLAN-SF monitored TSA space activity before the war, but lost a significant amount of that information due to infowar and covert operations. The AKVs were typically placed at strategic locations (as they lacked delta-v) by other vessels, but maintained a very low power profile. Sometimes they used heat sinks bored into small asteroids to mask their infrared signature. Those located in the L5 Junk Jungle were disguised as garbage, relying on passive or dispersed sensors to detect potential targets. Many of these sensors have been destroyed or deactivated, which makes the rogue AKVs located there little more than dangerous booby traps. Luckily, none of the Pacific War AKVs were equipped with nuclear weapons or XLMPs.

There is no official reward offered for locating or destroying a rogue AKV, but doing so will count toward gaining a positive Reputation with almost everyone living in space. Spacers have a fear of rogue AKVs that far outstrips the AKVs' actual capabilities. The loss of the *Charlevoix* in June of 2099 has only ratcheted paranoia to new heights. Many private groups have offered bounties on confirmed rogue AKV kills, up to several million dollars each.

KUPU-KUPU-CLASS AUTONOMOUS KILL VEHICLE

The *Kupu-Kupu* ("Butterfly") was the most common AKV used by the TSA, deployed in great numbers during the Pacific War. Some were stationed on TSA bases or spacecraft (and often destroyed before they could be launched), while others were secretly pre-positioned in hidden locations – mostly in Earth orbit, L4, L5, and Lunar orbit, and aboard merchant vessels – that allowed them to survive China's first strike . . . and in some cases, to continue fighting even after the TSA made peace.

The *Kupu-Kupu* is representative of the cheap "captor mine" AKVs that were common before the war, and is based on the earlier Russian *Istrebitel Sputnikov-G* killer satellites. It has a sphere hull 20' in diameter. Its only weapons are a 2.5-MJ light laser, a coilgun . . . and itself. The AKV will activate as close as possible to its target and immediately move both to ram and strike with a KKMP. The laser is used to attack targets of opportunity, or to further damage its target. If other rogues are in the area, they may cooperate. Typical payload is 9.5 tons, consisting of a single KKMP munitions pack.

Crew: Unmanned. Infomorph uses Electronics Operation (Communications), Electronics Operation (Sensors), Gunner (Beams), Gunner (Railgun), and Piloting (High-Performance Spacecraft)). These AKVs have much higher than average Piloting skills, with a skill level of 20.

Design: Sphere hull (8 spaces, foamed alloy, medium frame, smart); cDR/cPF 20/5 (carbon composite armor). Chameleon surface.

Modules: Old unmanned controls; medium fixed PESA [F]; medium fixed radar [F]; 0.5 compact kerosene-oxygen rocket; 3 tanks (ultralight, kerosene-oxygen); 2.5-MJ light laser [S]; coilgun [F]; 0.2 battery; 1 power pack; 1 new fission reactor (2 MW).

Statistics: EMass 227; CMass 257; LMass 278. Cost M\$12.26. cHP 19. Size Modifier +3. HT 12. Maintenance Interval: 11.42 hours. RRA 0.

Performance: sAccel: 0.96 G. Burn Endurance: 0.019 hours (1.14 minutes). Burn Points: 70. Delta-V: 0.200 mps. No air speed.

Notes: Many AKVs have far lower HT than normal as the result of wear and tear. In addition, many have long since run out of fuel for their fission reactor, and idle with only the PESA active. If such an AKV detects a target, it will immediately attack and attempt to do as much damage as possible before its battery and power pack are depleted.

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