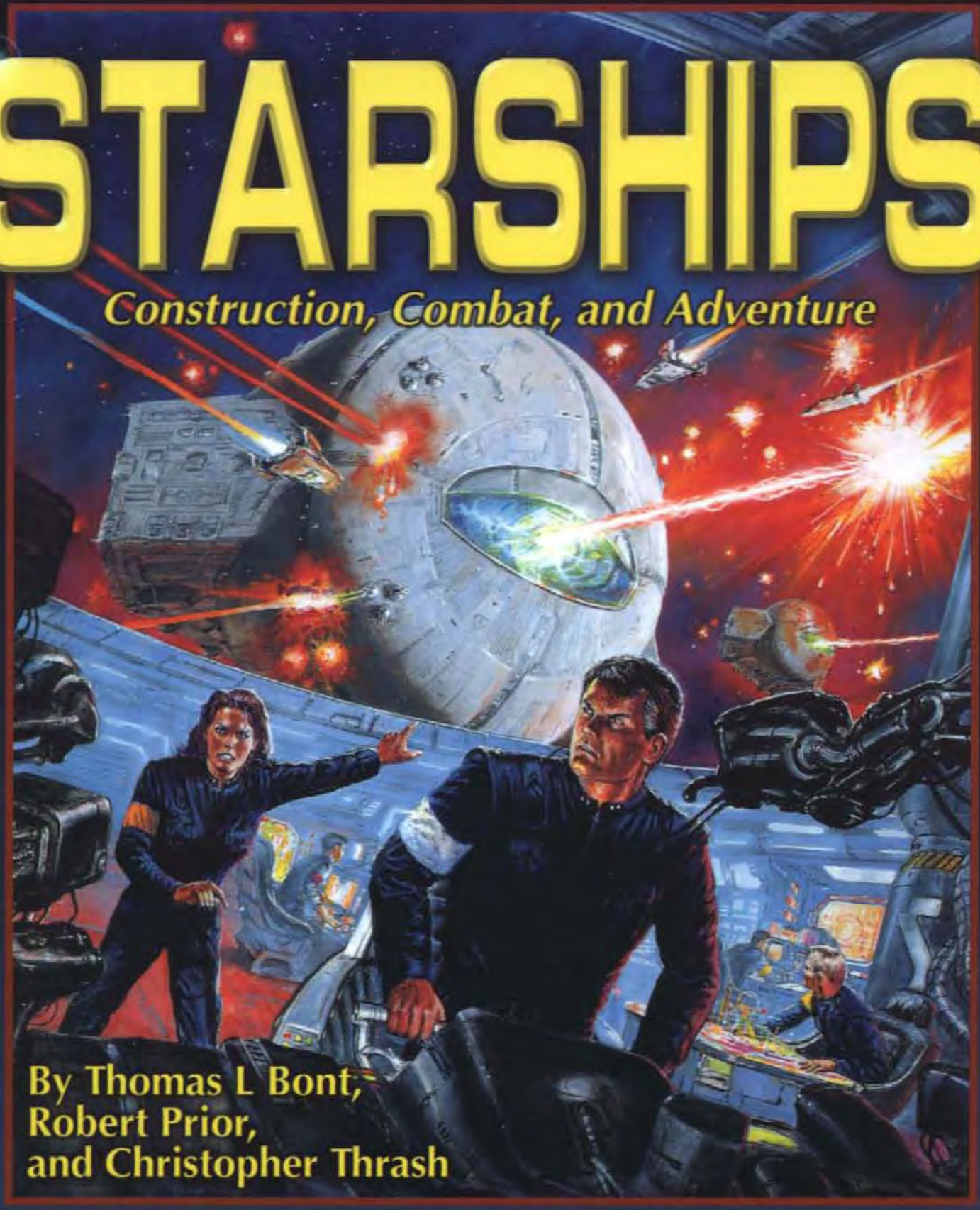
GURPS® Traveller

STARSHIPS™

Construction, Combat, and Adventure



By Thomas L Bont,
Robert Prior,
and Christopher Thrash

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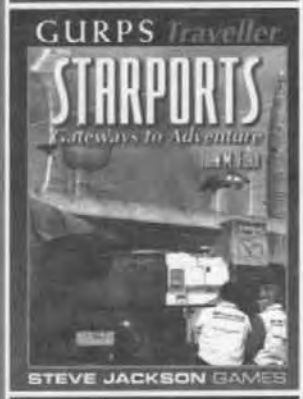

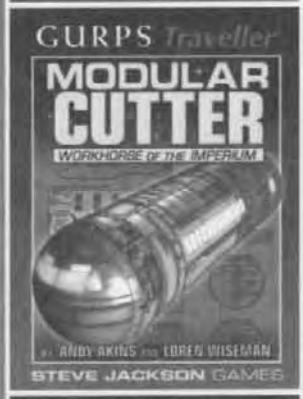

GURPS Traveller

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GURPS® Traveller®

STARSHIPS™

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ISBN 1-55634-475-9

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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!

New supplements and adventures. ***GURPS*** continues to grow, and we'll be happy to let you know what's new. For a current catalog, send us a legal-sized or 9"×12" SASE – please use two stamps! – or just visit **www.warehouse23.com**.

Errata. Everyone makes mistakes, including us – but we do our best to fix our errors. Up-to-date errata sheets for all ***GURPS*** releases, including this book, are available on our website – see below.

Gamer input. We value your comments, for new products as well as updated printings of existing titles!

Internet. Visit us on the World Wide Web at **www.sjgames.com** for 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, point your web browser to **www.sjgames.com/mailman/listinfo/gurpsnet-l/**.

The ***GURPS Traveller: Starships*** web page is at **www.sjgames.com/gurps/books/traveller/starships/**.

Page References

Rules and statistics in this book are specifically for the ***GURPS Basic Set,*** *Third Edition.* Any page reference that begins with a B refers to the ***Basic Set*** – e.g., p. B102 means p. 102 of the ***Basic Set,*** *Third Edition.* Page references that begin with CI indicate ***Compendium I.*** Other references are BIO to ***Bio-Tech***, CII to ***Compendium II***, RO to ***Robots***, S to ***Space***, *Third Edition*, UT to ***Ultra-Tech***, VE to ***Vehicles***, *Second Edition*, GT to ***Traveller***, *Second Edition*, T:AIII to ***Traveller Alien Races 3***, T:FT to ***Traveller Far Trader***, T:FI to ***Traveller First In***, T:GF to ***Traveller Ground Forces***, T:SM to ***Traveller Star Mercs***, and T:ST to ***Traveller Starports***. The abbreviation for *this* book is T:S. For a full list of title abbreviations, see p. CI181 or visit the updated web list at **www.sjgames.com/gurps/abbrevs.html**.

Introduction

As the name implies, ***Traveller*** is about *traveling* – heading toward new adventures, shaking pursuit from old adventures, and reveling in the freedom to explore the galaxy. Travelers who possess a starship have more control over their destinies, because it gives them more independence and freedom of movement than a group without a ship. An adventuring group that lacks its own starship will find buying, building, finding, or stealing one to be an important goal.

GURPS Traveller: Starships is intended as the ultimate guide to starships in its universe. This book contains extensions to the starship-design rules found in ***GURPS Traveller***, fully compatible with those rules and with ***GURPS Vehicles***. It also provides rules for starship operations, and details of what life aboard a starship is *really* like.

So sign on the roster, grab your duffel, and get ready to lift ship!

About the Authors

Thomas L Bont has been a gamer for over 20 years. This is his first foray into printed media, aside from a few collaborations from a gearhead perspective. He is the lead programmer for ***GURPS Vehicle Builder*** and has over a dozen articles to his credit in the ***Journal of the Travellers' Aid Society***. Currently, he is the president of Bont Software & Control Systems Inc., based out of Hickory Creek, TX.

Robert Prior has played ***Traveller*** since it was first published. He has written for Digest Group Publications, Heliograph, the Canadian Space Agency, and Steve Jackson Games, including more ***Journal of the Travellers' Aid Society*** articles than any other mortal. When not dreaming about the future, he nurtures it, one mind at a time.

Christopher Thrash is a serving military officer and a qualified helicopter pilot. He has spent far too much time away from his family, and has learned a fair amount about ships and shipping in the process. He has been playing roleplaying games since March 1976, ***Traveller*** since December 1977, and ***GURPS*** since 1991.

About the Line Editors

Loren Wiseman was one of the founding partners of GDW Inc., original publishers of ***Traveller***, and spent more than 20 years there as a game designer, developer, typesetter, and editor. After GDW closed, Loren freelanced for a time, then came to SJ Games, where he is the ***GURPS Traveller*** senior line editor and ***Traveller*** expert in residence.

Jon F. Zeigler has been a science-fiction fan since the cradle (literally). He and his wife and two children live in Maryland, where he works as a computer-security consultant. He has written several past books for ***GURPS*** and ***GURPS Traveller***, and currently serves as the ***GURPS Traveller*** line editor for Steve Jackson Games.

Journal of the Travellers' Aid Society

The long-running ***Traveller*** magazine is now online at **jtas.sjgames.com**. It supports all versions of ***Traveller*** with news, articles, discussion areas, and reviews. Subscriptions are $20 per two years, for 52 biweekly updates and full access to archives.

The *Traveller News Service* is updated weekly, chronicling the life and times of the Imperium, and is viewable *free* at **www.sjgames.com/gurps/traveller/news.html**. The SJ Games ***Traveller*** links page (**www.sjgames.com/gurps/traveller/links.html**) links to the ***Traveller*** Web Ring, which includes most of the major ***Traveller***-oriented websites. For information on subscribing to the ***Traveller*** mailing list, go to **tml.travellercentral.com**.

Chapter One

Starships

Consider how often we take the parameters of interstellar technology for granted. It's true that the workings of the jump drive are so perplexing that very few civilizations have ever developed it independently. Aside from that obstacle, however, almost everything about interstellar travel is easy. Once the jump drive is known, it can be built by relatively primitive cultures. It requires no extraordinary skill to maintain or use. It can be installed in ships small and simple enough to be operated by a single crewman. Its operating costs are well within the reach even of individual entrepreneurs.

As a result, interstellar travel is within the reach of common individuals everywhere in Charted Space. We can afford to use it for the most prosaic purposes: warfare, trade in basic commodities, migration, even idle tourism.

There's no obvious reason why this had to be the case. Suppose interstellar travel cost the equivalent of billions of credits per ton-parsec, could not be accomplished by ships smaller than flying mountains, and required skills only a tiny fraction of Humans could master. History would have been utterly different – assuming that an interstellar civilization could be built at all, under such circumstances.

– Sir Shamash Thomas,
An Overview of Imperial History

Starships bind the Imperium together. Millions of starships are registered within Imperial space, carrying cargo and passengers, protecting the trade lanes, helping Imperial citizens go about their business. Most citizens will never travel from one world to another – but starship stories fill the Imperial news and entertainment channels, giving every citizen a picture of what life aboard is like. Every citizen knows *something* about the ships that carry goods and passengers, protect the trade routes, or explore new worlds. Starships are romantic, promising the freedom to travel widely, visit exotic places, take part in a millennia-old tradition, and make one's personal fortune.

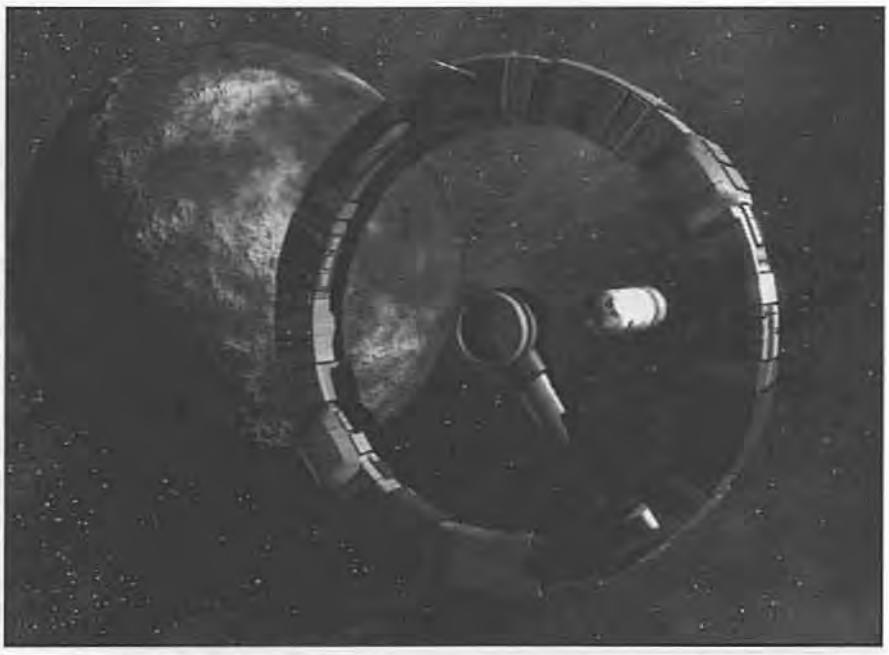
Traveller revolves around starships. Almost every adventuring party will spend much of its time making its way from one world to the next via starship. Perhaps only one member of the group will own a ship (or at least *control* it, in the case of a detached Scout). Or the adventurers may be part owners in a merchant starship. Or the GM may turn the acquisition of a ship into an adventure, making would-be starfarers earn their wings.

Adventuring without a ship is possible, but the campaign takes on a radically different nature (which some players may prefer). The focus changes from interstellar to interplanetary (or single-planet) situations, and the group tends to linger in one system or on one world. The group can take passage on NPC-operated starships, stow away, or otherwise arrange to travel from world to world – but this cannot always be done freely, at the will of the adventurers.

The Starship Environment

In ***Traveller***, a starship is defined as a spacecraft capable of faster-than-light travel. Because there is only one means of FTL travel in ***Traveller***, this specifically means any spacegoing vessel that has a jump drive. Slower-than-light generation ships can engage in interstellar travel, but are not called starships because they do not use jump drives. Such vessels are obsolete. Battle riders are large, extremely powerful ships of the line, but they have no jump drive, and thus are not starships.

A starship presents an artificial environment which spends much of its time utterly isolated from the wider universe. Crewmen and passengers coming aboard for the first time will find much of it unfamiliar, despite efforts to make it safe and comfortable.



Size Range

A starship must displace at least 100 dtons (see p. 12) in order to use a jump drive. The most common starship of this size is the *Suleiman*-class scout/courier, used by the IISS and by detached scouts throughout the Imperium and beyond. Coming in a close second is the 100-dton express boat (Xboat).

The upper limits of starship size have yet to be reached, but current theory places the maximum size of a starship between 1.5 million and 2.5 million dtons – although some engineers claim that there is no real upper limit.

Starship Structure

Every starship has a *hull*, a main body or shell which acts to contain the ship's components and payload. The hull always carries some armor to protect against meteor impact and other natural hazards. It may or may not carry extra armor to protect against combat damage.

The hull is internally divided into *compartments*, each of which contains some of the ship's components or provides space for payload. Compartments are separated by *bulkheads*, *decks*, and *partitions*. Decks are usually perpendicular to the onboard artificial gravity's "down" axis, while bulkheads and partitions are parallel to it. More intuitively, one walks on the decks and opens doors set into the bulkheads and partitions.

Bulkheads are structural elements of the ship and can withstand differences in air pressure on either side. A compartment which is sealed by bulkheads will maintain its internal environment even if there is a hull breach in an adjacent area. Bulkheads are used to surround very important or dangerous areas of the ship, such as the bridge, the engineering compartment, or the block of crew quarters. Bulkheads cannot be moved around the ship without a significant amount of work at a shipyard.

Partitions are simple walls, serving to divide compartments without being airtight. They can easily be moved from place to place by a mechanic-and-electrician team. As a result, different ships (even of the same class) can have different internal arrangements.

Common Ship's Systems

A variety of equipment and systems will be found inside the hull of any starship, all designed to provide basic support to the vessel and help fulfill its intended function. Each ship's internal design is different, but certain systems are common to almost all starships.

Almost all starships will have one or more *power plants*. In the present-day Third Imperium, these are usually reliable, long-lasting fusion installations. There may be backup power plants or energy banks using other technologies. The power plant is the basic energy source for all other ship's systems.

Most starships will have a *maneuver drive*. This system permits the vessel to travel under power through normal space. Maneuver drives can make use of a variety of technologies (see Chapter 4), but most Imperial starships use reactionless thrusters. Thrusters require no fuel, instead converting energy from the ship's power plant directly into motive thrust.

By definition, all ***Traveller*** starships will have a *jump drive*. The jump drive is the key to interstellar travel. It permits starships to traverse interstellar distances in reasonable time, by taking "short cuts" through an alternate dimension called *jumpspace*. Jump drives use power-plant energy, but they also use hydrogen fuel which is expended in the course of the jump. Jump drives are rated according to their operating range; a jump-1 drive can move its starship one parsec at a time, while a jump-6 drive can make six-parsec jumps. A controlled jump of more than six parsecs is theoretically impossible, although starships occasionally jump further as a result of "misjump" accidents. High-rated jump drives are very expensive and use vast quantities of fuel, so only courier and military vessels routinely use higher than jump-3.

Starships usually mount *communications* and *sensor* equipment. Most of this equipment uses very old technology for manipulating the electromagnetic spectrum: radios, communication lasers, telescopes, radar, and so on. More exotic electronics, such as meson communicators and gravitic sensors, are available on high-technology worlds. In ***Traveller***, all sensors and communications in normal space are restricted to lightspeed; as a result, interstellar communication is usually handled by courier starship.

Many starships are armed. Starships can use a variety of beam weapons such as laser cannon, particle accelerators, meson guns, plasma guns, or fusion guns. Many starships also use missiles. Small weapon systems can be mounted in *turrets* on a starship's hull. Large warships are often designed around *spinal mounts*, gigantic beam weapons that are aimed by turning the entire ship.

To defend against attack, starships use a variety of techniques. *Sandcasters* can be used to fill nearby space with prismatic particles, providing some protection against laser weapons. At high levels of technology, a ship can use force screens such as *meson screens* or *black globes* to protect against beam weapons. Ships' beams weapons also can be used in a defensive role, to shoot down any incoming missiles. Very advanced ships can use *repulsors* to deflect missiles or *nuclear dampers* to prevent nuclear explosives from working.

Many starships carry smaller craft on board as auxiliary vehicles. Auxiliaries give a starship greater flexibility, permitting cargo, fuel, or passengers to be carried where the starship itself can't go. Some starships (such as fighter-wing carriers) are designed entirely around their carried craft.

Internal Appearance

In Imperial starships, most spaces have carpeting on the floor; some have carpet on the walls as well (for greater comfort, and for safety in case of violent maneuvers). This carpet is usually in a neutral color, and is always designed to be easy to clean. The carpeting in crew or passenger living areas will usually be softer and more plush. Compartments which normally contain heavy machinery or cargo (especially the engineering compartment) will have gratings or bare deck plating, instead.

Living quarters will usually have "programmable walls," large vision screens that can display any pattern or image desired. The default setting for such walls may be "bare deck plating," but they can also simulate wood paneling or other attractive surfaces if desired. Programmable walls are tied into the Ship's Information System (p. 8) and can serve as elaborate display systems for games or passive entertainment. They also serve an important function during ship emergencies, displaying critical information or evacuation directions.

Most spaces have light panels recessed into the ceiling, providing soft indirect light. Emergency lights are also set into the ceiling, ready to activate using internal battery power should the ship's power grid shut down. A few compartments are normally set to "low lights," in order to make holographic imagery stand out more clearly.

Most compartments on any starship are kept bare and uncluttered – a messy area is inefficient, and can become a safety hazard in an emergency. Living areas will usually have a few pieces of furniture, often permanently fixed to the walls or floor. Some starships provide small hanging baskets, potted plants, aquaria, or other items to give a sense of nature amid the blatantly artificial environment. These are often affixed to stable surfaces using adhesive patches which have the strength of welds until released with a specific tool.

Noise

Starships are inherently noisy places, especially when certain areas are busy (such as cargo bays, flight decks, or weapons compartments). A ship's drives are particularly loud. In the drive compartments, engineers and mechanics normally wear soundproof ear protection with active noise suppression and built-in communications gear. Elsewhere in the ship, baffling and soundproofing tend to deaden the noise of the drives; experienced crew and passengers can still tell something of how the ship is maneuvering if they listen carefully.

Smells

Although life-support systems at TL10 and up are quite good, the problem of providing clean air is never-ending. Providing the proper gas mix is relatively easy, and the gas mix can even be varied from one airtight compartment to the next, if necessary. Making sure the ship *smells* pleasant can be much harder. No matter how much the air is filtered, no matter how well crew and passengers observe cleanliness rules, stale and unpleasant smells tend to build up throughout a voyage. Some ship classes (notably the *Suleiman*-class scout ship) are notorious for this, while others (especially passenger liners) are designed to minimize the problem.

A few ships use special measures to keep the air pleasant. Plant hangings and hydroponics equipment can provide some "natural" recycling. Some ships (notably those with K'kree crews) use artificial scents. Others use ionizers to push negative ions into the circulating air; most oxygen-breathing sophonts, especially Humans, find that this makes the air more bracing and agreeable to breathe.

Viewports

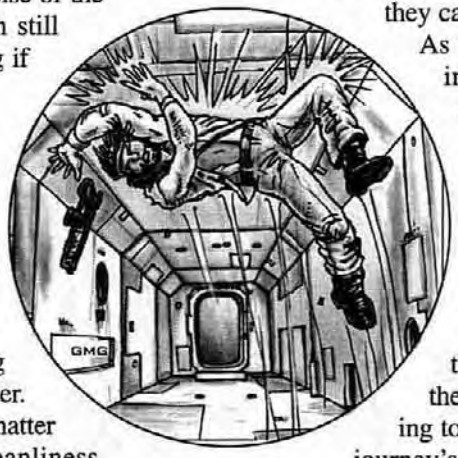
Many civilian ships include viewports, constructed of a high-strength polymer designed to be almost as resistant to damage as the hull (DR 80). This material is not strong enough to equal the protective armor used by military starships. All viewports are installed with opaque shutters, so that they can be closed while the starship is in jump space. Exterior displays in passenger compartments are usually electronic (and on some vessels are prerecorded in case weather conditions do not allow a perfect view of the takeoff).

On military vessels, viewports are unnecessary and dangerous weak spots in the vessel's hull. Views of the outside are provided by electronic displays, instead.

Gravity

All modern starships use artificial gravity plates in the decking. These systems can be very finely controlled, to the point of permitting every compartment to set the strength of its own gravity field. Most ships rarely make much use of this feature; indeed, crew and passengers are discouraged from changing gravity settings frivolously.

Sudden changes in gravity can be extremely dangerous. In fact, they can be used as a weapon in shipboard combat. Boarders or hijackers can be injured or effectively immobilized by being intermittently pulled to the floor, ceiling, and walls (this is sometimes called "grav pong" by Marines). Of course, if boarders gain control over ship's gravity, they can use the same tactic against the crew. As a result, the artificial gravity controls in each compartment usually include safety interlocks to prevent rapid changes in setting. These can be overridden from the bridge or other crew strongpoints, but the overrides themselves are carefully protected by access codes.



Merchant ships will often slowly adjust the internal gravity during the week of a voyage, matching that of the world of departure at first, then moving to match that of the destination world at journey's end. Imperial military ships usually maintain a consistent 1 G field at all times.

Shipboard Information Service

Every starship is run by computer, from the powerful mainframes that act as the ship's "main computer," to the swarm of small dedicated processors that are built into every workstation and stateroom. All of these computers are networked, and the entire network supports a software structure called the "Shipboard Information Service."

The SIS is a set of protocols and software applications that permit flexible information interchange among computers, crew, and passengers. Using it, those on board can call up a tremendous variety of information: systems readouts "echoed" from the bridge or engineering compartment; text or voice messages from other crewmen or passengers; information about scheduled events, entertainment programs, library data, or correspondence courses; and so on.

Whether the starship is a vast Imperial dreadnought or a small tramp trader, the SIS is a vital part of ship operations. It acts as a primary interface for ship's controls – but more importantly, it has a significant effect on crew and passenger morale. It can help a ship's inhabitants form a viable community. It can also *keep them occupied*, a critical factor when a dozen (or a thousand) sophonts are forced to live with one another in a tiny container for a week in jump space.

Compartments

A new crewman aboard any starship will soon learn how to find his way around. Within the Imperium, even the smallest starships use an alphanumeric system to "name" individual compartments, corridors, and other spaces. This system originates in the Imperial Navy, but is also maintained by the Imperial Ministry of Commerce as a standard for privately owned starships. As a result, even a new spacehand will soon find himself able to glance at a wall or door plate, determine where he is, and guess how to get to where he needs to be.

On any starship, many of the compartments are "generic" in nature, corridors or spaces that serve only as storage or as a means of moving around inside the hull. Other compartments serve special purposes of their own.

Bridge

The *bridge* is the primary control center of the starship, the place where all orders regarding the ship's movements and routine originate. It contains workstations for the pilot, astrogator, sensor officer, communications officer, and possibly a variety of other officers depending on the ship's size and function. (For instance, military starships often will have at least one weapons officer on the bridge.) The ship's computer and almost all of its important instruments will all have controls on the bridge.

When a starship is underway, the captain will spend most of his time on the bridge. When he can't be there, he will usually designate a watch officer (or "officer of the deck") to keep an eye on the controls and readouts. Other officers may be present, depending on the ship's current situation and how many workstations must be manned full-time (see *Watchbills*, p. 113).

Access to the bridge is often restricted. On large or military ships, non-watch crewmen must usually request permission to enter the bridge. Small private vessels are sometimes less formal, but even they usually avoid having too many unnecessary people on the bridge at any one time.

The captain usually maintains an office somewhere on the starship, either adjacent to the bridge or near (or in) his own quarters. On large ships, other senior staff will also have their own offices. Ordinary crewmen who don't have business on the bridge are more likely to seek out the senior officers in their offices.

While in theory the bridge functions could be decentralized, fast personal communication in emergencies outweighs any advantage of a decentralized nervous system. Large starships may decentralize somewhat by installing *auxiliary bridges*, either as a backup to the main bridge or to serve similar command-and-control functions. Large warships designed as command vessels may have a *flag bridge,* from which the admiral in command of a whole formation can work. Some ships also have a *combat information center* where large amounts of tactical information can be gathered, processed, and handed on to the captain or admiral in command.

At any time when a starship is manned but not under way, the bridge may be left empty while control shifts to another part of the ship. In such cases, a *quarterdeck* is defined – a marked-off area which is manned by the current watch officer and his staff.

Workstations

Every starship has one or more *workstations* on board. Critical ship's systems are controlled from workstations on the bridge and in the engineering spaces. Large starships may have workstations in many different compartments.

A workstation consists of a single acceleration couch and a set of displays and control panels, permitting a crewman to operate one or more ship's systems. Most workstations will be found in control areas like the bridge, auxiliary bridges, weapons stations, and the drive compartment. Large ships may have workstations dedicated to minor functions that are not treated independently on smaller ships.

Dynamic Configuration

Most starship workstations in the Imperium (at TL9 and up) use *dynamic configuration*. Such workstations do not have actual buttons or switches; instead, the entire control panel is a touch-sensitive pad, layered over a back-lighted display on which individual controls are marked. Some control areas or displays can also be projected holographically above the control panel. The placement of controls is managed by the workstation's local dedicated computer, and can be changed at will.

Under this system, each workstation panel has a default configuration, but each crewman can rearrange the controls and telltales to suit his own preferred work style. The goal is to make the controls as intuitive as possible for the crewman involved, minimizing mistakes and permitting him to watch the displays instead of his hands. Personal (or racial) preferences can easily be accommodated. Each configuration can be stored and called up at a moment's notice.

For example, the communications board may normally have radio tuning controls on the left, transmission controls in the center, and aiming controls for a laser communicator on the right. Regardless, the communications officer can rearrange things to suit his preferences. He could push the laser controls down to a lower "layer" of the display, making them invisible except when he actually needs them. Meanwhile, the radio-tuning and -transmission controls could be expanded to cover the entire panel, and rearranged to place the most-used controls under the officer's hands.

Dynamic configurations even allow workstation functions to be "shared," so that ship's systems can be controlled from different workstations as needed. In theory, the pilot could work from any workstation on the ship. Two or three major functions could be pushed onto a single workstation and handled by a single officer. In practice, such rearrangements are rarely used except in emergencies (such as when a ship is badly undermanned).

Engineering

Every starship's engineering department is responsible for maintenance and repair of systems all over the ship (and even outside the hull). As a result, many of a ship's compartments may be designated as "engineering spaces." The working heart of any starship, however, is the compartments containing maneuver-drive, jump-drive, and power-plant components. There can be several of these compartments, especially on large starships which may have multiple maneuver drives or power plants. All of them are under the control of the engineering department, and share similar features.

Drive and power-plant compartments are quite austere. Instead of carpeting, there will be bare deck plating or grillwork, with plenty of panels providing access to machinery in the decks themselves. There will be ladders and catwalks, giving access to hard-to-reach parts of the drive or power plant. The lighting will be bright and harsh, in comparison to the soft, indirect lighting found elsewhere on board. Aside from any workstations which are present, there will be no place to sit or lie down, and no extraneous furniture. The walls will be thick bulkheads, with soundproofing to help reduce noise; they will be broken up by tool bays, storage for spare parts, fire extinguishers, vacc suit lockers, and other utilitarian items.

Like the bridge, the drive compartments are usually off-limits to personnel who have no legitimate business there. The chief engineer (and his senior mates, on ships with large engineering crews) will maintain offices somewhere on the ship for routine business. On large starships, the engineering department will have whole compartments devoted to electrical shops, machine shops, and so on. These compartments will normally be more accessible to casual visitors.

Cargo Hold

Cargo holds are also very spartan places. The decks are bare plating, marked with guide lines for the placement of cargo containers. Ceilings are usually lattice-work, with lighting panels well inset so that mishandled cargo will not crush them. There will be plenty of mechanical fixture points, permitting cargo containers to be firmly locked to the deck or walls. An empty hold is a large space, full of echoes as sounds reverberate from the bare surfaces. A full hold is occupied by rows (or even stacks, on large freighters) of standardized cargo containers, each bearing its own corporate logo, handling markings, and manifest pad.

Each cargo ship usually has at least one "cargo office," placed close to the most likely entry point for cargo containers. This small office will contain a workstation, permitting the cargomaster to register cargo and plan how to place it in the hold. The cargo office is often designated as the quarterdeck (p. 8) when a ship is in port and the bridge has been left unmanned. In this case, the most critical readouts from the bridge are "echoed" to the cargo-office workstation, so that the captain or watch officer can deal with situations as they arise.

Cargo holds are rarely placed off-limits to any crew. Indeed, new apprentices on a merchant ship are likely to spend more time there than they would like!

Freshers

On most Human-designed starships, a "fresher" will be present in each stateroom, off each crew or passenger lounge, and in some other compartments, as well. A standard starship fresher is remarkably compact. Although it provides all the necessary equipment for a full-body shower or the relief of biological needs, it is rarely bigger than a coat closet. One person in a fresher will feel cramped. Two will feel crushed.

Although most Imperial starships have superb water-recycling systems, their water-*storage* capacity is limited. Freshers are usually engineered to use as little water as possible. Long, hot showers are usually possible, but actual bathing is out of the question except on the most luxurious (and expensive) passenger liners.

Crew Quarters

Crew members will spend almost all their off-duty time in crew quarters. In the Third Imperium, only the most cramped military starships will require crew to use bunkrooms. Most enlisted or apprenticed crewmen will live two to the stateroom, while senior officers will have their own staterooms (often with attached office space). On large ships, crewmen who work in the same department and are at about the same rank are usually assigned to bunk together.

In a crew stateroom, each crewman will have a single bed with a storage locker built into the base, and a computer terminal that can be used either for entertainment or for authorized access to ship's systems. (Of course, authorization varies widely depending on the crew position held.) There will be no loose furniture, but there may be at least one chair bolted to the floor, and there will probably be fold-down tables and locking cabinets set into the walls. Every crew stateroom will have a locker with vacc suits and other emergency gear.

Even a small starship will usually have at least one crew lounge, with tables, chairs, entertainment consoles, and exercise gear. Crew lounges are critical for crew morale, and often provide the best venue for formal meetings. If there is more than one crew lounge, each may be dedicated to a specific subset of the crew – an officers' lounge, a petty officers' lounge, an engineering department lounge, and so on. On military vessels, the largest officers' lounge is usually called the *wardroom*.

On small ships, a crew lounge may have an attached kitchen area. On larger ships, whole compartments are set aside for food storage and galley equipment. Away from the crew lounge, crewmen can still get small snacks or drinks, as needed. For example, the bridge and engineering spaces will often include small refrigerators and drink-making equipment for the convenience of crewmen on duty.

All but the smallest ships have a sickbay, usually attached to the crew quarters. If a starship has a bank of low berths, these are usually close to the sickbay (or to the crew lounge if there is no sickbay).

As one might expect, access to crew quarters is almost unrestricted. This is the crew's living space, and aside from the basics of onboard protocol, few social restrictions apply. Even passengers may be invited into crew quarters under certain circumstances.

Passenger Quarters

Passenger quarters are like crew quarters, but *more* – more spacious, more elegantly decorated, more devoted to entertainment, containing more storage space and more furniture. Instead of a pair of single beds, many passenger staterooms contain a single larger bed for the convenience of traveling couples.

The passenger lounge is the social center of any small starship, and is the space most often customized. Even if the crew lounge has no more than a small kitchenette, the passenger lounge will usually have a full galley. Large passenger ships may set aside large spaces for passenger entertainment and comfort: theaters, game rooms, exercise rooms, even swimming pools.

Access to passenger quarters is also unrestricted. Indeed, starships that carry passengers often encourage crewmen to visit the passenger spaces (although they insist that crew members present a good appearance and behave with courtesy when they do).

Culture and Naval Architecture

The fundamentals of naval architecture are a constant throughout Charted Space. Cultural traits can't change the laws of physics, so any civilization which manages star travel will build starships loosely similar in structure and appearance. On the other hand, the aesthetic values of a given culture will have an effect on the details of starship design.

Aslan Starships

The unique Aslan aesthetic shows clearly in their starship design. Aslan ships tend to be highly rounded, with almost no visible sharp angles or edges. Hull sections tend to be oval or circular in shape, and many designs make use of pods. Inside, the effect is even more pronounced. Almost all internal spaces are rounded and cave-like. Crew quarters are divided among many small spaces, so that every crew member can have his own enclosed room. Internal spaces tend to be more austere than on Imperial ships, although even workstations and wall space will sport subtle decoration.

Droyne Starships

Droyne ships tend to resemble those of their neighbors; Droyne ships in the Imperium follow Human conventions, in the Aslan Heirate they tend to mimic Aslan designs, etc. The main difference in internal arrangement involves the living quarters. Droyne ships have fewer staterooms, but they are up to three times the size of the Imperial standard stateroom, and several Droyne live in each. Quarters are arranged around a central area, which serves as both working area and crew lounge. All of these spaces will be connected with doors, even permitting Droyne to go directly from one stateroom to the next. These features are comfortable to the gregarious Droyne, but bother visitors who prefer privacy.

Hiver Starships

Hive Federation ships exhibit an aesthetic opposite that of the Aslan. They tend to be blocky, even cubistic, and very utilitarian in appearance. Unlike most other major races, Hivers tend to place control stations as deep in the hull as possible – the bridge will be in the center of the ship, not exposed at one end. Likewise, weapons will be fired from the bridge, not from turret stations close to the hull.

Inside, Hiver ships are very comfortable, but not ornately decorated. The cubic aesthetic continues, as most compartments will have straight walls meeting at strict 90° angles. Some observers find this peculiar, given that dirtside Hiver settlements are usually full of rounded buildings, tunnels, and chambers; the cubist design of Hiver starships may reflect a concern for efficiency.

K'kree Starships

K'kree starships are probably the most unusual in Charted Space, due to the oddities of Centaur psychology. First, they are *big*. Centaurs are physically large, hate traveling except in groups, and tend toward claustrophobia. All of this means that they need a *lot* of internal space, far more than a Human crew with the same number of individual members. The smallest of their manned starships is 1,000 dtons, and most are much larger. Almost all of them are built on a flattened-disk shape.

The entire working space of a K'kree starship is one big chamber, with consoles and equipment arranged around the rim. The crew lives and works in this space at all times, and uses robots if there's any need to work alone or in enclosed spaces. The working chamber is usually equipped with smart walls, holographic generators, and scent in the air circulation, all to give the illusion of being outdoors on a pleasant K'kree world.

Solomani Starships

Solomani Confederation ships are very close to the Imperial norm. They lack Vilani influences in their internal design and sometimes show Aslan touches, although they are always arranged to be comfortable for Humans. Solomani ships are rich with security features, and many of them have extensive internal-monitoring equipment.

Vargr Starships

Vargr starships have been described as "like Human ships, but with spiky bits." Although Vargr culture is too diverse to make general statements, most Vargr shipyards do tend toward angular designs, with plenty of radiator fins or sharp-edged projections. This is especially common in corsair or military vessels, which are intended to project an image of ferocity. Internally, Vargr ships can have widely varied arrangements and aesthetic styles, although they tend not to be too outrageous to a Human perspective.

Vilani Starships

Starships built to traditional Vilani designs have an aesthetic (or a lack thereof) all their own. Vilani starships look as if they were designed by engineers, not architects. They are blocky and solid-looking, and are considered ugly by most non-Vilani. Efficiency is the primary consideration, not attractiveness or comfort.

Internal spaces are close to the Imperial norm. A clear class distinction will be visible in staterooms and lounges. Passenger spaces are likely to be quite comfortable and well-appointed, while crew quarters will if anything be more austere and uncomfortable than in most Imperial ships.

Zhodani Starships

Zhodani ships are not far from the Imperial norm in design or aesthetics. Internally, they tend to be designed for greater comfort for crew and passengers (and most spaces have higher ceilings given typical Zhodani heights). The most significant difference is subtle – the presence of psionic switches in most of the ship's simple fixtures. A trained telepath of even modest power can use these switches to open and close doors, control lights, activate small items of equipment, and so on.

Chapter Two

Starship Design and Construction

Working the Yards

"Okay, now, listen up! I don't know where you came from, and I don't care. You're working at the Mora yards now, and we do things a little differently here.

"My name is Eirene Sennit, and for the next 30 days I'm your mother, father, and best friend. You may call me 'ma'am.' You may also call me 'sir' if you were in the military or think you've got the hackles to back up your attitude. If you're lucky enough, and good enough, you can call me Eirene when your orientation period is over. If not, you won't be around to call me anything.

"I know what you're thinking – 'What a hardcase!' You're right, and there's a reason for it. Look out that window, and what do you see? Girders. Forges. Deck plates. Work pods. The skeletons of starships. Looks like God's own erector set just went critical all over the place. This is the big league, boys and girls.

"You think you can build starships? Maybe you can, but that's old news. We don't build starships here, we ***produce*** *them. They're a commodity, a crop we harvest from asteroids and comets, the moons, and Mora herself. We give birth to dreadnoughts, freighters, fighters, SDBs – we crank out more copies of some designs in* ***one year*** *than some yards do in a decade.*

"Just because we can crank out the hulls does ***not*** *mean we skimp on quality! You will be a part of the best-trained, best-equipped, most professional shipbuilding team this Imperium has ever seen. We build ships that will outlive me, you, your kids, their kids – I fully expect some of our battlewagons to be in service when the next millennium rolls over. Your work is your legacy to the Imperium – make sure you give your best!*

"Once your orientation period is over, you will be assigned to your own work crews. You might get assigned to a destroyer squad, or one of the far-trader teams. We rotate assignments once every six months, so you won't get bored, and you'll gain experience working on every major design we produce here. We need well-rounded workers, girder monkeys who can lay a keel on any design in our inventory. You might pull duty on a specialty hull, a one-shot for some rich hunter or hush-hush corporate project. If you do, count yourself lucky. If not, we'll keep you so busy you won't notice.

"One thing – your head had better be screwed on tight 100% of the time. Out here, there's no margin for error. The workload is beyond anything most of you have ever experienced, and there are accidents all the time. There are no ***minor*** *accidents here. If you screw up, you* ***will*** *die, and I don't have time for that kind of paperwork.*

"There's no place to rest on your butt except the hardpoints on the construction gantries – those are for the architects and BuShip busybodies. Don't be surprised if they emerge from their caves every once in a while and peer over your shoulder. No matter how strong the urge, do ***not*** *use your torch to give them an attitude adjustment. If you do, you're liable to end up baby-sitting a bunch of newbies for 30 days."*

This chapter presents a comprehensive set of tools for designing and constructing vessels of virtually any type found within the Third Imperium and its predecessors. (The peculiarities of alien naval architecture are covered in their respective sourcebooks; see the ***GURPS Traveller: Alien Races*** series.)

Shipbuilding

Centuries of starfaring tradition have created a rather distinct set of definitions for some terms that are used in a much more general sense outside of the starship-building world.

Terminology

Vessel: Any spacecraft.

ston: A measure of weight and (conventionally) mass: a short ton; 2,000 pounds.

Displacement: Based on long-standing tradition dating back to the Ramshackle Empire, spacecraft are customarily recorded in official documents by their hull's "displacement." This refers to how many short tons of liquid hydrogen (the most common fuel) they would displace. One short ton of liquid hydrogen has a volume of 500 cf, which is referred to as one displacement ton, or dton. In this and other ***GURPS Traveller*** books, the word "ton" is used when the context makes it obvious that dtons are being discussed.

To avoid confusing these tons with the more familiar measures of mass and weight, these rules will call displacement tons "dtons." A short "ton" in this book generally refers to *stons*, above.

Note that a "space" in ***GURPS*** terms is also assumed to be about 500 cubic feet. The common names of ships often include the nomenclature *100-ton*, like the *Kugashin*-class 400-ton lab ship. In this example, the *Kugashin* has a displacement (or *hull class* – see below) of 400 dtons (but the ship's total mass is considerably more than 400 stons).

Total Displacement: The total volume of the ship, including the volume of all external stores (but not turrets and external bays) and vessels carried in cradles.

Hull Class: The volume of the main hull itself. Often simply called "displacement." Vessels are normally classified and referred to by their hull class, as in 200-ton *Beowulf*-class free trader.

Ship: A vessel of hull class 100 or larger.

Small Craft: A vessel of hull class below 100.

Starship: Any ship with a jump drive.

Non-starship: A vessel lacking a jump drive. Small craft are also non-starships.

cf: cubic foot or cubic feet.

Cr: A credit, the unit of currency in the Imperium. Dollar costs in ***GURPS Vehicles*** convert to credits on a 1-for-1 ($1 = Cr1) basis at the TL of the design. See p. T:FT48 for exchange rates between differing TLs. KCr is a thousand credits; MCr is a Megacredit, or a million credits. Because space vessels cost so much, they usually are priced in MCr.

HPs: Abbreviation for "hit points."

MW: A megawatt, or a thousand kilowatts; MJ is megajoule or megawatt-second (MWs); a thousand MW is a gigawatt (GW); a thousand megajoules is a gigajoule (GJ) also known as a gigawatt-second (GWs). Similarly, a million megawatts is a terawatt (TW); a million megajoules (a million million joules) is a terajoule (TJ). These last terms are normally used only in the description of extremely powerful ship's weapons.

Power Slice: Part of a power plant included in a module to simplify the design process.

Turret mount: A turret-mount weapon is a weapon built into a turret with a universal mounting system. It has a 180° arc of fire, though the turret itself allows a full 360° arc. This combination allows a full hemisphere to be covered.

Hull mount: A hull-mount weapon is a weapon built into the hull but with a casemate swivel-mount system. It has a 90° arc of fire (45° to either side). All weapons except spinal mounts can be hull-mounted.

Fixed mount: A fixed-mount weapon is a weapon built into the hull, with a 15° arc of fire. The only fixed-mount weapons in the *Module Tables* are spinal mounts as they are typically the only weapons to use this mounting system. See *Spinal Mounts*, p. 19, for more information.

Shipyard Facilities

All worlds with sufficient population and TL are capable of constructing space vessels within their industrial sector; such vessels cost double, due to limited production. Worlds with Class IV and V starports have shipyards attached to them, capable of turning out vessels in quantity (or at least able to take advantage of standardized production methods to keep costs down). Shipyards are also extensively used for annual maintenance, refits, upgrades, and overhauls (see p. 106).

Starports and their respective facilities are listed below. For more detail, see ***GURPS Traveller: Starports***.

Class V Starport

Installation of excellent quality. Annual maintenance overhaul available. Shipyard is capable of constructing starships and non-starships.

Class IV Starport

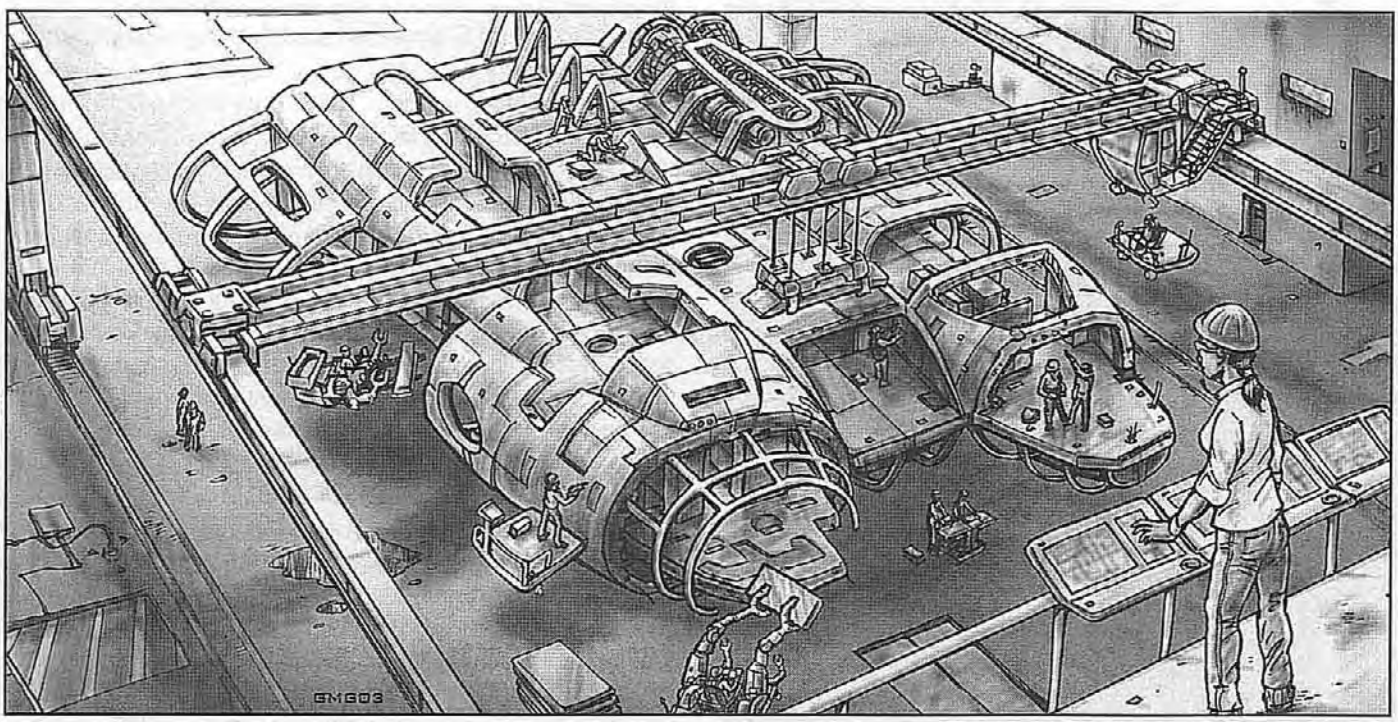
Installation of good quality. These also offer annual maintenance-overhaul services. Shipyard is capable of constructing non-starships.

Class III Starport

Shipyard facilities are standard or average. Reasonable repairs can be accommodated.

Class II, I, 0 Starports

No repair or shipyard facilities are present.

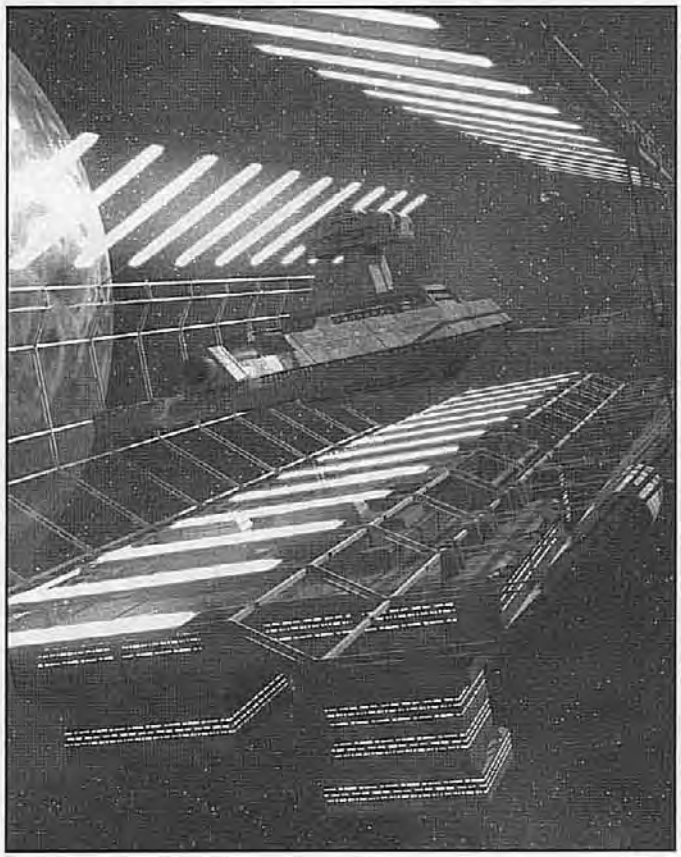


Standard Designs

Most starships are built to order from existing hull plans. Many standard classes (scouts, free traders, far traders, etc.) are centuries old and their designs are in "the public domain." These are included in the Imperial Data Package of industrial standards provided to member worlds. If the requirements are neither outlandish nor locally illegal, a builder can usually find plans for an appropriate ship; a set of plans would be about a 1 gig database costing Cr1,000. Some shipyards offer use of *their* standard plans, at a discount.

Buyers may specify reasonable variations from the plans on armor, surface features (stealth may be decreased or removed, but not improved), weapons, and non-vital interior components. Changes in hull size or drives should add considerably to the cost, at the GM's discretion.

The usual time to build a ship at a Class V port is calculated as (hull surface area in sf/2,000 days) with a minimum of six months due to ordering, lead time, and shipyard configuration. GMs may rule that if the vessel is common and produced locally, it takes a minimum time of one month. Both the actual and minimum construction times can be reduced by paying extra: doubling the price divides these times by 2, tripling it divides these times by 3, and so on. The absolute minimum time is 1/4 the standard time (never less than 6 weeks unless produced locally), costing four times the standard price and working around the clock. Military shipyards on a war footing use this speed; civilian shipyards require a reaction roll of Very Good or better (using influence and bribery as necessary). Anything not available locally must be imported, and special items might take extra time to install. For really radical new design concepts, refer to p. VE201.



Smaller shipyards also take longer. A Class IV port will take twice as long on any hull class over 400 and three times as long on anything over 2,000 dtons (if they will handle it at all). A Class III port isn't really equipped for shipbuilding at all. It can build a craft of up to 20 dtons, but takes four times as long. It can't build larger vessels.

The price for a ship built to standard plans is simply the sum of the prices of all its systems and components, plus labor.

Building Better Ships From the Ground (Clearance) Up

Why have construction guidelines? Few (if any) naval vessels are produced by a single designer working in isolation, without constraints on resources or fitness for purpose. Instead, they are designed by teams, to specifications drawn up by committees, to meet conflicting requirements of mission, flexibility, lethality, survivability, and cost. Creating an entirely new class of vessel requires extensive space trials to identify and to fix problems (see pp. VE201-202); even so, there is a limit to how much testing any organization will tolerate. Every vessel flying is the result of hundreds of compromises, large and small.

These guidelines represent the procurement standards published by the Imperial Navy's Bureau of Ships (BuShips). BuShips expects new ship designs that are offered in response to Requests for Proposals to adhere to these standards. Designs that do not meet these standards are considered "inadequate." Anything more is likely to be rejected as "excessive" or "not cost effective."

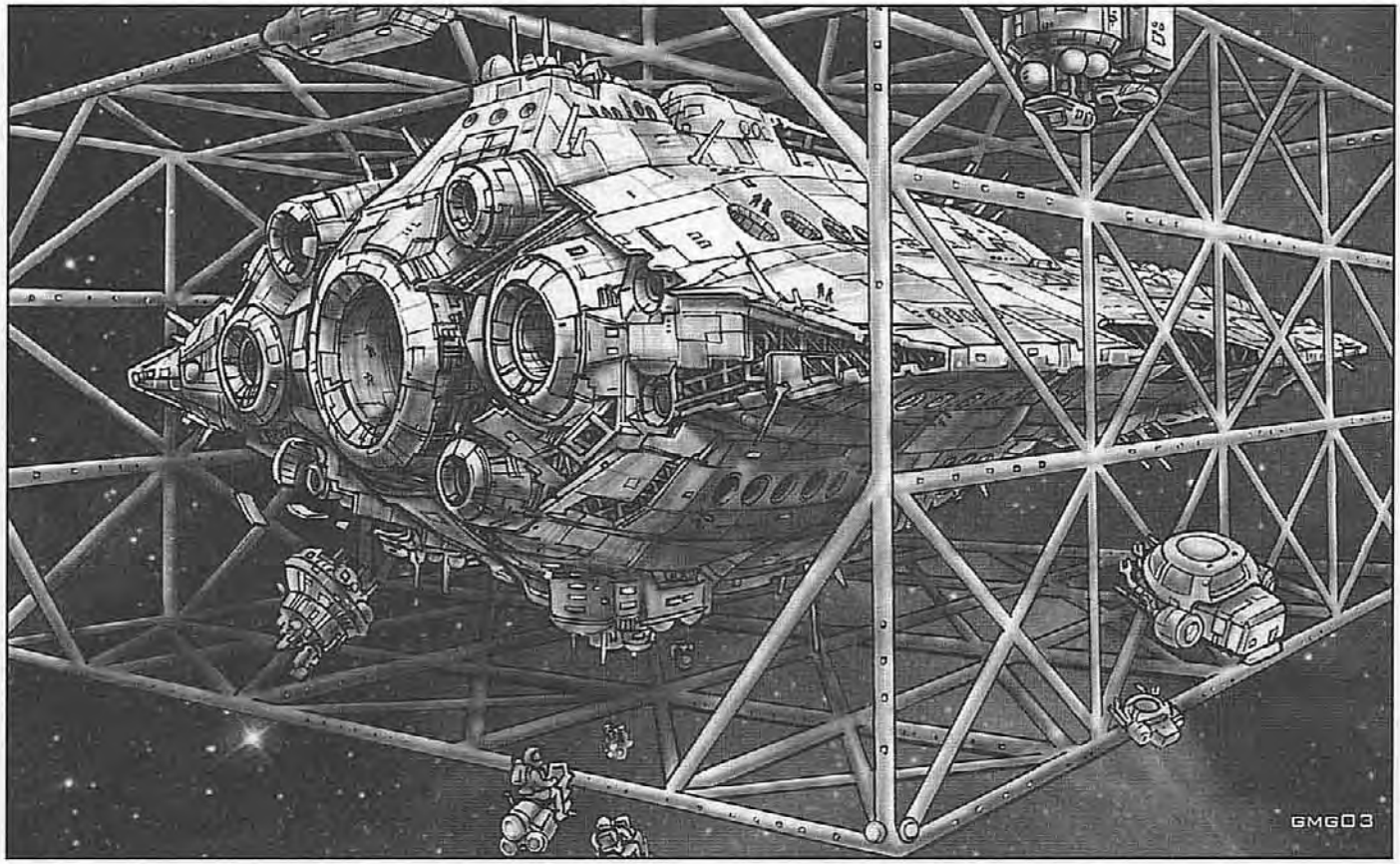
In game terms, this keeps the balance between naval weapons and armor within playable bounds, making for a faster, more interesting game. GMs are free to construct vessels with the modular design system that *exceed* these guidelines if they wish. It is entirely possible to construct vessels within the ***GURPS Traveller*** modular ship design system exceeding these guidelines.

The Modular System

While the ***GURPS Traveller*** starship design system is modular, in most cases the *ships* it produces are not. The components forming a specific module might be spread throughout a ship, rather than forming a compact bundle of the appropriate volume. The reverse is true of the ship's power plants, which are specific devices with controls in the requisite engineering compartment, but their volume is incorporated into many other modules for bookkeeping purposes only. That errant volume is termed a "power slice" or simply, "slice."

Hull and Armor Materials

The various classification societies (e.g., Lloyd's Register, Traveller's Aid Society, etc.) have determined through long experience that "Medium Frame, Standard Materials, Expensive Metal Armor" is the optimal combination of safety, utility, and economy for a particular TL. Anything more gets expensive, though some designs justify their cost. Anything less, however, is not going to meet the agreed-upon standards



(i.e., HP and structural HT). Bank financing will be nearly impossible to obtain, insurance rates will be astronomical, and government charters will be unavailable for such a shoddy operation. (Substantive differences between TLs are already factored into the exchange rates.) This sort of conservative approach is entirely consistent with the slow rate of technological progress within the Imperium and its neighbors.

How Big Is My Hull?

A ship's actual dimensions can vary greatly. For a rough idea of the hull's length, look up its Size Modifier in the Size column on the table on p. B201. This assumes a fairly average cylindrical ship, or a collection of disks, pods, and cylinders. Length varies from 1.5 to three times that in yards if it is long and skinny, dart-like, or a flattened disk or wedge. Diameter will be 2/3 that if the ship is ovoid or spherical. For examples, refer to *Suggested Hull Sizes,* p. S108.

How Big Is My Reactor?

When drawing deck plans, it is sometimes difficult to visualize just how large the reactor is. After all, you have all these neat modules but no information on just how large the power slice is other than a MW rating.

- Add up the total power (in MW) consumed by all modules included in the ship design.
- Determine the TL of the reactor (it's the same as the ship's overall TL unless specified otherwise).
- Multiply the total power (in MW) by the appropriate factor: TL7 = 0.96, TL8 = 0.48, TL9 = 0.12, TL10+ = 0.024.

The final answer is the reactor size in dtons. 1.5 dtons for TL7, 1/2 dton for TL8/10+, and 2.5 dtons for TL9 reactors should be added per core (there is one included in the Engineering modules, see p. 36). If a ship has more than one reactor core of the same TL, this final answer can be divided amongst them in any fashion desired to represent redundancy. Sometimes it is useful to include a secondary power core without the other elements of a complete engineering system. Installing a power plant core from a TL different from the ship's primary TL allows mixing systems from both TLs, for example. If a vessel has two reactor cores of different TLs, the power requirement for each TL must be determined separately.

Custom Building

If plans are not available, it will take (the square root of the final cost in MCr) days to draw up complete documents (regardless of ship size – although a very complex design may take more time, at the GM's option). The fee for this is usually Cr1 per dton of final displacement, with a minimum of Cr10,000. Triple the cost if the designer will not have the right to sell the plans as "standard" after he finishes.

New plans can be produced with Shipbuilding (Starship) skill. A shipbuilding program (see p. 70) will help! The GM makes a single skill roll. A failure wastes the effort for the time calculated above, but designers can start over. A critical failure produces a plan so subtly flawed that the builders won't notice . . . but the GM can provide a catastrophe as soon as the ship is first used.

An advantage of custom-built ships is their anonymity; one cannot judge their capability from casual observations. A successful roll on Shipbuilding (Starship) skill will allow a determination of capacity and a good guess about power plant and weapons.

Starship Design Sequence

GURPS Vehicles offers a complete design system suitable for all types of vehicles including starships, but it is complex. To make *GURPS Traveller* more accessible, this book expands upon the modular-design system in *GURPS Traveller*, enabling players to assemble ships from standard hulls and components.

A starship "module" represents a collection of components usually scattered throughout the entire vessel. The "power slice" will actually be in the engine room, control stations might be located in the bridge, and so forth. They are not necessarily homogenous systems found in the same location on a vessel.

These hulls and modules were all created using *GURPS Vehicles* or *GURPS Ultra Tech*, so experienced GMs may use those books to design their own modules or to create custom-built designs, but see *Building Better Ships From the Ground (Clearance) Up*, p. 14, for some important considerations.

Design Overview

The next several pages provide a systematic spacecraft-design process. Calculations are simple and can be easily done on scrap paper. A calculator is useful but not essential. Many of the steps below have a corresponding chapter in this book to explain more details.

Step 1: Decide on the ship's concept and TL.
Step 2: Design the hull and record its characteristics.
Step 3: Designate turrets and/or bays.
Step 4: Select armor. Calculate mass, cost, DR, and PD.
Step 5: Select surface features.
Step 6: Fill all internal spaces with systems.
Step 7: Add turret and bay weapons (optional).
Step 8: Calculate basic statistics.
Step 9: Calculate performance and finalize the design.

As design choices are made, keep a running total of the vessel's weight (in stons), cost (in MCr) and power requirements (in MW). Power requirements are very useful if deck plans are to be created, but are not integral to the design process itself.

Naval Ship Classes

The starships operated by the navies of the galaxy range from 100 to 1 million dtons. There are no known ship designs larger than that, but that doesn't mean that they don't exist. Ship types of one TL tend to be smaller than their higher TL counterparts, sometimes by as much as 20% per TL.

Five broad types of warships are registered in service with the Imperial Navy: Scouts, Escorts, Cruisers, Carriers, and Battleships.

Scouts: The Scout Service controls a wide variety of craft up to cruiser class, but scouts proper are vessels up to 200 dtons designed for exploration, survey, and courier work. In times of war, such ships are pressed into military service but have negligible combat value except in reconnaissance.

Escorts: Escorts are small ships of up to 5,000 dtons and are meant to be light support craft for larger ships, primarily cruisers. Escorts are also widely used for convoy protection and commerce raids.

Cruisers: Cruisers are the smallest ships to carry the large spinal weapons needed to cause serious damage to armored ships. Most are too lightly armored to withstand heavy battle action. They form the cadre of task forces that raid commerce and provide fire support for planetary invasions. Hull sizes range from 20,000 to 100,000 dtons. Cruisers serving with a battle fleet are generally grouped in cruiser squadrons of four to eight ships, while individual ships or pairs of cruisers are used to form scouting or raiding teams.

Carriers: Carriers are designed to transport large numbers of combat boats (termed either "fighters" or "system defense boats"). The small ships are used in the screen of the battle fleet or in support of a planetary invasion. Given the limited weaponry of fighters and light boats, they are little more than a distraction in a major fleet action, but they can be extremely effective against ships of cruiser class or less.

Battleships: As their name suggests, battleships are jump-capable vessels, which are, due to their armament and protection, capable of standing in the line of battle. Also often called "dreadnoughts" (because their crews theoretically dread no opponent . . .), battleships generally have little better in the way of primary armament than cruisers, but their extensive secondary batteries render them virtually immune to missile and small-craft attack; their bulk also provides tremendous damage absorption, allowing considerable endurance in pressed attacks and long battles.

Other Naval Vessels

A wide variety of supporting ships and boats of the Imperial Navy are deployed in the Spinward Marches. Many don't fit into the five categories presented above, and they are commonly classed as auxiliaries. A battle rider is a non-jump-capable combatant generally carried on a large (up to 1 million dtons) fleet tender. A typical tender carries a complete battle squadron (BatRon) of six to eight vessels.

Commercial ships of 50,000 dtons or more are unknown in the Spinward Marches as of 1120, although 10,000- and 20,000-ton bulk carriers are fairly common.

Cruisers (including carriers) and battleships together are considered *capital ships*, a designation with historical and

social, as well as tactical, significance. Battleriders may or may not be considered capital ships, depending on who is doing the considering . . .

Step 1: Concept and Tech Level

First, come up with a general concept and mission for the vessel. Who's building it and for what purpose? Is it an interplanetary craft or a starship? A merchantman or a warship? This design system can also be used for space stations and satellites; just read "ship" as "station" and do not install maneuver or jump drives.

Next, decide on the vessel's TL. The design system presented here allows vessels to be designed at any TL from 7 to 12, with some items of TL13 supertechnology included for GM use. Crude and limited spacecraft are possible under special circumstances at TL5-6; these are best approached on a case-by-case basis using ***GURPS Vehicles***. Higher TLs are the realm of Ancient artifacts and alien superscience: GMs are encouraged to refer to ***GURPS Space*** or use their imagination.

When designing the vessel, do not install components higher than the vessel's TL without good reason (e.g., a TL10 hull upgraded with TL12 electronics and weapons); be sure to include an engineering module or a power core for the additional TL.

The strangest ship design I ever saw was some wealthy loon who wanted a yacht that duplicated a Terran surface ship named ***Henry Grace a Dieu****. The inside was normal (as much as any spaceship with black powder cannons can be called "normal"), but the outside had masts and sails with internal wires so they "billowed."*

– Loni Watt-Tukera,
Principles of Starship Design

TL7 Vessels

Generally homegrown for local conditions, TL7 vessels might service nearby markets or serve as an alternate to depending on foreign imports. TL7 will support routine space operations, but each vessel must normally be optimized for its specific role and/or mission profile due to the tight constraints imposed by the less robust technology base. Fission reactors are most often used to provide power.

TL8 Vessels

TL8 vessels are markedly more capable and versatile than TL7, primarily because they employ gravitic technology – contragravity (p. 40) – and reactionless thrusters (p. 37), but they are constructed for the same reasons. Fission power is standard.

TL9 Vessels

These ships use fusion power and are capable of mounting jump drives. The fusion power plants are crude and expensive, however; the capabilities and prices of TL9 vessels follow suit.

Naval vessels at TL8 and early TL9 are often equipped with dual maneuver drives: reactionless thrusters for long-haul operations, and reaction thrusters (or even reactionless thrusters powered by energy banks) for short-duration, high-thrust maneuvers (i.e., takeoffs and landings, and combat).

Historically, the First (Vilani) Imperium was TL9 for its entire history, as were the early Terran Confederation (-2431 to -2210) and the few remaining starfaring planets and polities during the Long Night (-1776 to -150).

TL10 Vessels

TL10 vessels are average for the present-day Imperium, often used by merchant lines, independent traders, and planetary and subsector navies. Many TL7-9 worlds also use TL10 designs, ordering them (and spare parts) from shipyards elsewhere in their sector, just as Third World nations of Terra's 20th century ordered ships from Europe, Russia, or the United States.

The Terran Confederation's achievement of jump-3 (early TL10) in -2210 was the edge they needed to finally defeat the Vilani Imperium and establish the Rule of Man (Second Imperium). After the technological regression of the Long Night, the Sylean Federation (precursor to the Third Imperium) was able to re-establish TL10 by around -150 and was fully TL10 following the upheavals of the Civil War (604 to 622). Empress Arbellatra (then still Regent) used the new jump-4 capability to establish the Xboat network (624 to 718).

TL11 Vessels

These ships are more advanced with improvements over TL10 in several areas. They serve as the "front line" vessels for most of the Imperium's potential adversaries: the Zhodani Consulate, the Solomani Confederation, top clans in the Aslan Hierate, and exceptionally well-equipped Vargr corsairs.

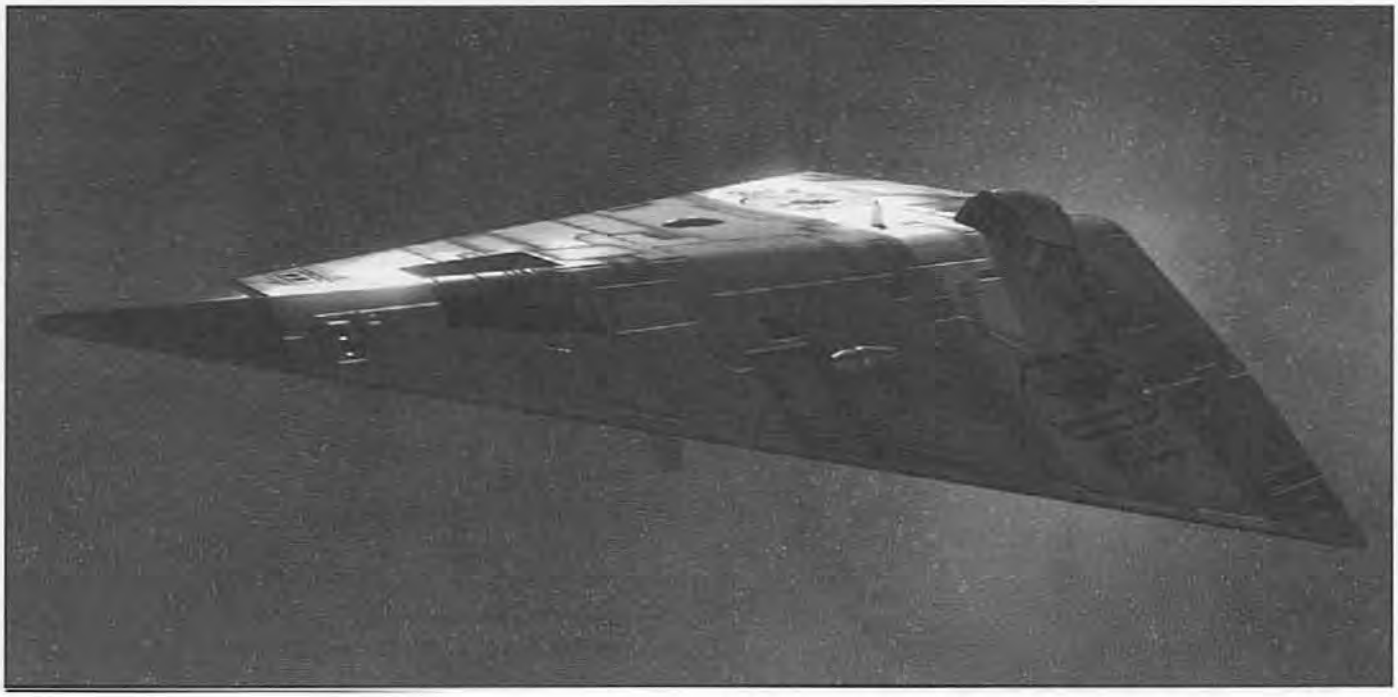
TL12 Vessels

These represent the cutting edge of naval architecture. The Imperial Navy is equipped at TL12, with a few TL10-11 vessels in service in backwater areas or as auxiliaries. Shipping lines and corporations use TL12 vessels as fast couriers and liners.

The Solomani Rim War (990 to 1002) provided the impetus the Imperium required to develop TL12.

Streamlining

Streamlining specifies how much attention was paid to airflow over the hull, and affects the ship's performance in an atmosphere. Although many different configurations and streamlining options are available, spacecraft streamlining can be grouped into three broad categories: streamlined, unstreamlined, and other (dispersed structure and planetoid hulls).



Streamlined

Atmospheric performance and airflow over the hull were prime considerations in the design of the hull. All protuberances were kept to a minimum and aerodynamic lifting and control surfaces are incorporated into the hull. The spacecraft has full atmospheric maneuverability, and generates lift so it can take off from worlds with a surface gravity greater than its G-rating. Streamlined hulls may skim gas giants for hydrogen fuel and can safely re-enter any atmosphere.

Unstreamlined

Airflow over the hull was considered as an afterthought, if at all. Sharp edges were rounded off and protuberances may have been covered by fairings. However, the hull does not generate lift and no aerodynamic control surfaces have been provided. Unstreamlined ships can skim for fuel and can enter a world's atmosphere but they do not have landing gear or any other facilities to relieve the stresses on the hull when set on the ground. This typically means that they can land once – and stay there indefinitely.

Other Hulls

Dispersed structure hulls are not designed to operate in an atmosphere. Sharp edges, antennae, bracing, and all kinds of other things stick out from the frame at various places. These hulls are extremely vulnerable to wind turbulence; they should never land on any planet and should never enter an atmosphere greater than trace (0.1 atmosphere), even with contragravity.

Planetoid hulls are not stable enough for atmospheric operations and are not normally designed for any type of planetary landing, but can land on airless worlds in extreme circumstances. Hulls intended for planetary landing are normally equipped with contragravity units.

Dispersed structure and planetoid hulls may not skim gas giants under any circumstances.

Step 2: Hull Design

The hull is the frame of the ship, but it is more than just a metal shell. It includes decks, cables, stress bracing, and other elements.

Streamlining

Decide whether the ship is streamlined (SL), unstreamlined (USL), planetoid (PL), or dispersed structure (DS). *Streamlined* ships are sleek lifting bodies (often dart-, teardrop-, wedge-, or disk-shaped) and may fly within a planetary atmosphere. *Unstreamlined* ships are usually cylindrical, spherical, or some other non-aerodynamic shape. *Planetoid* hulls are nickel-iron asteroids, hollowed out and mounted with ship systems. *Dispersed structure* hulls are open tubular frameworks, with some components in separate subhulls.

Hull Classes

Select a standard hull class from the Hull Table on p. 28 or design a custom hull (p. 29). See *How Big is My Hull?* (p. 15) to approximate ship dimensions. Multiply the listed weight, cost, and hit points by the factors shown under *Options*, p. 29. Record hull mass, hull cost, and Size Modifier (SM; p. B201). Hull areas and volume are for reference and will figure in later calculations.

Spaces

Calculate the vessel's *internal spaces.* An unstreamlined vessel has spaces equal to its hull class. A streamlined vessel has spaces equal to the volume factor (from the *Streamlining Table*) × hull class. Standard hulls with Very Good streamlining have spaces equal to 0.8 × hull class. Internal spaces will be used up by equipment and other options. Keep a running total of how many spaces remain; when they are all gone, nothing else can be installed in the vessel.

Step 3: Turrets, Bays, and Spinal Mounts

Decide how many turrets and/or bays the vessel has. Their mass, cost, and internal spaces are shown on p. 131. As with the hull, mass varies by TL and cost varies depending on whether the hull is streamlined or not.

See *Batteries,* p. 24, for a way to increase firepower by linking turrets or hull-mounted weapons. Batteries should be considered *after* the actual weapons are installed.

Turrets

Turrets are standard mounts for shipboard weapons. They have the most flexibility in terms of arc of fire because the entire turret is turned to aim it, along with all the weapons mounted in it, of course. They have effectively unlimited arcs of fire – as long as the ship's hull or appendages aren't in the way, the turret can fire at any target, independent of the attitude of the ship. For most configurations, that means the arc of fire is 180° in any direction – a complete hemisphere. For game purposes, assume turrets can fire at any vessel within range.

In ordinary 1-second combat turns, weapons in turrets may not fire on targets on the opposite side of the ship, and may be further restricted by the configuration of the hull (GM's decision). ***GURPS Traveller*** space-combat rounds (see p. GT163) represent 20 minutes, so GMs may ignore this targeting restriction due to ship maneuvers in zero gravity during that time scale.

A ship can have a maximum of one turret per 100 dtons of hull class, or it can have fewer or none at all. A small craft of at least 3 dtons may have one turret.

Instead of a turret, weapons can be built directly into a hull. A vessel can have 3 spaces of turret weapons installed in hull mounts in place of one turret. Hull-mounted weapons have reduced range of tracking due to the lack of a turret mechanism. Since they are inside the hull's armor belt, the degree of protection is greater than for turrets, but they can only fire on targets within a 45° arc to either side of the direction the mount is facing. Each hull-mounted weapon must be installed on one of the six faces of a ship (forward, aft, port, starboard, dorsal, or ventral).

The figures in the Module Tables (p. 124) are for medium frame, standard materials, with very good streamlining (VGSL) and unstreamlined (USL) prices (the two most common). Multiply turret *weight* by the same frame and material factors used to design the vessel's hull. To select a streamlining level other than VGSL, multiply the USL turret *cost* by the appropriate factor (3.6 for SSL, 6 for ESL, or 12 for RSL). Then multiply this cost by the same frame and material factors used to design the vessel's hull. (Use the USL cost if the turret is unstreamlined.)

Optionally, turrets purchased as unstreamlined can be placed on streamlined hulls, but they make the vessel unstreamlined as a result. Turrets on planetoid hulls may use any materials and have a frame strength equal to the hull. Turrets have 800 sf of surface area each and must be armored separately (see Step 4).

Pop Turrets

Pop turrets are identical to ordinary turrets, except they can be fully retracted into the hull when not needed. They are only protected by the hull's armor while retracted, but may still be separately armored. Pop turrets are often used on planetoid hulls to preserve the appearance of a natural asteroid. If a pop turret takes more than half of its HP in damage, it is locked in whatever its position was before the damage was inflicted. (It may still rotate.) Pop turrets are treated as hull-mounted when not extended.

Weapon Bays

Weapon Bays are large weapon mounts. They come in two varieties: external or internal. External bays are treated exactly like turrets, above (though they have the same surface area as a vessel of their size; see p. 28). Internal bays are treated exactly like hull-mounted weapons, as above. Bays on planetoid hulls are usually internal. Weapon bays may *not* be grouped as batteries.

Bays are available in large and small sizes (for 100-ton and 50-ton weapons, respectively). Bays must be installed during construction (though their weapons may be installed later). Weaponry in internal bays is easily removed and replaced at a suitable shipyard or spacedock as the need arises. It takes about two hours to replace a small internal bay weapon; double this time for large bays, and triple it for external bays. The 50-ton bay is the bay in the ***GURPS Traveller*** core book. It is referred to as a 50-ton or small bay here to prevent confusion with the 100-ton or large bay.

Empty internal bays may store cargo or hold small craft. *External* bays may not store cargo or craft – they are only capable of holding weapons due to a honeycomb structural arrangement designed to hold either missiles for the multiple missile racks or the components used to build energy weapons.

Vehicles and craft may be carried in otherwise unused internal bays at 50% space wastage (a 100-ton bay holds 50 dtons of vehicle or craft); a bay may launch one craft per turn (see p. 64).

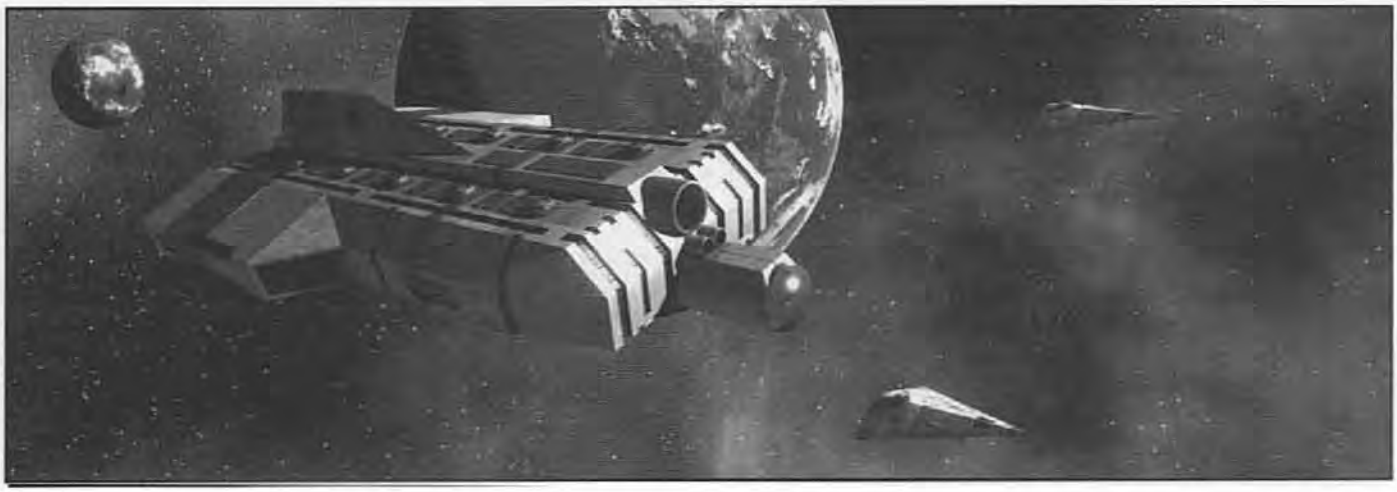
An internal bay may carry deadfall ordnance (p. 53); such a bay is useless in battle, but is used to bombard worlds.

A ship can install one bay for every 10 turrets *not* installed. For example, a ship with Hull Class 10,000 may have up to 100 turrets, but the designer could instead install 80 turrets and two bays. This effectively limits bays to ships of 1,000 dtons and larger.

Spinal Mounts

Spinal mounts are large enough to require special planning; they are considered fixed-mount weapons and basically become the main structural member for the ship. They have limited arc of fire – no more than 15° to either side of the direction the vessel is facing. Spinal mounts require that the entire ship be pointed in order to aim the weapon, but they have no overhead for mounting.

Spinal weapon mounts reduce the number of turrets possible by 1 for every 100 dtons they occupy. Other surface features (external grapples, etc.) also affect the number of turrets and bays that can be mounted; see p. 31.



Evolution vs. Revolution

Warships are expensive investments, especially large warships. This simple fact drives much of the design conservatism for which navies are notorious. Any officer who suggests radical design changes is placing his career on the line (especially after a victorious war). Navies tend only to adopt new technologies after they have been thoroughly proven and tested on smaller, less expensive vessels. It is a common naval paradigm that more than 25% novelty in a new design will lead to disaster. Therefore, new designs should be evolutions of older vessels rather than revolutions in design practice. Assume Imperial Navy ships last 80-100 years before undergoing a major overhaul/refit, and then are good for another 80-100 years before retirement. There will be instances where some ships last longer and some retire quite quickly, but on average, 180 years is the life expectancy of a warship due to HT loss (see below).

Aging Ships

So what happens at 180 years? Does the ship spontaneously combust? Not likely, but its chances of being fully operational are slim. When making a Structural HT check, make an *extra* check for every 50 full years that the ship has been in continuous service. This means that a ship 50 years old makes two HT checks, one 100 years old makes three HT checks, etc. Reset this to one check if the ship has had a major rebuild (see p. 106).

For every 200 years of service, a ship's HT permanently drops by 1; ships of that vintage are normally retired or used for light duties. TL13+ ships multiply the intervals by TL-10. However, regardless of how many times a ship is rebuilt, overhauled, prayed for, or glued back together, the maximum theoretical lifespan is 60 years at TL7 and doubled every TL after that. This puts a TL10 vessel at around 500 years and a TL12 vessel at around 2,000 years.

How Much Armor Do I Need?

Armor in ***GURPS Traveller*** can be divided into four types: Recommended Minimum (DR 100), Turret Invulnerable (can ignore hits from standard turret-mounted weaponry), Bay Invulnerable, and Spinal Mount Invulnerable. What is invulnerable at one TL may *not* be at the next. Depending on a ship's mission, it may only need enough to keep the dust off. When designing a warship, make a determination as to what class of weapon this type of vessel will be able to ignore or shrug off.

Step 4: Armor

Vessels are armored to protect against cosmic rays, micrometeors, and enemy weapons. Adding heavy armor will slow a ship down (due to the extra mass) but make it more "survivable." Choose both armor material and DR.

Most starships use expensive armor. Bulk transports and ore carriers may use cheaper materials as an economy measure, while prototypes might use advanced materials.

To figure out how much armor is needed, calculate the ship's *Total Surface Area:* This is the number shown in the area column of the *Hull Table* (p. 28) plus the surface area of all turrets and *external* bays. Each turret has an area of 800 sf. Each external bay has an area of 6,500 sf (small) or 10,000 sf (large). Internal bays, hull-mounted weapons, and spinal mounts do not take up surface area.

The minimum armor for manned vessels is generally considered DR 100 – military starships will have considerably more. As a rule of thumb, a light military vessel will be able to withstand a hit by turret lasers of its TL at 1/2D range, while a ship of the line will be completely impervious to turret beam weapons – and will frequently shrug off bay particle and plasma/fusion weapon hits as well! See *How Much Armor Do I Need?*, above.

Optionally, armor for the turrets may be calculated separately from hull armor. Turrets and bays are often designed with lighter armor than the hull itself. For a fast way to design this, just add *half* the turrets' and external bays' area to the vessel's area; afterward, they can be assumed to have half the DR the hull has. Military vessels also have suggested minimum and maximum armor requirements for turrets. The ***GURPS*** rules don't normally track armor volume because it is negligible, but placing huge amounts of DR on a relatively tiny turret will use up the space for weaponry (and would slow rotation speeds below the standards assumed in the space-combat system). To reflect this, turrets have maximum DR. They should have an absolute minimum of DR 100, and not exceed DR 250 at TL7, doubled every TL after that, or half the ship's armor, whichever is less.

Passive Defense (PD). Armor PD depends on DR, as follows: 1 if DR 1, 2 if DR 2-4, 3 if DR 5-15, 4 if DR 16+.

Step 5: Other Surface Features

Sealed: Vessels must be sealed. Dispersed structure hulls are unsealed; instead, individual subhulls are sealed separately. GMs may wish to ignore the cost of sealing on large, high-TL vessels, as it is so low as to be negligible.

Sensor Masking: Warships are usually the only vessels to use sensor masking. A ship may optionally be given *stealth*, making it harder to detect by active sensors (like radar), and/or *emission cloaking* to mask it from passive sensors (like infrared). Each type comes in three levels: "Modest," "Basic," and "Radical." A third type of sensor masking, *sound baffling*, is used only when in an atmosphere.

Step 6: Component Modules

A component module is a set of components grouped together into a system, like a bridge or a jump drive. Each module is rated for the *spaces* it takes up. Select modules whose total spaces are sufficient to fill the ship's hull spaces. Weapons and magazines are placed in turret spaces unless hull-mounted. Keep a running total of remaining space; when it's gone, no more modules can be installed inside the hull.

Cargo Space in Turrets

Although turrets aren't designed to carry cargo, they can – with great difficulty. Maintenance hatches must be removed, exposing wiring and conduits, and the cargo must be carried by hand. Safety regulations prohibit the use of turret access space for cargo storage. Players choosing to ignore safety regulations can store small cargo in them. This requires dismantling the turret from the hull side and most cargo in standard shipping format can't even be put in there without a major engineering chore. This is also backbreaking labor – imagine stowing cargo in the front seat of a hatchback, going in through the trunk – and the GM should roll for mishaps which may result in anything from static on the intercom to leaks in the turret's jump field causing jump fluctuations.

Carrying cargo in turrets is not normal practice. If crew members do risk the difficulties and the malfunctions, customs inspectors might decide to examine *every* access hatch and crawlspace, which could easily take days. GMs take note: While the volume of turrets is not counted as part of a ship's total volume when calculating jump, that is a simplification for accounting, *not* a loophole through which ships can get an extra 3% external cargo space "for free." Just the opposite, in fact: Starship owners often pay the price when stuffing things into areas where they don't belong.

So I get settled on the ship and the pilot calls me up to the bridge to sign autographs for the crew. While I'm there, I notice that one of the buttons has a light that says "Press to Test." I resist for about ten minutes, then I press it, and the light changes to "Release to Detonate."

Everybody's a comedian.

– Anton Wilson Peale

Every ship should have a bridge and an engineering or a cockpit/systems module. Other modules are more or less optional, although drives and quarters should be installed in nearly all vessels.

Where modules are available at different TLs, the TL is given after the name; for instance, "Maneuver Drive/10" means a TL10 maneuver drive. If no TL is given, assume the system is available at TL7+. If a series of modules tops out at a TL lower than the vessel's TL, assume the highest TL module is available at the vessel's TL. Modules are also rated for other statistics:

Spc: The spaces the module takes up.

Mass: The module's mass in stons.

Cost: The module's price in MCr.

Pwr: The module's power requirement in MW.

In some cases, a module is partially designed by the ship's builder: select a size in spaces, which then determines mass and cost. Some modules have additional statistics like thrust, power output, and fuel consumption; see the individual description for details.

Balanced Arrays

A balanced array of one missile rack, one laser, and one sandcaster per turret is normal for commercial vessels. On average, two sandcasters will buy a ship an additional laser hit before it takes major damage. Lasers are useful offensive/defensive (anti-missile) weapons, while missiles are the most effective purely offensive weapon. Because small ships in combat rarely have urgent tasks for all five bridge crew stations (the Pilot and Gunner certainly will be busy, and the Sensors station also should be, but a distinct Communications station and the Navigator may have time available), one useful technique is to hand off missiles after they are fired to another crew station, using the bridge's lasercomm for guidance and allowing gunners to concentrate on anti-missile/anti-ship fire.

Step 7: Turret and Weapon Bay Armament

Add each weapon's mass and cost to the running total of vessel mass and cost. Turret weapons may occupy a turret space (up to three spaces per turret) or take up space inside the hull (up to three spaces per turret not installed).

Bay weapons may occupy an entire external bay or take up space inside the hull (in an internal weapon bay).

Spinal mounts always take up space inside the hull.

See *Module Tables,* p. 124, for more information.

Step 8: Statistics

Once the various components that make up a vessel have been added together, it will be necessary to figure out what they can *do* . . .

Payload

Payload is:

- The weight of cargo carried. Assume 5 stons per dton of cargo hold (i.e., about 20 lbs./cf) unless you want to recalculate every time these vary. Exceptionally dense cargo may weigh up to 25 stons/dton; this is the maximum the holds can handle without special reinforcement.
- The mass of vessels carried in spacedocks, vehicle bays, and external grapples.
- The mass of all ordnance: missiles, sand canisters, etc.
- The mass of all non-jump fuel.

Total Empty Mass

Total the mass of hull, turrets/bays, armor, surface features, chosen modules, and weapons. This is the vessel's empty mass.

Total Loaded Mass or Weight (LWt.)

This is equal to empty mass plus payload.

Volume

This is the volume of the vessel in dtons, excluding turrets and external bays.

Maintenance Requirements

For any complete module (drop tank, cargo pod, etc.) that is unpowered and has no systems requiring power, an annual maintenance overhaul is usually sufficient to ensure peak performance. However, starships and small craft have different maintenance requirements. Starships require maintenance in an ongoing fashion, while small craft and non-starships not normally in continuous operation require maintenance only on a periodic basis.

To calculate a starship's maintenance requirement, use:

Maintenance = 4.8 × original purchase price in MCr / (square root of actual purchase price in MCr).

The result is number of man-hours per day required for maintenance.

To calculate the maintenance requirement for a small craft and non-starships in temporary service, use:

Maintenance = 20 × (square root of actual purchase price in MCr) / original purchase price in MCr.

The result is the maintenance interval, or the number of operating hours between 4-hour maintenance check-ups.

Customized Maintenance Requirements

Some ships also require more maintenance than other ships. Some require less. For every percentage more maintenance required by a vessel, increase its original purchase price by an equal percentage in the above formula. The reverse is also true. For every percentage less maintenance required, decrease the original purchase price of the vessel by an equal percentage in the above formula. *Note that the actual purchase price remains unchanged for purposes of use in the formula.* If the point system is used via the *Ship's Patron* advantage from ***GURPS Traveller: Far Trader***, increase or decrease the ship's point cost by the same amount, rounding *up*. Note that some shipyards (or even whole polities) may produce ships that require more or less maintenance than normal. Terran ships from early in the Interstellar Wars are known to have required 20% more maintenance.

Example: A particular shipyard produces ships that are known for their low maintenance. The GM decides these vessels require only 95% the normal routine maintenance. The team decides they want one of these vessels – it costs MCr25 as per the design sequence in this book. Using the formula above, 4.8 × (25 × 0.95) / (square root of 25) = 22.8 Man-Hours per day of maintenance. Normal maintenance on a ship costing MCr25 is 24 man-hours per day. GMs may also decide to increase the cost the players have to pay for a ship such as this, but the original purchase price and the actual purchase price must be based on what the ship normally costs as per the rules in this design system.

Total Cost or Price

Add together hull, turret/bay, streamlining, armor, surface features, modules, and weapon costs to get the vessel's cost.

Fitted-Out Cost or Payload Cost.

This is equal to the final cost of the ship once it has been fitted out (p. 26).

Structural Health (HT)

Ships in ***GURPS Traveller*** have a structural Health (HT) statistic to reflect their general condition and resistance to wear, fatigue, and breakdowns. Used ships may have reduced HT due to age and wear (see p. 20). If the purchase price was discounted to 50% or less, reduce HT by 1; 10% or less, reduce by 2.

A ship's basic HT is [75 × (internal space in dtons / loaded mass in stons)] + 5, rounded to the nearest whole number. Maximum HT is 12 or the ship's overall TL, whichever is higher. Multiply "internal space in dtons" by 0.1 for super-light frame, 0.25 for extra-light frame, 0.5 for light frame, 1 for medium frame, 2 for heavy frame and heavy asteroid frame, 4 for extra-heavy and extra-heavy asteroid frame, and 8 for super-heavy asteroid frame. See p. T:FT75 for more information.

Hit Points

Record hit points for the hull and each bay or turret. A hull, bay, or turret's hit points are its area × 1.5. Multiply this result by 0.1 for super-light frame, 0.25 for extra-light frame, 0.5 for light frame, 1 for medium frame, 2 for heavy frame and heavy asteroid frame, 4 for extra-heavy and extra-heavy asteroid frame, and 8 for super-heavy asteroid frame.

Damage Threshold

This is the point at which the ship takes major damage. Vessels designed with medium frames suffer a Major Damage result every time cumulative damage to the hull reaches a multiple of 10% of their hull points (HP), as per p. GT169. For vessels with other frame strengths, this "damage threshold" is different. It is equal to the hull's HP multiplied by 1 for super-light frame, 0.4 for extra-light frame, 0.2 for light frame, 0.1 for medium frame, 0.05 for heavy frame and heavy asteroid frame, 0.025 for extra-heavy and extra-heavy asteroid frame, and 0.0125 for super-heavy asteroid frame.

Step 9: Performance and Design Finalization

The final step in starship design involves computing performance and miscellaneous statistics. These bits of information will be handy during game sessions, where pilots will need them to fly their vessel!

Jump Number, Air Speed, and Space Acceleration

These statistics are determined as on p. GT159. To determine drag for airspeed calculations, divide surface area by 10 for superior streamlining, 20 for excellent streamlining, or 40 for radical streamlining.

Space Acceleration and Reaction Drives

If a vessel uses a reaction drive, it can only accelerate for a limited amount of time before running out of fuel. The accounting unit used to determine how long a vessel can accelerate is called a G-Round, or GRd for short. Calculation of GRd formulae is only necessary if a vessel uses a reaction drive; most vessels use reactionless thrusters. The GRd formulae determine the average acceleration over the complete burn time afforded by the available fuel on board. See *G-Round Calculations*, below, for the formulae used to calculate GRds.

G-Round Calculations

For reaction-drive ships only, this statistic measures how long a ship can accelerate without running out of fuel. The format is *A G R GRds*. *A* is the vessel's maximum space acceleration in gravities; *R* is the number of gravities of acceleration that can be used before the vessel runs out of fuel.

A is reaction drive thrust in stons divided by (ship loaded mass in stons minus half the mass of reaction drive fuel in stons). This reflects the fact that drive fuel will be burned away as the ship accelerates, and thus gives an average result without much complication.

R is the spaces of fuel carried for the reaction drive divided by the drive's fuel consumption in spaces per hour, multiplied by *A* times 3.

Each space combat round, subtract the acceleration in G used by the ship from its remaining G-Rounds. When G-Rounds reach zero, the ship is out of reaction drive fuel and can no longer accelerate.

Example: A ship has a reaction drive with a thrust of 54 stons and a fuel consumption of 188 spaces/hour; the ship has a loaded mass of 600 stons. It carries 282 spaces of hydrogen fuel for its reaction drive; hydrogen masses 1 ston per space, so the fuel masses 282 stons.

A is 54 divided by [600 – (282/2)] = 0.12 G.

R is 282 (fuel spaces) divided by 188 (fuel consumption per hour) times 0.12 (A) times 3 = 0.54.

Its GRd statistic is written as 0.12 G 0.54 GRds. If the vessel accelerates at 0.1 G for two rounds, its GRds drop to 0.34.

Missiles are also rated in GRds; instead of fuel, they use electricity stored in power cells.

Underwater Performance

There may be occasions where the underwater performance of a spacecraft will be relevant (System Defense Boats hiding deep in the ocean, for example). In ***GURPS Traveller***, ships with vectored reactionless thrusters capable of more than 2 G of thrust, very good or better streamlining (see p. 29), and total compartmentalization (see p. 30) are assumed to have the equivalent of a submersible hull. A submersible hull is required for most underwater operations, but ships without one may still be able to function in this environment. For more information, see *Submerged Performance,* p. VE132.

There are two key parameters for underwater performance: Maximum Speed and Crush Depth.

To calculate Maximum Speed underwater (uSpeed), first determine:

Hydrodynamic Drag = 944 × cube root of (Total Displacement × Total Displacement).

Then:

uSpeed in MPH = 76 × cube root (Thrust/Drag).

Total Displacement is in dtons and Thrust is in stons.

Crush depth in yards is 10 plus the DR of the hull or turrets (whichever is lower), multiplied by 0.75 for super-light frames, 1.5 for extra-light frames, 3 for light, 6 for medium, 12 for heavy, and 24 for extra-heavy. Divide this final result by the size modifier of the ship (p. 28). If the ship does not have a submersible hull or the equivalent, divide again by 2. In ***GURPS Traveller,*** this supersedes the formula on p. VE133.

Underwater Action

UV and rainbow lasers have 1/500 their listed range underwater, X-ray lasers 1/1,000, and plasma and fusion guns are useless. TL8+ missiles use their uSpeed statistic as calculated above and can travel for one hour (though their crush depth is quite shallow). If combat occurs in this environment, ***GURPS Traveller: Ground Forces*** is recommended for the shorter combat rounds and distances involved.

Batteries

Up to 10 turrets, or 30 spaces of hull-mounted weapons, may be linked together to form a *battery,* aimed and fired by a single gunner. This is normally done to increase firepower and reduce crew requirements. All turrets must be on the same side of the ship and carry the same weapons. Each time the number of *weapons* is doubled, the battery's effective rate of fire is increased by 1. Battery assignments may be changed at will, so long as sufficient gunners are available. Batteries may not mix turrets and hull-mounted weapons. Weapon bays may not be grouped as batteries.

Directions and Numbering

Directions on shipboard can be both relative ("forward of bulkhead 30") and absolute ("the aft airlock").

Direction Terminology

Drive Axis – the principal direction on a ship is its drive axis, a line from the center of thrust of the primary drives through the center of mass of the ship. Some ships may have both a primary and a secondary drive axis if they have more than one drive configuration; if so, the primary drive axis is almost always meant.

Deck Orientation – Ships are defined as *belly-landers* if their main deck is parallel to the drive axis, or *tail-landers* if perpendicular. Belly-lander designs are common among freighters; this configuration maximizes the area for cargo hatches in proximity to a dock. Belly-landers are also suited to lifting-body designs for streamlining. Military and scientific vessels, and those designed purely for zero gravity, are often tail-landers (e.g., the Laboratory Ship, p. GT145, and Mercenary Cruiser, p. GT139).

Fore and Aft – Forward (fore) is in the direction of the drive axis (toward the nose); after (aft) is in the opposite direction, toward the "tail" of the vessel.

Port and Starboard – The left and right sides of the ship, respectively, always determined while facing forward. The term "port" refers to the Solomani custom of placing the primary airlock (and hence, access to the starport) on that side; Vilani-influenced designs show no particular preference.

Dorsal and Ventral – the top (back) and bottom (belly) of the ship, while facing forward and with port to the left. On tail-landers, port is arbitrarily defined by the location of the main airlock; ventral, starboard, and dorsal subsequently are defined from there.

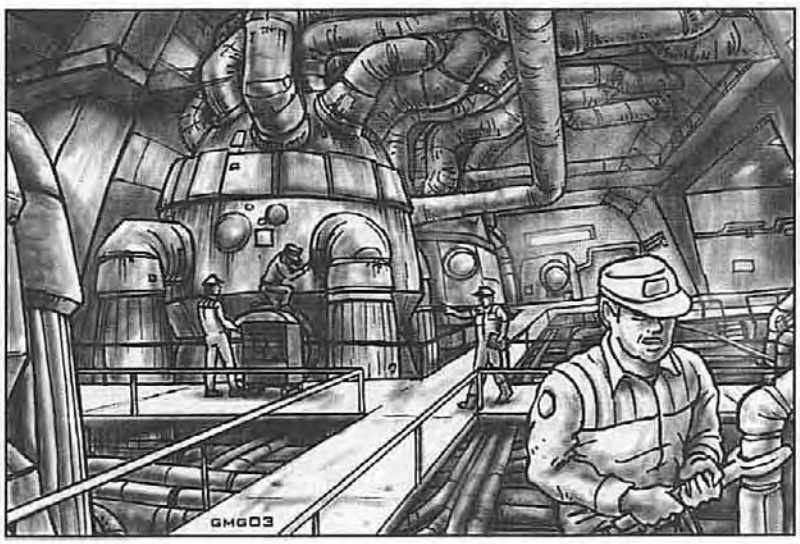
Outboard and Inboard – Outboard is away from the drive axis; inboard is toward the drive axis.

Numbering

Starships have many identical components located throughout the hull; when it is important to distinguish them clearly, a standard numbering system is used. Odd numbers are used on the port side, even numbers on the starboard. Numbering is consecutive, in order from inboard to outboard, fore to aft, dorsal to ventral. Items on the drive axis are numbered after any others of the same type.

For example, the cabins on a *Beowulf*-class free trader (pp. GT132-134) are numbered thusly: starting on deck 1, from top to bottom on the deck plan, numbers 1-3-5 on the left (port) side and 2-4-6 on the right (starboard). On deck 2, the captain's cabin on the port side is #7, while the double occupancy cabin is #8 and the remaining crew cabin #10 (the low berth compartment could be called #9). The two drive units are #1 on the left and #2 on the right; the dorsal turret is #1, the ventral turret #2.

Different ships may have slightly different conventions, and all components should be clearly labeled in any case to prevent confusion. But when the chief engineer tells a crewman to "cut off power to the #3 drive, and hurry!" he should at least know where to look!



Crew and Passengers

All (non-sentient) starships require a crew to operate and maintain the ship. In general, the crew of the ship must provide enough personnel to operate all machinery and man all weaponry. The actual number of crew personnel required for the ship is based on the drives, weaponry, and other equipment carried by the ship. If the ship is under 1,000 dtons, then the rules on pp. GT149-150 should be followed. For vessels 1,000 dtons and over, see *Crews on Large Ships,* below.

In general, crew should have a skill level of at least 12 in the skill(s) appropriate to their positions. Good computers can make up for a lot (especially at high TLs); a luxury yacht may be capable of interstellar travel even though nobody aboard knows anything about piloting, astrogation, or the engine room!

If the GM feels a ship is under-crewed, he should assess penalties to appropriate skill rolls, especially in stressful situations when one spacer has to be in three places at once. See p. GT165 for rules on penalties due to additional duties.

Crews on Large Ships

Typical crew requirements are given below, but these are *averages;* actual requirements can vary a great deal. Military ships will have larger crews to allow for multiple shifts and to replace losses in combat. Transports often run with a bare minimum of crew to save money. A civilian yacht might not have anyone with the titles listed below, but somebody needs to do the job. Ships with minimal crews call for talented people since several jobs are doubled up.

Command Section

The ship should have a commanding officer, an executive officer, a computer officer, two navigation officers, and a communications officer. The section should also have some support personnel, ratings equal to 50% of the total officers in the section. On ships over 20,000 dtons, the number of personnel in the command section should amount to five per 10,000 dtons of ship.

Engineering Section

Engineering crew requirements are listed in the descriptions of each drive and power module. Additional mechanics and technicians (life support, electronics, etc.) may be required to meet maintenance man-hour requirements (see p. 106). The section should include a knowledgeable chief engineer, a second engineer, and several petty officers. There should be 10% officers and 20% petty officers.

Gunnery Section

The ship should have a chief gunnery officer and at least one petty officer for each type of weapon aboard. A spinal mount should have a crew of one per 100 dtons of weapon (round to the nearest whole number); bay weapons should have a crew of at least two; turret weapons should have a crew of at least one per battery. The gunnery section should have 10% officers and 30% petty officers.

A weapon cannot be fired in combat unless it has an operator. However, this may be a gunner, a non-gunner operating at default, or a computer. Some weapons may be manned by ship's troops during combat operations.

Flight Section

If the ship has any small craft, it should have a flight-control officer, crew for each craft, and at least one technician per craft. Launch tubes should have a crew of at least 10, which will include a flight-supervision officer and a preponderance of petty officers.

Stewards on passenger liners are often given minimum certification as lifeboat operators for emergency evacuations.

How Many Medics Do I Need?

If a ship is 1,000 dtons or larger, see *Medical Section*, below. For smaller ships, here is a review of the different rules and guidelines.

- ***GURPS Traveller: Far Trader*** says one Certified Medical Technician is required for ships 200 dtons or larger and carrying paying passengers.
- ***GURPS Traveller*** states one Sickbay is required for every 120 staterooms, rounded up. It is recommended that the first Sickbay have two medics and then one medic for each additional one.
- ***GURPS Traveller*** states a medic with First Aid should be carried on ships without Sickbays but carrying passengers. This medic may be a steward with the required training.
- ***GURPS Traveller*** states a medic with Electronic Operations (Medical) at 10+ should be carried on ships to oversee cryogenic freeze capsule (low berth) operations. This may be a steward with the required training.

To sum up: If a ship is carrying paying passengers (awake or in low berth) and the ship is 200 dtons or larger, a certified medical technician is required with Electronic Operations (Medical) at 10+. If the ship doesn't have a Sickbay (or Emergency Aid Station) this medic can also be a steward. One full-time medic for each 60 people aboard is highly recommended. Automeds and chrysalis machines (p. S91) can replace medics, but a ship should retain at least one live medic per sickbay, military sickbay, or per two Emergency Aid Stations (see p. 65).

Medical Section

A chief medical officer, plus one full-time medic or assistant per additional 50 people aboard. Automeds and chrysalis machines (p. S91) can replace medics, but a ship should retain at least one sophont medic per sickbay or military sickbay, or per two Emergency Aid Stations (p. 65).

The rate at which low-berth passengers can safely enter or awake from cold sleep is critically dependent on the number of skilled medics available: one medic at Physician 10+ or Electronic Operations (Medical) 10+ can assist the entry of 12 or revival of 16 passengers per hour (p. GT108). Passenger ships with large numbers of low passengers often cross-train stewards to minimum standards to expedite this process.

Service Crew

The ship itself may have a requirement for additional sections which provide basic services including shops and storage, security (especially if there are no ship's troops aboard), food service, and other operations. Allow two per 1,000 dtons of ship or 100 other crew, whichever is more; three per 1,000 dtons or 100 crew if there are no ship's troops.

Luxury liners often have extensive housekeeping and service staffs for the comfort of passengers; see p. 56.

Ship's Troops

Most ships 1,000 dtons and over have a marine (or military) contingent aboard which ranges in size from a squad to a regiment. The size of contingents can range from three per 1,000 dtons of ship to three per 100 dtons. Such forces are organized according to the standards of the service from which they are drawn, but are assigned to the ship; their equipment should be consistent with the TL of the ship. Ship's troops often fill the role of security forces aboard the ship and are used for military exercises by the ship's commanding officer. They are also used for damage-control parties, manning of some weapons, and boarding actions.

Ship's troops often get bunkroom accommodations, though this is avoided whenever possible. They also require approximately one armory per 20 troops, in addition to special facilities for storing battledress (p. 55) if so equipped.

Specialists

Large ships, especially military vessels, will have full-time officers and specialists for intelligence, liaison, electronic warfare, etc. There may also be science crew, cargo specialists, etc.

Optional Crew

Entertainers of various sorts will be found on luxury liners – sometimes more entertainers than passengers. They may or may not have any actual "crew" skills.

Frozen Watch: If low berths provide enough places for a 50% overage in personnel (including ship's troops, if any), then the ship may have a "frozen watch." Fresh personnel are kept available in low berths for continuous replacement of casualties and battle losses; between battles, the frozen watch can be revived and used to restore lost crew.

Fitting Out

Once a ship has been designed, it is far from ready for flight. A variety of consumable supplies must be acquired, first.

Additional Expenses

Vessels may require these additional expenses not included in their cost:

- Computer programs (p. 70).
- Missiles (p. 52).
- Sand canisters (replacements cost Cr400).
- Spare parts: assumed at 0.1% of original purchase price of vessel per year.
- Berthing costs: Cr100 × hull class per week (or fraction thereof) to land or dock at any starport. For more detailed costs, refer to ***GURPS Traveller: Far Trader***.
- Fuel: depends on required type. See the table below:

Fuel Type	*Cr/dton*	*Abbreviation*
Refined LHyd	350	H
Unrefined LHyd	50	H
Hydrogen/Oxygen	333	HO
Jet Fuel	10,000	J
Metal/Oxide	50,000	MOX
Rocket Fuel	6,667	R
Water	0	W

- Fresh provisions: cost Cr60+ per person per week; required for high-passage accommodations. Also refer to p. 59.
- Annual maintenance: costs 0.1% of original purchase price and two weeks at any Class IV or V starport. See p. 106.

Outfitting the Ship

A starship costs tens of millions of credits, yet some owners will begrudge a few tens of thousands to keep their investment in top shape. Here are a few points to consider when outfitting a new ship.

Auxiliary Equipment

Auxiliary equipment includes every item not part of the ship's basic design. Freight-handling equipment (p. 62) is an investment – a self-sustaining ship is one that can make a profit where others can't. Environmental gear for the ship's locker (see p. 61) and survival gear for the crew and passengers (especially sufficient rescue balls in every compartment) can make the difference between life and death (see p. 116). Finally, buy shotguns and snub pistols enough to equip the crew, for repelling boarders and hijackers *without* frying the bulkheads (see p. 105).

Parts and Stores

Spare parts cost 0.1% of the ship's original purchase price per year; their volume is included in engineering. This is in addition to parts required for annual maintenance (p. 106).

Although ships' life-support systems can produce edible food from algae and mycoprotein, it is not too tempting; the product is a bland-tasting, dry, flaky paste or cake, often gray or brown. Flavor additives (100 single-meal packs weigh 5 lbs. and cost Cr 50) make it more palatable. Vats that produce fauxflesh (a product of artificial tissue-engineering technology) provide real animal protein, but ships with less than 50 staterooms may have room to grow only one variety ("Beef *again*? I'd kill for lamb!").

Fresh provisions are the alternative of choice, and a necessity on any ship intending to carry high passengers. Preserved provisions are 2 lbs., 0.04 cf, and Cr6 per person per man-day. Fresh *real* food ranges from two to four times the price (and up, although at the high end the quality of the product depends more on the Cooking skill of the chef), and has twice the weight and volume. Both are carried as cargo: 2,000 man-days of preserved provisions or 1,000 man-days of fresh food per dton; fresh provisions are also perishable.

Ammunition

Not all merchant ships need to be armed; in the core sectors of the Imperium, armed turrets are not only a waste of space, but attract unwanted attention as well. Ships operating on the fringes or contracted to carry mail, however, need some form of armament. Some captains elect not to buy ammo while they pray their weapons alone will act as a deterrent. Others swap out weapons in bays and turrets when available at starports or planetside.

There is no magic formula for how many missiles and sandcasters to buy. In general, the ship with the most ammo wins; buy as much as possible.

Cash

Don't forget to maintain a cash reserve. Ideally, this should be enough for three months' expenses – but no one ever manages to save that much. Just set something aside for quick speculations, battle-damage repairs, unforeseen equipment requirements, "contributions" to local economies and their officials, and so on.

Hiring Crew

As in most business ventures, personnel can represent the single top expense of a starship operator.

Salaries and Shares

Crew members must be paid monthly, usually at the first port of call each month. Non-player characters must be paid according to the Job Table on p. GT106. Player characters may bargain for better pay rates or elect to accept worse. In addition, crew members may participate with the owners and accept shares in the proceeds of the ship's activities in lieu of all or part of their salaries. Salaries (and shares) should be noted next to names on the crew manifest, though this detail might be neglected on pirate ships.

Working Passage

A starship captain with a crew shortage may fill the vacancy by offering passage instead of wages. Working passage may not continue for more than three jumps or the individual is considered "hired" for standard salary – retroactive to the date he joined the ship. Crew members that work for passage do not sign the ship's Articles; instead, an entry is made in the ship's log detailing the circumstances and terms of the contract. In order to sign on for working passage, the individual must have some expertise in the position for which he is hired (but might not be fully certified). Baggage totaling 2,000 lbs. or one dton is allowed. Working passage costs the individual nothing; he receives passage, room, and board in lieu of salary.

Chapter Three

Hulls

There are four types of hull: streamlined, unstreamlined (the hull type that ***Traveller*** calls "partially streamlined"), dispersed, and planetoid.

Standard hulls are constructed according to the hull tables below; custom hulls make use of several options for more efficient or specialized design.

Streamlined and Unstreamlined Hulls

Many vessels previously seen in the ***GURPS Traveller*** universe used standardized hull designs, either TL10 or TL12 medium frames with standard materials, and either a non-streamlined hull or very good streamlining with a lifting body.

Standard Hull Sizes

The following table is for TL10, non-streamlined hulls:

Hull Class (dtons)	Volume (CF)	Area (SF)	Hit Points	Mass (stons)	Cost (MCR)	Size Mod
10	5,000	2,000	3,000	2	0.1	+6
20	10,000	3,000	4,500	3	0.15	+6
25	12,500	3,500	5,250	3.5	0.175	+7
30	15,000	4,000	6,000	4	0.2	+7
40	20,000	5,000	7,500	5	0.25	+7
50	25,000	6,500	9,750	6.5	0.325	+7
60	30,000	7,000	10,500	7	0.35	+7
80	40,000	8,000	12,000	8	0.4	+8
90	45,000	9,000	13,500	9	0.45	+8
100	50,000	10,000	15,000	10	0.5	+8
200	100,000	15,000	22,500	15	0.75	+8
300	150,000	20,000	30,000	20	1	+9
400	200,000	25,000	37,500	25	1.25	+9
600	300,000	30,000	45,000	30	1.5	+9
800	400,000	40,000	60,000	40	2	+10
1,000	500,000	45,000	67,500	45	2.25	+10
1,200	600,000	50,000	75,000	50	2.5	+10
2,000	1,000,000	60,000	90,000	60	3	+10
3,000	1,500,000	80,000	120,000	80	4	+11
4,000	2,000,000	90,000	135,000	90	4.5	+11
5,000	2,500,000	110,000	165,000	110	5.5	+11
10,000	5,000,000	170,000	255,000	170	8.5	+12
15,000	7,500,000	230,000	345,000	230	11.5	+12
20,000	10,000,000	280,000	420,000	280	14	+12
30,000	15,000,000	360,000	540,000	360	18	+13
50,000	25,000,000	510,000	765,000	510	25.5	+13
60,000	30,000,000	580,000	870,000	580	29	+13
70,000	35,000,000	640,000	960,000	640	32	+14
75,000	37,500,000	660,000	990,000	660	33	+14
80,000	40,000,000	700,000	1,050,000	700	35	+14
90,000	45,000,000	760,000	1,140,000	760	38	+14
100,000	50,000,000	810,000	1,215,000	810	40.5	+14
110,000	55,000,000	870,000	1,305,000	870	43.5	+14
120,000	60,000,000	920,000	1,380,000	920	46	+14
130,000	65,000,000	970,000	1,455,000	970	48.5	+14
140,000	70,000,000	1,020,000	1,530,000	1,020	51	+14

Standard Hull Sizes (Continued)

Hull Class (dtons)	Volume (CF)	Area (SF)	Hit Points	Mass (stons)	Cost (MCR)	Size Mod
150,000	75,000,000	1,070,000	1,605,000	1,070	53.5	+14
175,000	87,500,000	1,180,000	1,770,000	1,180	59	+14
200,000	100,000,000	1,290,000	1,935,000	1,290	64.5	+14
250,000	125,000,000	1,500,000	2,250,000	1,500	75	+14
300,000	150,000,000	1,690,000	2,535,000	1,690	84.5	+15
400,000	200,000,000	2,050,000	3,075,000	2,050	102.5	+15
500,000	250,000,000	2,380,000	3,570,000	2,380	119	+15
750,000	375,000,000	3,120,000	4,680,000	3,120	156	+15
1,000,000	500,000,000	3,780,000	5,670,000	3,780	189	+16
1,250,000	625,000,000	4,390,000	6,585,000	4,390	219.5	+16
1,500,000	750,000,000	4,950,000	7,425,000	4,950	247.5	+16
1,750,000	875,000,000	5,490,000	8,235,000	5,490	274.5	+16
2,000,000	1,000,000,000	6,000,000	9,000,000	6,000	300	+16
3,000,000	1,500,000,000	7,860,000	11,790,000	7,860	393	+17

Custom Hull Sizes

Hulls can be constructed to any size. If a hull class falls between two classes on the table, treat it as the larger class for area, hit points, cost, mass, and size modifier. The volume (in cf) of the new hull is calculated by multiplying the Hull Class (dtons) by 500 (the number of cubic feet assumed to be in a space).

Options

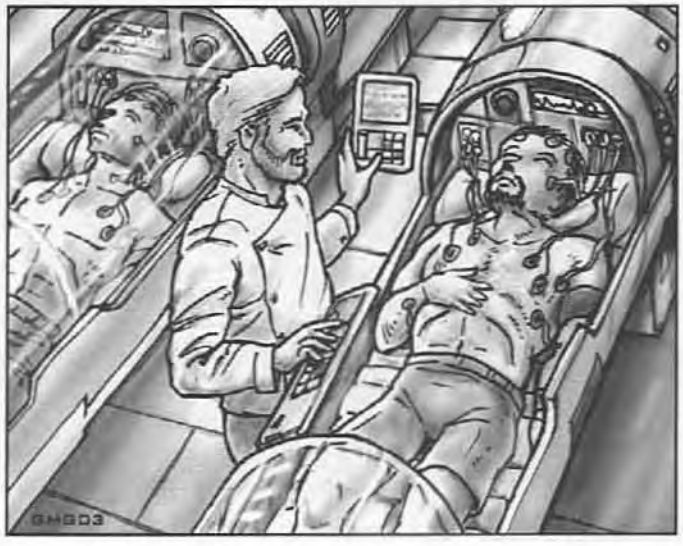
The naval architect can vary several structural factors, depending on the vessel's intended purpose.

Frame: Most *GURPS Traveller* vessels use medium frames, but other types are possible: racing vessels are often super-light, while warships are frequently reinforced. Multiply cost, mass, and HP by the values on the table. Ships with high accelerations, external cradles, or other abnormal loads should have heavy or extra-heavy frames to handle the additional stress this places on their hulls if gravitic compensation is below the acceleration the engines can provide. Hit point thresholds for determining major damage is not affected by frame strength (this means vessels with heavier frames will typically take more major damage before becoming disabled). See Chapter 2.

Materials: Most *GURPS Traveller* vessels use standard materials, which represent the optimum balance between mass and cost. Where one of these factors is overwhelmingly important, different materials can be used. Multiply mass and cost by the values on the table. All starports have standard materials readily on hand and are tooled to work with them. Starports may not have other options available; it will add to the construction time (and thus cost, at GM's discretion) if they have to retool for it.

TL: Improving materials technology reduces structural mass, as indicated on the table. TL10 hulls are the standard against which all others are measured.

Streamlining: Standard *GURPS Traveller* vessels have either no streamlining or very good streamlining. All streamlined vessels are lifting bodies (like the Space Shuttle or "flying wings" – see p. VE11). Better streamlining increases



a vessel's atmospheric speed. Multiply hull cost and internal spaces by the values from the table.

Tech Level

	7	8	9	10	11	12+
Mass	3	2	1.5	1	0.75	0.5

Frame

	Super Light	Extra Light	Light	Med	Heavy	Extra Heavy
Cost	0.1	0.25	0.5	1	2	5
Mass	0.1	0.25	0.5	1	1.5	2
HPs	0.1	0.25	0.5	1	2	4

Materials

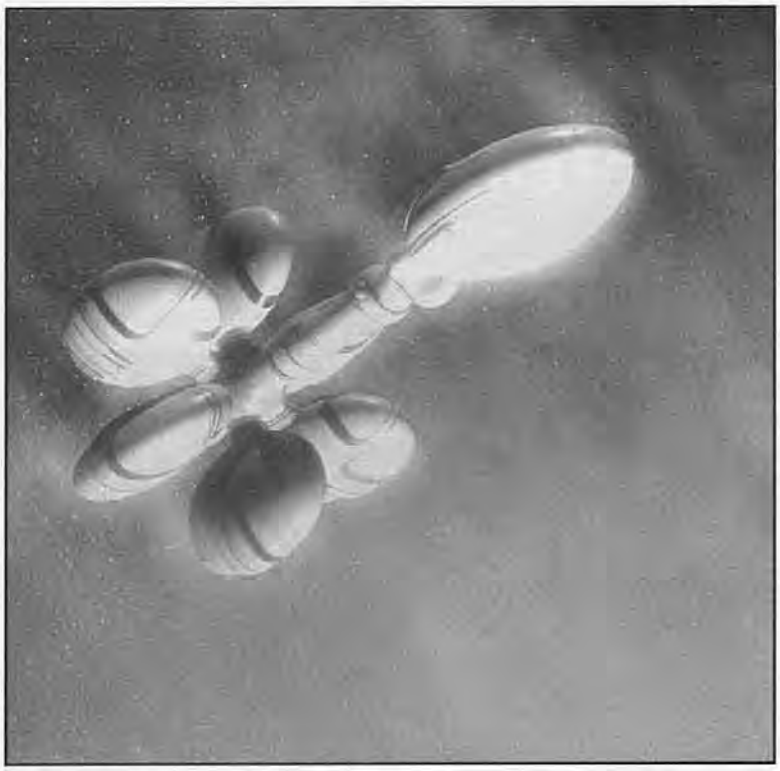
	Cheap			Exp.		Advanced
	Very Cheap		Standard		Very Exp.	
Cost	0.2	0.5	1	2	5	10
Mass	2	1.5	1	0.75	0.5	0.375

Streamlining

	Unstream.		Superior		Radical
		Very Good		Excellent	
Cost	1	2.4	3.6	6	12
Spaces	1	0.8	0.77	0.74	0.71

Compartmentalization

Vessels are already divided into airtight compartments with interior walls and pressure doors. For extra weight and cost, vehicles can have Heavy Compartmentalization (adds 10% of hull mass to total weight) or Total Compartmentalization (adds 20% of hull mass to total weight). Either type costs MCr0.01 per ton of weight added. Effects of compartmentalization are outlined on p. 31.



Robotic Ships

For a ship that can be run completely by computer, double hull cost (cumulative with the above modifiers) to include the necessary systems and internal data highways to enable the vehicle to be controlled entirely by a robot brain (see pp. VE61-63). A robotic ship still requires routine maintenance which can be performed by a human crew or with a crew of generic tinker-bots as described in ***GURPS Robots***.

Robotic vessels are severely restricted by Imperial safety regulations (starships cannot legally be operated on interstellar flights without a crew, for instance). There is nothing to prevent robotic provisions being added to a *crewed* ship, however; this represents a high degree of automation in the ship's systems. Robotic ships are commonly used as in-system gas and ore haulers on routine runs.

Other major powers and most independents have similar restrictions. The Hiver Federation is the notable exception: Hivers make extensive use of robotic vehicles and spacecraft.

In situations where a crew is required on a robotic ship, add up the total crew required to operate the maneuver drive as per the individual modules. The number of crew needed is the square root of the total, rounded up to the nearest whole number. This should also be done for the jump drive and the combination gravitics system if installed.

Dispersed Hulls

A dispersed hull is a structure with a minimum of open frame armor, to which components are attached. The hull itself cannot be sealed or pressurized; instead, separate sub-hulls are constructed and attached to the frame to provide pressurized environments. Dispersed hulls are common at low TLs (to save weight) and for military and commercial jump tenders, because a dispersed hull can launch and recover all carried craft at once.

Select a hull from the hull table; this provides the framework. Dispersed hulls cannot be streamlined or have any sensor masking or radiation shielding.

A maximum of (DR 100 × structural hit point factor) of "open-frame" armor may be added. Open-frame armor protects normally against collisions but provides no protection against explosions, beams, bullets, or other small projectiles (optionally, there is a 2 in 6 chance of hitting the frame). Open-frame armor has 20% of normal weight; since cost is based on weight, this makes it 20% as expensive.

All inhabited portions of the ship (bridge, engineering, staterooms, and any component with a power requirement) must be installed in pressurized sub-hulls. Turrets and weapon bays need not be included, as they already constitute separate compartments. Total all pressurized systems and design a single "hull" to contain them. This "hull" is framed (often of super-light strength), armored, and sealed normally. Total Compartmentalization allows this "hull" to be divided into as many sub-hulls as desired. The sub-hulls may be stealthed and cloaked at basic or lower levels (though it is pointless because the rest of the hull cancels any benefits gained). Sub-hulls may not have any other external surface features (hardpoints, external cradles, etc.) or streamlining, as they are contained within the primary hull. This sub-hull is still considered part of the overall vessel and not removable. It therefore does not require any special mounting hardware.

Planetoid Hulls

A planetoid may be used as a hull; they are available for the finding in any system with an asteroid or planetoid belt.

Planetoid hulls must be sealed, but may not be streamlined, nor have any sensor masking above basic. The inexpensive nature of planetoid ships would appear to be their major attraction, but they do provide other benefits, such as relatively inexpensive (though bulky) armor protection.

Hull: Select a hull from the hull table (or design a custom hull) using Medium Frame, Standard Materials. Multiply by the following factors:

Frame	Heavy	Extra Heavy	Super Heavy
Mass	18	24	36
HPs	2	4	8

Super-heavy frames are only available for planetoid hulls. They represent a hull that is mostly solid nickel-iron with compartments hollowed out of it.

Armor: Multiply DR by (surface area × 0.00035) to get armor weight in stons; planetoid armor is free. Minimum DR is 100; maximum DR = surface area.

Alternatively:

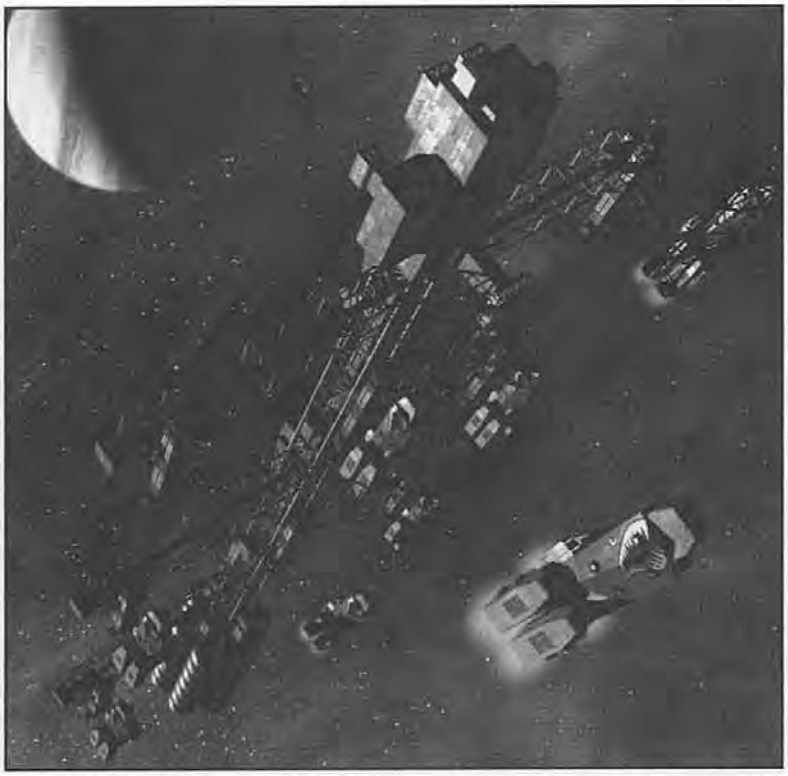
Planetoid DR = (armor weight in stons × 2,857) / surface area.

Planetoid hulls must still be sealed.

Cost: Starports charge a higher fee for "wrangling" a suitable planetoid, especially if it is located in a remote or dangerous system. Finding and moving a planetoid can kick off an adventure revolving around ship construction! Cr100 per space for hollowing, plus Cr2.5 to Cr40 per space for bringing in the planetoid.

Compartmentalization: Heavy Compartmentalization weighs 10% of hull mass; Total Compartmentalization weighs 20%. These don't have to be hollowed out (obviously), but they do count against the transportation cost. Their weight counts against the empty weight of the ship.

Volume: Unlike most vessels, the structural framework, armor, and compartmentalization of a planetoid hull are too bulky to ignore. Add up the total weight of the frame plus compartmentalization, divide by 125, and round up to get the number of *internal spaces* occupied by solid nickel-iron; these spaces are not available for other systems. Divide the total weight of armor by 125 to find its volume in spaces. Again, these spaces are not available for other systems.



Armor

Standard ***GURPS Traveller*** vessels use expensive metal armor. Select the DR level and material for the vessel's armor, then calculate the mass and cost. Metal armor is assumed to occupy no volume; planetoid armor is treated differently (see p. 31).

Armor Type at TL	Expensive		Cheap		
	Advanced		Standard		Mass
Steel or Aluminum Alloy	–	–	7	8	0.00025
High-Grade Steel or Aluminum Alloy	–	7	8	9	0.0002
Titanium Alloy	7	8	9	10	0.000125
Durasteel	8	9	10	11	0.000075
Crystaliron	9	10	11	12	0.00005
Superdense	10	11	12	13	0.00003
Bonded Superdense	11	12	13	–	0.00002
Cost (MCr/ston)	0.04	0.012	0.004	0.002	

Tech Level: The TL shown on the table is the TL at which each type of armor is considered Advanced, Expensive, Standard, or Cheap, respectively. A dash "–" means the armor is not available at that TL.

Mass: Multiply the figure in the table by total surface area and desired DR to get total mass of armor.

Cost: Multiply the cost factor for material and TL by total mass to get cost.

Surface Features

Surface features are components and options applied to the outside of the hull. They generally do not consume internal space, but almost always add to the vessel's cost and often add to weight.

Sealing

Vessel hulls must be sealed to retain internal atmosphere; crew and passengers will require vacc suits and their own oxygen supply in the very few classes of vessel that do not possess this feature. Multiply total surface area by MCr0.00004 to determine cost. Halve this cost at TL8 and halve it again at TL9+.

Sensor Masking

Warships are generally the only vessels to use sensor masking. A ship may be given *stealth* making it harder to detect by active sensors (like radar) and/or *emission cloaking* to mask it from passive sensors (like infrared). *Infrared cloaking* is an earlier version of emission cloaking. It is effective only against infrared, thermograph, or a PESA using thermograph mode but *not* any other type of PESA. Each type comes in three levels: "Modest," "Basic," and "Radical."

Stealth systems at TL8+ may incorporate, at no extra cost or mass (GM's discretion), a color-changing liquid crystal coating centrally controlled by the ship's computer. Civilian ships sometimes add this feature to their hulls separately and use it for camouflage (-2 to Vision rolls), decoration, or advertising.

Sensor Masking Feature	Mass	Cost	Power
Modest Infrared Cloaking/7	0.0005	0.00003	0
Basic Infrared Cloaking/7	0.001	0.0003	0
Radical Infrared Cloaking/7	0.002	0.003	0
Modest Stealth/7	0.0005	0.00003	0
Basic Stealth/7	0.001	0.0003	0
Radical Stealth/7	0.002	0.003	0
Modest Emission Cloaking/8	0.0005	0.00003	0
Basic Emission Cloaking/8	0.001	0.0003	0
Radical Emission Cloaking/8	0.002	0.003	0
Modest Sound Baffling/7	0.0005	0.00001	0
Basic Sound Baffling/7	0.001	0.0001	0
Radical Sound Baffling/7	0.002	0.001	0
Liquid Crystal Skin/8	0.0001	0.00004	Neg

Weight and cost are each equal to the vessel's total surface area times the number shown on the table above. Weight and cost are halved the TL after the system's introduction, and halved again 2 or more TLs after introduction. A vessel may not have two different versions (i.e. basic and radical) of the same feature.

Each level of cloaking, stealth, or sound baffling has a bonus associated with it. Modest is (TL-4) / 2 (round up). Basic is (TL-4). Radical is 2 × (TL-4). The bonuses for IR Cloaking and Emission Cloaking while in space are halved.

Infrared (IR) Cloaking subtracts its bonus from rolls to determine the success of IR sensor scans. Emission Cloaking subtracts its bonus from rolls to determine the success of passive sensor scans. IR and Emission Cloaking have no effect on vessels propelled by fusion air-rams or any other rocket.

A vessel with modest stealth has rudimentary smooth contours, but can pass as an ordinary design. A vessel with basic stealth has more smooth contours, but can also pass as an ordinary design. One with radical stealth always *looks* stealthy; think of a contemporary B-2 bomber or F-117 strike fighter. Either kind of stealth loses its effectiveness if the vessel has loaded external hardpoints (although empty hardpoints are fine); the vessel regains its stealth bonus after dropping its load. Stealth subtracts its bonus from rolls to determine the success of active sensor scans.

A vehicle with sound baffling is less noisy – system defense boats (SDBs) acting underwater or in a gas giant and atmospheric fighters often have sound baffling to make them harder to detect, but it can also reduce noise pollution! Sound baffling represents a variety of internal and surface measures to reduce the vehicle's noise level. Care is taken to mask sounds emitted from the vehicle, especially those of the engines. Equipment is carefully mounted so its vibrations are reduced. A vehicle with sound baffling may have modest, basic, or radical levels. Radical sound baffling is even more obsessive in its quest for noiselessness: the vehicle's surface may be covered with special tiles designed to degrade sonar detection. At higher TLs, the vehicle surface may actually be shaped to absorb sound. Sound baffling subtracts its bonus from rolls to hear the vehicle or detect it with any form of microphone, sound detector, or passive sonar. Radical sound baffling also subtracts TL-4 from attempts at active sonar sensing.

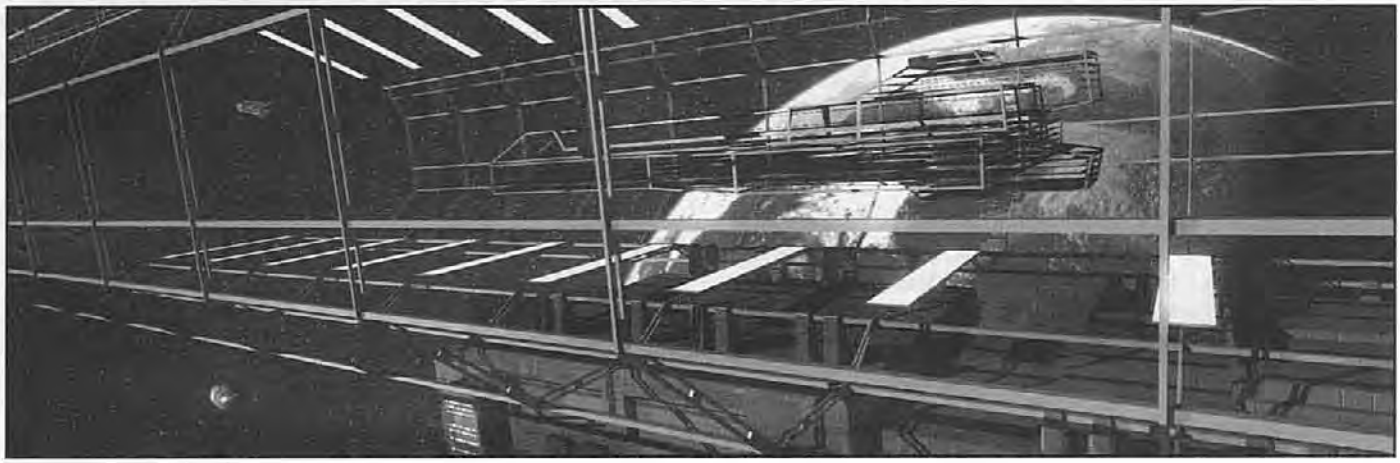
Each of these Sensor Masking options produces the ship's Detection Modifier. If a vessel is attempting to scan a ship with AESA (or another active sensor), its Detection Modifier is its Stealth Modifier. Likewise, its Detection Modifier against passive sensors is its Emission Cloaking Modifier.

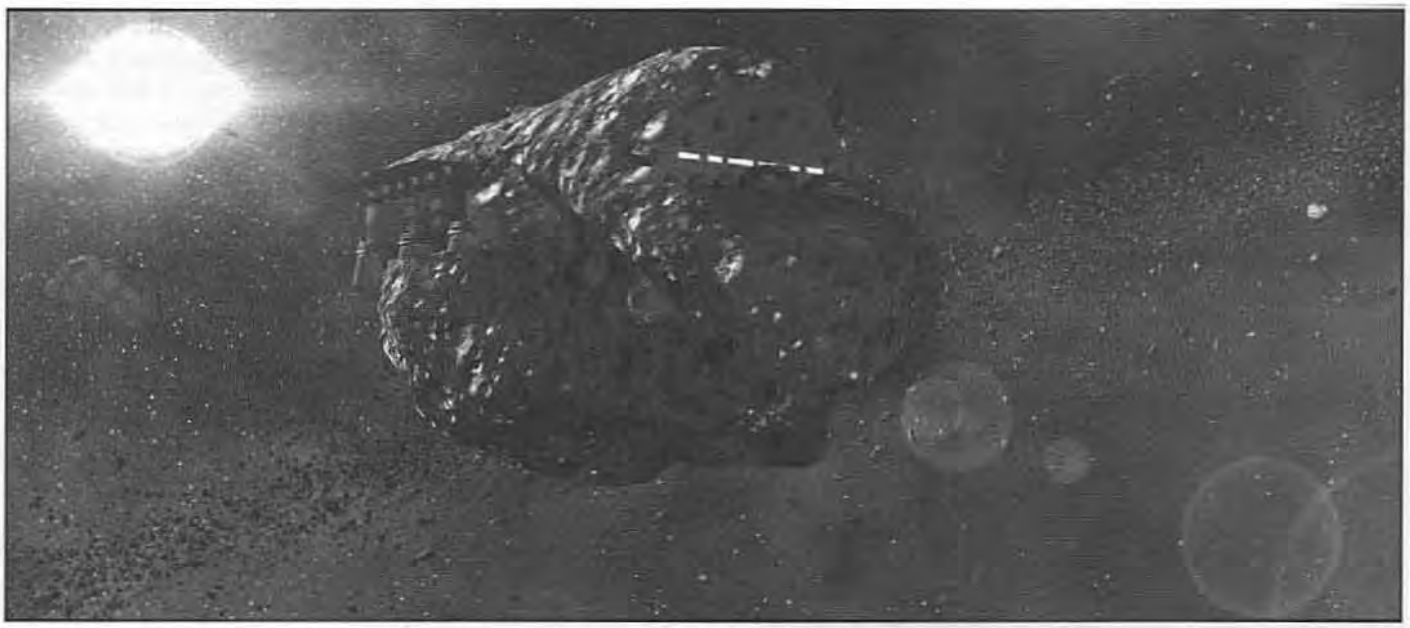
Typically, sensor masking can only be installed when the ship is designed. However, GMs may rule that *Modest* levels of sensor masking can be retrofitted to existing designs. This includes enhancements such as radar-absorbing paint, smoothing out some edges, and various tune-ups to the ship's systems.

Additional Shielding

Vessels likely to face certain hazards may have additional shielding installed. Alternatively, individual compartments may be shielded (brigs, bridges, staterooms, etc.). Find the surface area of individual compartments using the formula (spaces × 500) raised to the 2/3 power, multiplied by 6. The following types are available:

Electrified Surface: This feature is used to keep animals away or discourage people from tampering with the vessel. Conductive wires are embedded in the vessel's hull. The system can be set for "stun" or "kill." When turned on, any uninsulated object touching or touched by the outside of the hull takes 2d damage (if set to "stun") or 10d damage (if set on "kill"). Complete metal armor protects with only DR 1 against electrocution. A HT roll is required if any damage penetrates DR and the victim is still conscious; failure means he passes out for 25-HT turns (seconds). Electrical damage is covered more fully on pp. CII138-139.





Turning an electrified surface on or off can usually be accomplished from the bridge or main security station; it can be disabled from engineering or when the vessel loses power. An electrified surface can be designed to activate when an alarm system detects tampering with the locks or (if appropriate) by an operational Anti-Hijack program.

Radiation Shielding: Radiation shielding is typically ignored in ***GURPS Traveller*** but included here as an option. Detailed radiation rules are given on pp. S104-106. A vessel's hull has a natural radiation protection factor (PF). This is based on the DR of the hull facing the radiation. DR less than 100 gives PF 2. DR 100 gives PF 10 and every doubling of DR after that increases PF by a factor of 10 (e.g., DR 800 gives PF 10,000). In addition, double the PF if the vessel has superconducting armor, and the radiation is primarily X-rays, UV, or gamma rays.

Additional radiation shielding may be added if desired. PF for one layer is 10 at TL7, 100 at TL8, 1,000 at TL9-10, 10,000 at TL11-12, and 100,000 at TL13+, which adds to the natural PF above. Architects can add as many layers of shielding as desired, subject to the limitations of weight and cost.

Psi Shielding: Interferes with the use of telepathy (friendly or hostile) through the hull of the ship. Psi shields protect exactly as if it were a Mind Shield used by a telepath with a skill of 3 and a Power of (TL-2) × 2 (see p. B167).

Thermal Superconductor Armor: This coating may only be added over armor. It doubles DR up to an additional +DR 250 against shaped-charge (HEAT and HEDP) explosive warheads, lasers, X-ray lasers, and high-energy (plasma and fusion) weapons.

Shielding Feature	Mass	Cost
Electrified Surface	0.0001	0.00001
Radiation Shielding	0.001	0.00003
Psi Shielding/8+	0.00005	0.0001
Thermal Superconductor Armor/11+	0.000125	0.00025

Multiply mass and cost by the total surface area of the vessel. Weight and cost are halved 1 TL after the system's introduction, and again 2 or more TLs after introduction.

Turrets

Turrets come with a roomy built-in crew station (seat and console) with computer terminal and a Heads-Up Display/Weapon Aiming Computer (HUDWAC); at TL8+ they include a pupil scanner. Note that even though batteries of turrets (p. 24) do not require crew stations, naval experience has shown it is prudent to include them, anyway. If centralized battery control falls victim to battle damage, the only thing that might save a warship is crew members rushing to the turret stations and manning the weapons the old-fashioned way . . .

Turrets have three spaces available for weapons external to the main hull and consume one space internally for rotation room and the crew station. Pop turrets consume four spaces internally and three spaces externally when extended.

See p. 19 for more information on turrets. Turrets are Size Mod +5.

Weapon Bays

Weaponry in bays may be of five different types: meson guns, particle beams, high-energy weapons (plasma and fusion guns), repulsors, and missile racks. Bays don't come with crew stations – these crew stations are built into the actual weapons installed in the bay.

Small external bays have 50 spaces available for 50-ton bay weapons external to the main hull and consume 10 spaces internally for rotation space. Large external bays have 100 spaces available for 100-ton bay weapons external to the main hull and consume 20 spaces internally for rotation space.

If used as a sort of pop turret, small external bays consume 60 spaces internally (weapon space plus rotation space) and 50 spaces externally when extended. Large external bays consume 120 spaces internally and 100 spaces externally when extended.

Small internal bays have 50 spaces available for 50-ton bay weapons and consume 50 spaces internally. Large internal bays have 100 spaces available for 100-ton bay weapons and consume 100 internal spaces.

See p. 19 for more information on weapon bays. Weapon bays have a Size Mod equal to that of a vessel of their volume.

Modular Sockets

A modular socket is a space *in* a vessel designed to accept different component modules, and to allow them to be changed as needed without a shipyard facility or extensive reconstruction. A modular socket is rated for the exact volume of the module it can accept. It has no weight but costs MCr0.25 per dton. Its volume is exactly equal to its capacity. Modular sockets are available in half-space increments. The modular component (what fits in it) costs 20% more than its base cost.

External Store Mountings

External stores are anything carried outside the main hull and not stored in turrets or external bays. If a vessel does not have grav compensation, install enough mountings to hold the expected "weight" of the stores. This is determined by multiplying the mass of the stores by the expected acceleration of the vessel. This could result in small cradles capable of fitting large stores if the vessel is quite slow.

Hardpoints

Hardpoints are reinforced points on the exterior of a vessel's hull to which external stores such as drop tanks, missiles, or equipment pods are attached and jettisoned.

Each hardpoint (which is actually a set of related fittings) is rated for the maximum weight it can carry – its load capacity. Within these weight limits, a single hardpoint can be loaded with *one* drop tank, weapon, or equipment pod.

If a vessel will have hardpoints, determine how many it will have and the load capacity of each. Control over all of a vessel's hardpoints (which includes firing weapons) must be assigned to one of the vessel's crew stations, typically the pilot's.

The total weight of all hardpoint loads may not exceed (0.01 × the ship's hit points) in stons. Each hardpoint weighs 0.05 stons and costs MCr0.0002 per ston of load capacity. Hardpoints are assumed to be "tapped," allowing the vessel to draw liquid hydrogen from drop tanks and provide power to pods containing electronics.

Performance (jump number, acceleration) for ships with hardpoints must be calculated separately with and without external stores. Each 100 spaces of external stores on hardpoints obscures the arc of one turret. Each 1,000 spaces obscures the arc of one bay or 10 turrets. In either case, the weapons may be hull-mounted in lieu of losing their arcs completely.

Because hardpoints are generic and can carry any store within their weight limit, the stresses associated with atmospheric flight are unknown. Ships mounting loaded hardpoints may not enter an atmosphere without destroying the hardpoint and the stores attached. For atmospheric flight with external stores attached, see *Modular Couplings*, *Intrinsic Couplings*, and *External Cradles/Grapples*.

Modular Couplings

Modular couplings are linkages commonly used to affix a module to a modular craft. These linkages are simple connectors, far less elaborate and expensive than the robotics found in an external grapple. Conversely, modular couplings are not automated; a freight handler usually performs manual attachments and detachments. Modular couplings are also "dedicated" – only a module of the same "standard" can be attached to a given modular coupling. The most common standard in the Imperium is the "cutter coupling," used by the 30-ton modules for the modular cutter. Coming in a distant second is the "freight coupling" used by the standardized containers described on pp. T:FT56-57.

Modular couplings are designed exactly as *hardpoints* except they are dedicated to a specific external store.

Any couplings installed on a small craft take up the space normally available for a turret (but see *Intrinsic Couplings*, p. 35) due to the strengthened mechanical connection. For ships of 100 dtons or greater, each 100 stons of modular coupling *capacity* takes up the space usually available for one turret.

The standard coupling includes data and power leads. A "dead" coupling can be installed for half the cost of a linked coupling. For double cost, a linked coupling can be *remote-controlled*, allowing the modular ship operator to detach (but not attach) a module from his crew station. A linked coupling can be made *explosive* for 5 times normal cost; this allows the module to be released by remote control, though this disables the coupling until it is repaired.

The modules themselves require no extra cost or weight to fit a given coupling standard.

Intrinsic Couplings

Standard modular couplings simply tack the module to the hull of a ship, much like a TL7 fighter plane attaches weapons under its wings. An intrinsic coupling makes space for the module within the general outline of the modular ship itself; the module is "inserted" into its coupling like a battery into a radio.

Intrinsic couplings *quadruple* the weight of module a given coupling can carry because the module is held more snugly by the hull of the ship carrying it.

Several factors offset this advantage. First, an intrinsic coupling must be rated for dtons as well as stons of capacity. Thus, the standard modular cutter's intrinsic coupling must carry a 30-ton module. Modules of smaller size may be carried, but the coupling will have only one-quarter its usual weight capacity.

Second, a ship with intrinsic couplings may have restrictions placed on its sAccel rating when it is not carrying modules. The ship's structural integrity is just as dependent on the module as the module's fastening is dependent on the ship's structural integrity. To determine the sAccel limit of a ship with intrinsic couplings, divide the dton capacity of all intrinsic couplings by the displacement of the ship before the couplings are added. Look up the result on the table below:

dton Ratio	sAccel Limit
0.01 or less	None
0.011-0.5	3
0.51-1	2.5
1.01-1.5	2
1.51-2	1.5
2.01-2.5	1
2.51 or more	0.5

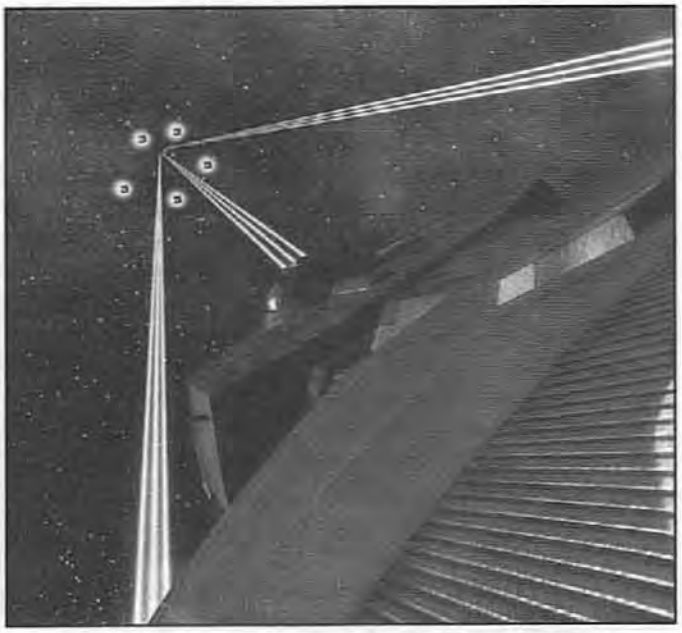
Each time the vessel exceeds its sAccel limit, the pilot should make a Piloting roll at -3, with a further -1 per 0.2 G over the limit. Roll once per hour for extended periods of high acceleration. Every failed roll does 6d×50 damage to the vessel's hull, bypassing armor.

Ships with two or more intrinsic couplings will have several sAccel limits, depending on whether all or some modules are missing. Modules in place count as host-vessel displacement when comparing empty intrinsic capacity to host-vessel displacement.

Third, in almost all circumstances ships with intrinsic couplings are considered to displace their own hull displacement *plus* the displacement of their intrinsic couplings. Therefore, the 50-ton modular cutter rates as 50 dtons of small craft when carried by another ship, whether or not the cutter is carrying a module. Standard Imperial practice is to even call the ship by this expanded displacement.

Intrinsic couplings must be added when a ship is designed; they cannot be retrofitted. They do not displace turret capacity as do standard modular couplings.

Example: The 50-ton module cutter is designed as a 20-ton small craft. This gives it 4,500 hit points. Its maximum intrinsic-coupling capacity in weight is up to (4,500/100×4) or 180 stons. We calculate that its intrinsic coupling will have the maximum 180 stons of capacity with (of course) 30 dtons of volume capacity. The coupling adds 2.25 stons to the cutter's weight and MCr0.009 to its cost. The craft now will be designated as a "50-ton" modular cutter, even though in combat it will be targeted as a 20-ton vessel (the 30-ton module would be targeted separately, unless using the alternate rules from ***GURPS Vehicles,*** p. 177). Dividing its 30 dtons of module capacity by its 20 dtons of hull size gives a dton ratio of 1.5, which limits sAccel to 2 G when a module is not carried. The cutter also takes up space as a 50-ton craft in all circumstances, unless a generous GM allows crafty space hands to stack cargo carefully around its odd configuration.



External Cradles/Grapples

These are multi-functional grapples capable of holding a wide variety of items – asteroids, small craft, cargo containers, etc. (for external craft in recessed vehicle bays, see p. 63). Each cradle consists of strong electromagnets, gravitics, or soft clamps attached to cables and winches, matched with articulated buffers to protect the hull. One cradle module holds an object of up to 125 stons on the outside of the ship's hull; total cradle capacity can be divided among as many actual cradles as desired but a cradle assembly can only hold one object. Cradle systems can be installed in increments of 1/2 space. Objects in cradles are not counted against the ship's internal spaces, but must still be included in jump drive requirements. They are also not protected by the ship's armor.

Grapples can also be used remotely, launched by a low-powered gas jet and attached to their target using Professional Skill (Grapple Operator). This provides rated force to pull objects toward the ship. Acceleration is pulling force divided by the mass of the smaller object (thus it is rarely necessary to have more capacity than the weight of the ship on which grapples are mounted); maximum speed is 4 yards/second. Stopping the grappled mass in zero-g is another matter, requiring the cradle's buffers or (for properly aligned, streamlined vessels) landing gear.

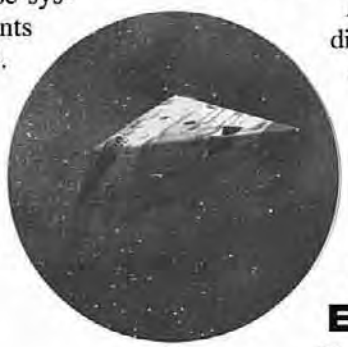
External cradle systems count against the turret-mounted weapons limit at a rate of one turret per three spaces.

Chapter Four

Propulsion, Power, and Fuel

Propulsion systems are the heart of any vessel – without them, a hull is just a cold, immobile hulk. Drives move the ship through space (or jump space). The power plants in engineering provide energy in the form of electricity; engineering and life-support systems also maintain a habitable environment inside the ship. Fuel systems collect, process, and store fuel used for jump and maneuver drives.

The number of engineering personnel on a vessel depends on the quantity and type of these systems installed. Specific crew requirements are noted in the *Module Tables*, p. 124. Add up all requirements (retaining fractions) and then round up to the next whole number. For systems that come in half-sized or small versions, divide all statistics by 2 unless otherwise noted and round any fractional spaces to the nearest 1/2 space.



Engineering Component Modules

Engineering systems package the basic requirements for power and life support into a single module. The power-plant and life-support cores are only the beginning, however. In the modular ship-design system, every module includes a "slice" of power plant sufficient to meet its own energy requirements (crew and passenger accommodations include a similar "slice" of life support). These power-plant slices must be taken into account when computing the total size of a ship's engineering spaces if designing deck plans. See *How Big Is My Reactor?* on p. 15.

Engineering Modules

All ships require a single engineering system (or equivalent); naval vessels often have more than one for redundancy and to allow for maintenance. Each system has a power core (the base "startup" weight, cost, and volume for a power plant) appropriate to the TL, total-life-support core, full fire-suppression system, and a six-man airlock. Included with the airlock is an inflatable 100'-passage tube (armored to DR 20) that can be erected in 30 minutes to connect two airlocks for passenger boarding, cargo transfer, and so on. Some smaller vessels have the same power requirements as larger vessels but have a much more limited volume requirement for their airlocks. The *small* modification (see *Module Tables*, p. 124) reduces the six-man airlock to a one-man version.

Airlocks

All TL13+ modules containing airlocks are assumed to have membrane airlocks to add a bit of a "wow" effect (see *Future Developments*, p. 72). Membrane airlocks are cell-like "curtain" membranes made of bioplastic that are selectively permeable to atmosphere. They work like normal airlocks but take only 2 seconds to cycle. GMs who feel this is too futuristic may assume standard airlocks, instead.

Any airlock rated for more than one person may be divided up into smaller units as needed. For example, a six-man airlock could consist of two three-man airlocks or one two-man airlock and four one-man airlocks. These divisions must be specified at design time (or when designing deck plans) if this level of detail is desired.

Small-Craft Bridge Add-Ons

This system includes a startup power plant, full life support for five, and a two-man airlock. The TL12+ version also includes one bunk. The design is compatible with the hardened bridge option (p. 42). It uses some of the waste space in the bridge systems. A craft with one of these add-ons still requires a Basic Bridge, but does not need an engineering system; this replaces the engineering module.

Power-Plant Cores

These modules are used when installing modules of different TLs in a single ship. The engineering module will, of course, provide the power-plant-core needs of whatever other modules are installed at the same TL as it, but a power-plant core will be required as the basis for the alternate-TL energy sources for other modules of higher or lower TL.

Each module includes one power core appropriate for the TL (fission at TL7-8 and fusion at TL9+) with long-term access space. The TL10+ versions may contain two cores for twice the cost and mass, with no additional volume.

Power Plant Slices

This module contains a power-plant slice of the type appropriate for the TL (fission at TL7-8 and fusion at TL9+) with long-term access space. They are used when a larger plant than the one built by adding the various modules to a ship is desired. A power-plant core of the same TL as this module must be installed. This core comes from either the engineering module or a power-core module.

Naval designers may install extra power capacity for several reasons, including emergency backup capacity, but usually this is done to improve the performance of lasers or other energy weapons. The higher a weapon's RoF, the better chance it has of hitting a target. Each doubling of the RoF increases hit probability by +1 without loss of range or damage capabilities (however, see *Double Fire* program, p. 72). The simplest way to determine how much extra energy is required is to add up the power requirements for each weapon and multiply by the desired RoF doubling. No RoF may be faster than 1/2.

Example 1: To take a 250-MJ Turret Laser from RoF 1/60 to RoF 1/30 (a single doubling), its energy bank requires recharging twice as fast. P. GT157 points out that the usual 60-second recharge takes 11.1 MW, so doubling will require 11.1 × 2 = 22.2 MW. The weapon already has a power slice rated at 11.1 MW, so it requires an additional one rated at 11.1 MW (22.2 – 11.1).

Example 2: To take a 250-MJ Turret Laser from RoF 1/60 to RoF 1/8 is a triple doubling (from 1/60 to 1/30 to 1/15 then finally 2/15, which rounds to 1/8). An energy bank requires recharging eight times as fast: 11.1 × 8 = 88.8 MW. The weapon already has an energy bank rated at 11.1 MJ, so it requires another one rated at 77.7 MW (88.8 – 11.1).

Energy Banks

A rechargeable energy bank is used to provide energy to systems whose transitory power requirements far outstrip the capacity of ordinary power plants. Energy banks are also used to store excess energy that is absorbed by black globes (see p. 50). Ships with any of these systems should be built with energy banks. Energy banks are available in full- and half-sized versions.

Jump Drives (TL9)

A ship requires a jump drive to make interstellar jumps. Each system includes the jump-drive machinery and power slices. Decide on the ship's Jump Drive number to a maximum of jump-1 at early TL9, jump-2 at late TL9, jump-3 at early TL10, jump-4 at late TL10, jump-5 at TL11, and jump-6 at TL12.

The number of jump-drive modules required is based on the ship's total displacement. See *Terminology*, p. 12, for information on total displacement. Whenever the total displacement changes (when jumping without craft carried externally or without other external stores, for example) the jump number must be recomputed based on the new displacement. The number of jump drive modules required is:

number of jump drive modules = 0.01 × total displacement × (jump number+1).

In some circumstances, this formula indicates a fractional value. Round up to the nearest space in those cases.

Short-Term Systems

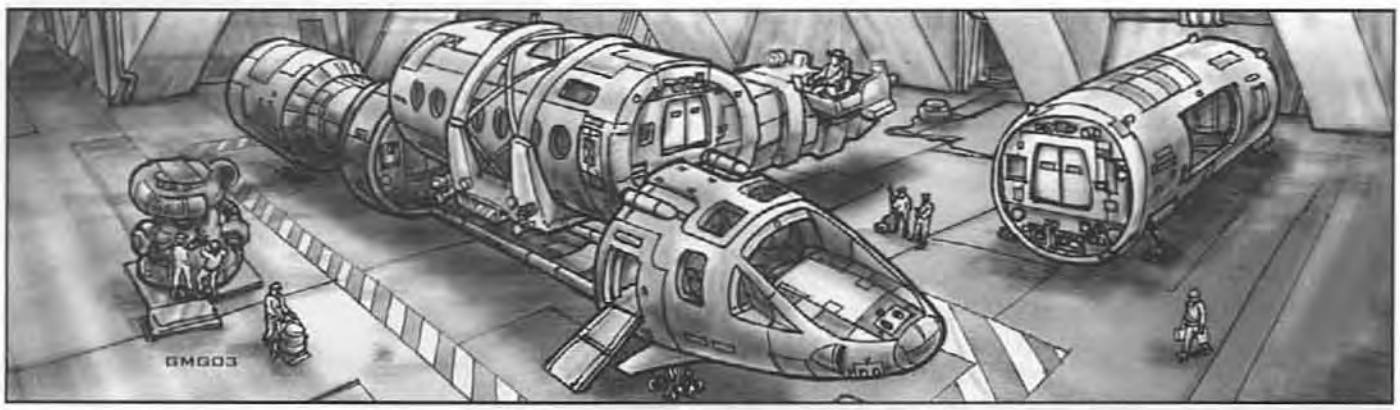
Small craft are generally used solely as short-duration vessels. Short-term modules utilize short-term access space instead of long-term access space. Vessels built with these modules are only serviceable groundside or from within a spacedock, and only when the craft is *not* in use – there is not enough access space within the vessel to get to the required systems. Small craft *do not* have to be built with these systems. They can be (and usually are) built with the normal long-term access modules, instead. Short-term systems start with "ST" to differentiate them from the long-term systems (see *Module Tables*, p. 124).

Reaction and Maneuver Drives

There are two kinds of normal space drives: reaction drives and reactionless maneuver drives. A vessel needs some type of normal space drive to adjust its course through space; even "immobile" space stations and platforms will often have weak drives to make small corrections in their orbits. All normal space drives are available with long-term access and most are available with short-term access for use with small craft.

Maneuver Drives

A maneuver drive (M-Drive) is a reactionless thruster that produces thrust without fuel or reaction mass. Each module has a vectored reactionless thruster and a power-plant slice to run it. Install as many M-Drive modules as desired. Short-term and half-sized modules are available, as well. See *Ships Without Vectored Thrust Engines*, p. GT174, for more information.



Solar Sails

The solar sail, though not really a standard maneuver drive, is a low-thrust space drive that uses the pressure of light (usually sunlight) for propulsion. Its main advantage is it requires no fuel. A solar sail is essentially a very large, ultra-thin steerable mirror. Unlike normal sails, it does not require a mast subassembly.

Light pressure is very slight and varies inversely with the square of the distance from the system's star. As such, a solar sail is most useful within the inner part of a star system. A solar sail can maneuver and propel the vessel in any direction, by tilting the sail and using stellar gravity to assist in changing course.

Solar sails are very fragile. A ship with an unfurled sail cannot use any other form of thrust without damaging the sail, nor can it come within 200 miles of any world with an atmosphere. Furling or unfurling a solar sail is a difficult maneuver requiring one hour to accomplish. A successful Piloting (Solar Sail) roll will cut this time to 15 minutes.

Reaction Drives

The reactionless maneuver drive is the most common form of slower-than-light propulsion in the ***Traveller*** universe, but far from the only one. At low TLs, reaction drives (rockets) of various sorts may be a better option or the only option available. Short-term modules are available for all except the HEPlaR drives and Solid Rocket Boosters. The Solid Rocket Booster has no access space, as it is disposable.

"Reaction drive" is a general term for any drive that involves throwing something out the back of the ship to make it go forward. The limiting factor on reaction drives is reaction mass – the material ejected as exhaust. A drive that uses a lot of reaction mass has limited acceleration, since carrying the reaction mass itself slows down the ship. But a ship which uses little mass, or which can pick up more while traveling, could in time accelerate to speeds approaching light speed.

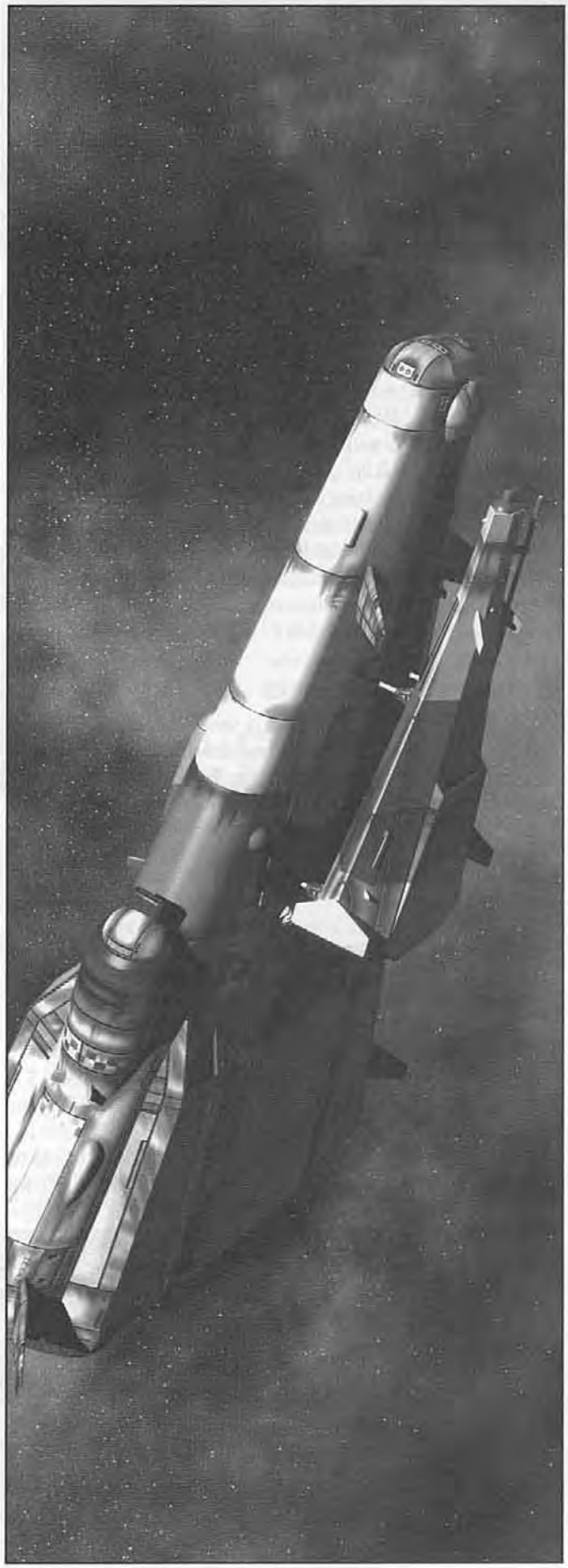
GMs that feel reaction drives are too archaic or too realistic may choose to ignore them completely. Alternatively, they may feel reactionless thrusters are too "super-science" and decide to use reaction drives exclusively (though this can substantially change the flavor of a ***Traveller*** campaign). Early discussions of campaign style can avert the use of inappropriate technologies.

Thrust, mass, cost, and fuel consumption (in dtons per hour) are *per module* of drive. All drives are *vectored thrust* (except the Bussard ramjets). Most are already in half-space increments.

Liquid Fuel Rockets are rocket engines that burn a mixture of fuel and oxidizer, and expel the resulting hot gas exhaust to create thrust. Liquid-fuel rocket engines are quite lightweight, but they are extremely fuel-thirsty.

Fission Rockets utilize a built-in fission reactor optimized to heat reaction mass and expel it to produce thrust. They are heavy and expensive. Their exhaust is also somewhat radioactive. Fission rockets require a Power Core appropriate for the drive TL (see p. 36).

Solid Rocket Boosters (SRBs, or solid fuel rockets) differ from the more advanced models of chemical rocket in that



the fuel is part of the rocket engine. Each module installed either adds 20 minutes burn time or the rated thrust (in stons). Alternatively, the thrust may be doubled, halving burn time. In either case, once the rocket fuel has burned away, the rocket is useless. The remaining weight of the rocket casing is 15% of the fueled rocket and is usually jettisoned. SRBs may be externally mounted in any of the available external mountings (see p. 34). Cradles are generally not used because guidance of the rocket requires control connections. Hardpoints may be mounted on a larger assembly containing the SRBs, to hold the actual spacecraft itself.

Example: If a ship is using a TL8 SRB (providing 7 stons of thrust for 20 minutes) and it requires 14 stons of thrust, cut the burn time of the booster by 10 minutes or add another SRB module. If a thrust of 28 tons (4×) is required, cut burn time to 5 minutes (1/4×) or add three more SRB modules.

HEPlaR drives (High Energy Plasma Recombustion) are an advanced and efficient fusion drive. They add a heat exchanger/recombustion chamber to any existing fusion power plant. Hydrogen injected into the chamber is heated to a plasma state, and then magnetically accelerated further to produce a high-velocity stream of reaction mass. HEPlaR thrusters *do* require input power. They are not available in short-term versions. They incorporate crude, first-generation elements of the technology that eventually becomes reactionless thrusters.

Total Conversion Rockets are a total conversion drive; see *Reaction Drives Table*, p. S117. They convert fuel directly into energy. It is marginally "harder" science than a reactionless thruster, since it does not violate the conservation of energy or momentum. It also requires ships to refuel occasionally even when the jump drives are not used.

Metal/Oxide Rockets burn a watery mixture of metal powder in liquid oxygen (Metal/LOX). The performance is substantially lower than other types, but they are sometimes used because fuel can be obtained by processing asteroids or lunar rocks.

Metal/LOX fuel (MOX) is a cryogenic slurry – the metal element may vary, though aluminum and magnesium perform about equally and are common in asteroids. It is a tricky fuel to burn, requiring tougher pumps and engine parts to resist abrasion from both the metal powder and the exhaust, which is essentially hot, fine sand. The advantage of Metal/LOX is that it can be produced from material commonly available on waterless vacuum moons and asteroids, where hydrogen is scarce.

Atmospheric Drives

Atmospheric drives are typically used at lower tech levels to allow spacecraft access to ground facilities. They are not able to function in a vacuum, so are only useful on worlds with an atmospheric pressure of 0.5 or higher. Short-term modules are available.

Turbo-Ramjets are turbojets with variable geometry inlets allowing them to function as ramjets once the vehicle is moving faster than sound, considerably increasing their thrust. TL8+ turbo-ramjets include turbo-scramjets (supersonic combustion ramjets, designed to operate at very high speeds).

Hyperfans are advanced, hydrogen-burning turbofans. They are common in places where petroleum-based jet fuel is unavailable or too expensive.

Fusion Air Rams are fusion rockets that suck in air, heat it using fusion reaction, then expel it as reaction mass. They operate for 2.5 years on an internal fuel supply. While they only work in an atmosphere, its type or density (beyond a mere trace atmosphere) is irrelevant. The air-ram includes a high-efficiency fusion reactor that serves only to power the engine.

Gravitic Systems (TL8)

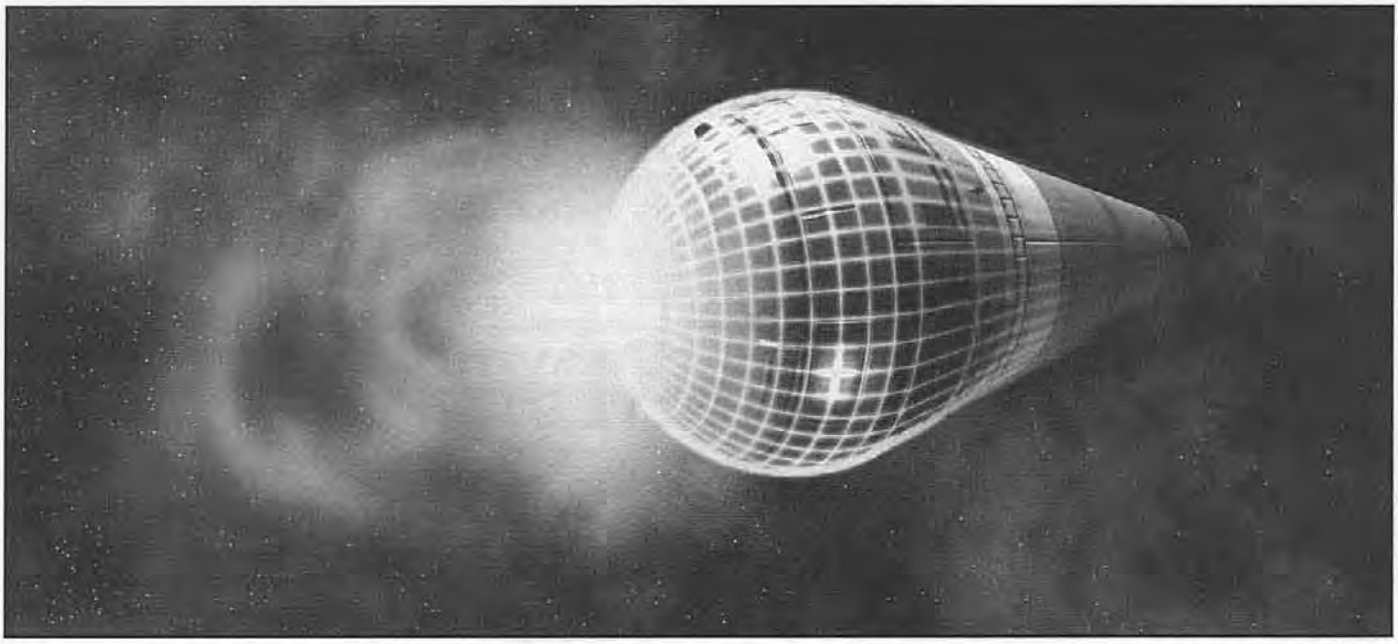
Gravitic systems are the product of scientific insight into the nature of the force of gravity, and the technical ability to manipulate the gravitic force to achieve specific effects, particularly counteracting the felt effect of high-G acceleration.

Maneuvering Without Grav Compensation

GURPS Traveller vessels, if equipped with artificial gravity, are assumed to have compensation for transient high-G maneuvers (see p. GT107). This relieves many of the stresses on the structure of a vessel, allowing it to perform at the fantastic accelerations found in the ***Traveller*** setting. But what happens when a ship suddenly loses this capability? Typically, external stores (cradles, drop tanks, and cutter modules) are at the highest risk as their mountings are usually only sized for the mass of the carried item under 1-G acceleration; exceed this and the mounting has to hold more "weight" than it was designed for. Cargo and stored vehicles may also suddenly "fall" against a bulkhead. The hull can also be affected (dented or even crushed) if acceleration is too high. Crew members may find it difficult to operate, as they are thrown against bulkheads and/or hit with "falling" objects.

A few guidelines:

- Can the crew operate under the high G? G-seats and G-suits help to reduce the effect of high-G maneuvers. See pp. CII131-132 or pp. VE152-155 for more information.
- Each time the vessel exceeds its "safe acceleration limit" (as imposed by the external mountings, p. 34), the pilot should make a Piloting roll at -3, with a further -1 per 0.2 G over the limit. Roll once per hour for extended periods of high acceleration. Every failed roll does 6d×50 damage to the external mountings, bypassing armor. Note this assumes a fully loaded mounting. Once HP have been reduced to 0, the mounting breaks and its payload is lost. The GM should determine if there is further damage caused as it bounces down the hull. External mountings are assumed to have a volume equal to mass/50 unless otherwise specified. Use the method under *Additional Shielding*, p. 32, to determine surface area, then multiply by 1.5 to get HP. Assume cargo containers and vessels stored in spacedocks or hangars are mounted with clamps that can hold twice the "weight" of the item contained; then apply the penalties above, if necessary. Should the item break free, treat this as a collision between the item and any bulkheads that it hits.



• The ship's structure itself has limits on how much stress it can take. The actual calculations and theory are quite intense and not appropriate for this book. As a guideline, if a crew can endure the acceleration, then the vessel can, as well.

Utility Systems (TL8)

This is an artificial-gravity generator that can vary gravity from 0 G to 3 G over a 500-dton volume via deck plating and other similar means. Artificial-gravity units include automatic compensation for transient high-G accelerations (separate "grav compensators" aren't needed) to 3 G at TL8-9, 6 G at TL10-12, and 9 G at TL13+ throughout the same volume. It also includes a two-person airlock. Utility systems are also available in half-sized, or *small*, versions, covering half the rated volume and only including a single airlock. Small craft normally omit utility systems, though there are also short-term versions presented covering 120 dtons (300 dtons at TL13) with a one-man airlock.

The grav compensation covers the total volume capacity of the module, permitting no more than 1 G of stress on structures fitted to the hull. This allows cradles, hardpoints, etc. to be rated at a minimum of 1 G without fear of undue stress from high acceleration. (See p. 39 for information on ship performance without grav compensation). Certain designs will still have other limits, such as those with *Intrinsic Couplings* (see p. 35).

Contragravity Systems (TL8)

Contragravity systems cancel out all natural gravitational forces acting on an object up to their rated lifting capacity, as discussed on pp. GT107 and S120. In ***GURPS Traveller***, where reactionless thrusters are common, such technology is available but only necessary in very specialized applications.

Each module counteracts 450 stons of weight at TL8, 1,500 stons at TL9, and 5,000 stons at TL10+. The module provides no lateral thrust.

Can My Vessel Really Fly?

For extra detail, a ship required to fly in an atmosphere must have enough lift to compensate for its weight. This lift can come from three different locations: the hull (via streamlining), contragravity, or vectored drives. One or both of the latter two are required if unstreamlined ships want to move around in an atmosphere – they don't get any lift from the hull (see *Streamlining*, pp. 17 and GT119).

The minimum required surface area to keep a *streamlined* ship in the air if its contragravity and/or vectored drive cannot totally compensate for the weight is 10 × LMass × square root of (LMass / Thrust), where LMass and Thrust are in stons. This formula indicates how much surface area is needed to stay in the air given the thrust of the vessel in one Earth atmosphere. If the CG or vectored drives can't keep it in the air and the hull's surface area is below this value, the design needs a bigger hull or to add more CG or drives.

Combination Gravitics Systems (TL8)

These systems combine contragravity, artificial gravity, and grav compensation in one module. These can be substituted for standard utility modules on most existing designs to provide contragravity lift on a 2-for-1 basis (two of these replace one existing *Utility Module*, above). Each module covers 250 spaces and provides 400 stons of lift at TL8. This decreases to 300 stons at TL9 (where each individual module becomes more compact, see above), then increases to 450 stons of lift at TL10+.

Fuel Tanks

These systems consist of a tank and appropriate pump mechanisms. They store the liquid hydrogen (H) used by jump drives and the reaction mass used by reaction drives. Strictly speaking, tanks should be required for all bulk liquid or gaseous cargoes, as well.

A ship with a j-drive requires a volume of H equal to its total displacement × jump number × 0.1. Typically, ships have enough fuel tanks to accommodate this volume.

Jump-Fuel Tanks

Ultralight self-sealing internal tanks permanently installed as part of a ship's design, these are available in half-sized versions. If the tank is designed to carry hydrogen, it includes the cryogenic equipment required; if the tank is carrying something other than hydrogen, this additional mass and cost is required to strengthen the tank structurally. Jump-fuel tanks are assumed to have fuel scoops for frontier refueling whether installed in a streamlined or unstreamlined vessel. Mass includes 1 ston of hydrogen fuel, so be sure to subtract it before using other fuel sources.

Collapsible Tanks

A 400,000-gallon collapsible self-sealing tank made of light folding polymers, this expands into an empty Hold or Spacedock module (which are required, to provide support and stability). It holds 120 dtons (and only 120 stons) of fuel when full. It can be installed in half-sized increments. A full tank will rupture and spill during maneuvers at least 1.5 G greater than that compensated by the utility systems.

Fuel from collapsible tanks must be pumped into the normal fuel tanks before it can be used; thus, a jump made with collapsible tanks may not use more fuel than the capacity of the normal interior fuel tanks. Pumping fuel before a jump takes about three hours. A typical use for collapsible tanks is to allow a short-jump ship to cross a long-jump "gap" in two or more jumps.

Demountable Tanks

Additional tankage can be installed or removed from cargo holds or space docks as required; the process takes 10 man-hours per dton at a suitable maintenance facility, at a cost of Cr10 per man-hour. Unlike the collapsible tanks, fuel stored here does not require pumping to the main tanks before use.

Drop Tanks

Disposable fuel tanks may be added to the ship. These jump-fuel tanks are fitted to the outside of the ship on hardpoints (see p. 34). The result is more interior space available for cargo and passengers, or increased jump number for military vessels. Such tanks may either be retained throughout jump or jettisoned just before jump (assign a -2 penalty to all jump checks if they are jettisoned, due to jump-field interference). Jettisoned tanks can only be replaced at a starport, base, or spacedock, so this operation is only practical on runs to civilized areas or for naval operations.

Drop tanks are constructed as sub-hulls; choose a hull from the hull table (or design a custom hull) and fill it with internal jump-fuel tanks. They need not be armored, but are very vulnerable to damage if not; military drop tanks normally carry at least DR 100. Drop tanks are often constructed for half price (using the "Cheap" quality option) if designed to be disposable. (The tanks themselves may be recovered, but are often irreparably damaged during the drop operation.)

Because drop tanks must be attached to hardpoints to jettison properly, there is a built-in limitation on the amount of fuel carried this way. This limit is highly dependent on the mass of the tank. See *Hardpoints*, p. 34.

Reaction Mass

A ship that uses a reaction drive requires fuel tanks in addition to those required for the jump drives.

To determine how many hours a particular reaction drive will operate, add up the total consumption of the drive in dtons and multiply it by the desired duration in hours. This is the total size of the fuel tank required (see *Module Tables*, p. 124). To increase the drive's endurance, add additional tankage. Liquid hydrogen from a starship's jump-fuel tanks can be used as reaction mass (and vice versa), but using too much may mean the ship cannot jump!

R-Mass Type	Cr/dton	ston/dton	Fire	Abbrev.
Refined LHyd	350	1	13	H
Unrefined LHyd	50	1	13	H
Jet Fuel	10,000	10.8	13	J
Metal/Oxide	50,000	20	13	MOX
Rocket Fuel	6,667	16.7	13	R
Water	0	15	0	W

Fire is explained under *Damage Control*, p. 116.

Fuel Collection and Purification

The hydrogen that starships use in their jump drives may be the most common element in the universe, but it isn't always the most accessible. Specialized equipment is often necessary to procure liquid hydrogen for a jump, or to refine it to remove destabilizing impurities.

Fuel Processors

This module purifies raw fuel (skimmed from a gas-giant atmosphere or from another source), turning it into refined fuel. Fuel processors use catalytic grids and molecular filters to extract the hydrogen from gas-giant atmospheres. Each system can process 1 dton (TL8), 3.5 dtons (TL9), or 8 dtons (TL10+) of raw gas-giant atmosphere every hour. Half-sized versions are available.

Some ships install combination electrolysis/processor modules that can more efficiently "crack" water and ice. Each module cracks 1/3 dton of water into 1/2 dton of liquid hydrogen (H) and 1/4 dton of liquid oxygen (LOX) and it refines 3 dtons of unrefined fuel per hour (1 dton at TL8). When finished, the ship should jettison the water or the hydrogen – or store each in separate fuel tanks.

Dedicated fuel-electrolysis systems are also available, though they are not as common as fuel processors except at low TLs due to their power consumption. Each module cracks 2/3 dtons of water into 1 dton of H and 1/2 dton of LOX.

Each system also includes necessary power components.

Chapter Five
Controls, Sensors, and Electronics

Spacecraft require sensors, controls, computers, and communicators. For safety, most spacecraft carry three redundant computer systems; these are included in Bridge and Cockpit components. Select the required electronics from this section and add them to the design.

Bridge Systems

The vessel's control, navigation, sensor, and communication systems are in the Bridge. All ships require at least one bridge system; larger vessels sometimes have an auxiliary bridge. Three types of bridge system are available: Cockpit/Systems, Basic Bridge, and Command Bridge.

Cockpit/Systems

A Cockpit/Systems component module is used on small craft instead of separate Bridge and Engineering modules. It provides two crew stations with computer terminals and HUDWACs, compact fire suppression, two advanced radar/laser detectors, one laser communicator, one radio communicator, a flight data recorder, one IFF, one inertial-navigation system, three microframe computers (Complexity TL-4), precision navigation instruments, active and passive sensors, a radscanner on all TL9+ versions, power startup, and a one-person airlock and two man-days limited life support.

The *Command* version is used on long-range fighters; it includes one hardened computer (Complexity is TL-2) and two hardened backup computers (Complexity is TL-3). It also has sensors and communications as listed for a Command Bridge of the same TL, except that it has only *one* communicator of each type. Full life support for two and two bunks are included for extended-patrol missions.

The *Light* version is a smaller, cheaper cockpit, with reduced sensor ranges. It is designed for short-duration commercial roles where sensor ranges and long-term pilot activity are not a key factor (e.g., orbital interfaces, runabouts, lifeboats, small private crafts). It occupies a niche between grav vehicles and full spaceships, as normal cockpits tend to cost far too much for private ownership of spacecraft.

Basic Bridges

A Basic Bridge is typical of civilian ships. It includes five crew stations with computer terminals and HUDWACs, full fire suppression, two advanced radar/laser detectors, one laser communicator, two radio communicators, a flight data recorder, two IFFs, two inertial-navigation systems, three mainframe computers (Complexity is TL-3), precision navigation instruments, and active and passive sensors. A radscanner is included at TL9+; one meson communicator is part of the system at TL11+.

Command Bridges

Some ships, especially military ships, will install a larger and better-equipped Command Bridge. It includes 10 crew stations with computer terminals and HUDWACs, full fire suppression, two advanced radar/laser detectors, four laser communicators, 10 radio communicators, two flight data recorders, two IFFs, two inertial-navigation systems, three macroframe computers (Complexity TL-2), precision navigation instruments, and active and passive sensors. At TL9+, the Command Bridge includes a radscanner; at TL10+, one meson communicator is included.

Bridge Options

Throughout the Imperium and beyond, there are many different bridge configurations. Below are just a few.

Compact: Bridges can be made more compact by removing crew stations. This is often done with command bridges on smaller military vessels to save space. For every *two* crew stations removed, reduce the size of the bridge by 0.5 spaces and the mass by 0.04 stons. There is no reduction in cost. If desired, bridges can add additional seating by increasing space and mass at the same rate.

Thermograph/LLTV: This option replaces the PESA sensor system in any of the above (except Command Cockpit/Systems) with Thermograph and LLTV of the same rating. This modification is common on low-end commercial ships.

Thermographs are high-resolution infrared sensors. Treat a thermograph as Infravision (p. B237) but there is no -1 penalty for night combat (or the darkness of space) and an extra +1 to Tracking bonus.

Dumb: This reduces complexity of all computers by 1.

Genius: This increases the complexity of all computers by 1. As this is an expensive option, it is typically only used by the military for high-precision targeting systems.

Hardened: All bridge/cockpit computers can be "hardened" (e.g., fiber-optic backup), making them immune to radiation (see *Radiation Shielding*, p. 33, and *Turret Particle Beam Weapons*, p. 48). The higher the TL, the more resistant even unshielded electronic gear becomes, though. Rad levels equivalent to an EMP kill are as shown:

TL	Rads
7	100
8	200
9	500
10	2,000
11+	10,000

Bridge Systems Modifications Table

System	Th./LLTV Mass	Th./LLTV Cost	Dumb Cost	Genius Cost	Hard Mass	Hard Cost
Cockpit/7	0	0	-0.114	2.28	0.6	0.48
Cockpit/8	-0.2	-1.63	-0.228	4.56	0.3	0.96
Cockpit/9	-0.187	-1.14	-0.057	1.14	0.3	0.24
Cockpit/10	-0.188	-0.838	-0.029	0.57	0.15	0.12
Cockpit/11	0.125	-0.375	-0.029	0.57	0.15	0.12
Command Cockpit/10+	0	0	0	49.4	0	0
Light Cockpit/7	0	0	-0.114	2.28	0.6	0.48
Light Cockpit/8	-0.017	-0.235	-0.114	2.28	0.6	0.48
Light Cockpit/9	-0.02	-0.294	-0.057	1.14	0.3	0.24
Light Cockpit/10	-0.019	-0.293	-0.029	0.57	0.15	0.12
Light Cockpit/11	0.013	-0.127	-0.029	0.57	0.15	0.12
Basic/7	0	0	-0.48	11.4	1.5	2.4
Basic/8	-0.338	-2.17	-0.48	11.4	1.5	2.4
Basic/9	-0.375	-1.68	-0.24	5.7	0.75	1.2
Basic/10	-0.425	-1.38	-0.12	2.85	0.375	0.6
Basic/11	0.187	-0.512	-0.12	2.85	0.375	0.6
Basic/12	0.188	-0.512	-0.12	2.85	0.375	0.6
Command/7	0	0	-4.8	114	12	24
Command/8	-0.525	-2.7	-4.8	114	12	24
Command/9	-0.9	-2.76	-2.4	57	6	12
Command/10	-0.937	-2.99	-1.2	28.5	3	6
Command/11	0.662	-1.47	-1.2	28.5	3	6
Command/12	0.65	-1.47	-1.2	28.5	3	6

Auxiliary Control Stations (Duplicate Controls)

This is a simple auxiliary control station with duplicate controls and a one-person airlock, but no fusion startup, navigation, nor independent life support. Various uses include:

- As another piloting position, similar to a cockpit, for docking the craft or other delicate maneuvers.
- As a security station.
- As a training/auxiliary workstation used to provide training on, or extra assistance with, an already installed module (e.g., Engineering).

Information Centers

A high-tech military-style operations room for 10-20 people, this has workstations, a sophisticated array of electronic mapping and display tables (which function as a fire direction center, p. VE58), plus several dozen digital cameras for video teleconferencing. The system also includes a hardened Complexity TL-2 macroframe computer and 10 terminals for running high-end analysis programs like Expert (Tactics), Transmission Profiling, and Traffic Analysis. It may also be called a *Command Center* or *Tactical Command Center*.

Comm Systems

All Bridges include a standard package of basic communications equipment, adequate for routine operations. Separate communications systems are available for applications with specialized requirements. The Underwater Electronics System (see p. 45) also has a radio.

Communications Suites

Communications suites are designed for vessels requiring additional communications longer-ranged than those included in the Bridges or Cockpits. These are generally found on warships (particularly carriers and flagships) but also have civilian applications.

Communications suites come in *enhanced* and *advanced* packages, and require that some form of bridge be installed on the vessel, as well. The bridge contains the crew stations, which the communications suites lack.

A maser is also known as a tight-beam radio. This is an ultra-high-frequency directional signal or an actual microwave beam. Only receivers within a 20° cone can pick up the signal. Maser signals are often sent up to satellites and then relayed down again. They also have military uses where a radio signal sent in all directions is not desirable.

Communications Systems

Module/TL	Number of Sets/Range (Millions of Miles)			
	Radio	Maser	Laser	Meson
Enhanced Comms/7	3/0.3	1/3	1/0.6	–
Enhanced Comms/8	5/1	2/10	2/2	–
Enhanced Comms/9	5/10	4/100	5/20	–
Enhanced Comms/10	5/50	2/500	1/100	1/1
Enhanced Comms/11	5/50	4/500	3/100	1/1.5
Enhanced Comms/12+	10/50	6/500	6/100	1/2
Advanced Comms/10	10/50	9/500	9/100	1/10
Advanced Comms/11	10/50	9/500	9/100	1/15
Advanced Comms/12+	10/50	9/500	9/100	1/20

Communications Modules (Xboat)

This system consists of a single massive laser communicator, three hardened computers, hardened mass-data storage capacity with double backups (5 TB at TL7, 50 TB at TL8-10, and then ×10 per TL after that), and an independent energy bank (5-hour supply). It is designed for high redundancy: the three computers check each other's results and three sets of data are stored in different locations. The laser communicator is used because of its very high bandwidth. Even with the usual high level of encryption and error correction on the signal, the system can upload or download its entire storage capacity in about an hour. It is used on the Xboat couriers of the Imperial Interstellar Scout Service as well as related ground and space-support installations. See ***GURPS Traveller: First In*** for further details.

The TL10+ versions have Imperial-grade high-security encryption systems. Reduce volume by 1.5 cf, mass by 12.1 stons, and cost by MCr2.44 for systems without the encryption equipment.

Sensor Systems

All Bridges include a package of standard sensory equipment, adequate for routine operations. Separate sensor systems are available for vessel applications that have specialized requirements.

A ship cannot use a sensor system which has a Scan value greater than the ship's Size Modifier +36, because the ship isn't big enough to mount a large enough sensor array. (It may still *install* a system this powerful, as long as the actual lesser Scan is noted.) Dispersed hull structures are an exception – they may mount any size of sensor system. The drawback is that their Size Modifier is increased to (Scan value -36) for detection purposes, due to the inclusion of booms, masts, or periscopes required by the oversized sensors.

Sensor Suites

Sensor suites contain a full array of sensors that extend the capabilities of standard bridge equipment. Some of these systems have a crew requirement that can be filled by regular bridge personnel, instead.

Enhanced and *Advanced* sensor suites each contain large PESA, AESA, and radscanner sensors. They are used to supplement the systems on existing bridges.

Survey Module/Traffic Control contains four sets of 10,000× astronomical instruments, four high-resolution planetary-survey arrays (medium resolution at TL7), a macroframe computer available at TL7-9, a mainframe computer at TL10+, eight crew stations with computer terminals, and a "survey center" featuring sophisticated holographic-projection devices (small movie screens at TL8-). This allows survey specialists to create elaborate visualizations of incoming data. Use of the survey system is detailed in ***GURPS Traveller: First In*** and the traffic-control system in ***GURPS Traveller: Starports***.

Planetary Survey Add-on modules contain one medium-resolution planetary survey array at TL9- or high-resolution at TL10+. Both fit within the waste space of a sensor system.

Astronomical Add-on contains one 200× astronomical-instrument array that fits in the waste space of a sensor system.

Long-Range Sensors (TL8)

These are military-grade sensors typically used on picket ships (vessels that patrol the edges of a fleet). Scan rating and nominal range in miles (divide by 10,000 to get number of combat hexes) is given for each. The PESA and Radscanner systems require negligible power, so they include nothing but the sensor. The AESA systems have the listed sensor and a slice of power plant. They are not mounted in a turret; thus, the ship must be pointed in the direction that they will scan.

Densitometers (TL11)

This device uses gravitic-imaging technology to map the interiors of objects. Effective range is 500 miles at TL11, 1,250 miles at TL12, and 2,500 miles at TL13. A successful Electronics Operation (Sensors) roll is required to make a clear scan, which takes 1 second per 27 cubic feet (18.5 seconds per dton). Failure means the scan must be repeated. When an object has been scanned, the data is stored as a 3D plan on standard computer media (0.037 gigs per cubic foot or 1.85 gigs per dton) accessed via a computer for a "cutaway" view of the object. More powerful versions of this device are available. For each +6 to scan, multiply range, cost, mass, and volume by 10. Power consumption is negligible.

Densitometers are very susceptible to disruption by artificial gravity fields (especially those under constant manipulation). They require special shielding to prevent the artificial gravity field in their *own* vessel from interfering with them. If a vessel is attempting to foil a densitometer scan by varying artificial gravity or contragravity, treat it as *Basic Emission Cloaking* (see p. 31) for defensive purposes. They are considered passive sensors for all practical purposes, but other densitometers can detect their use at 20× range.

Legitimate users might be very interested in a civilian ship carrying such equipment. Some GMs may opt to disallow densitometers in their games as they might too easily detect important clues in an adventure.

Underwater Electronic Systems

This component includes one active sonar system with the active/passive option, one passive system with the towed array option, one passive dipping array with the active/passive option, one roomy crew station, one hardened macroframe computer (a mainframe instead at TL9-), and one computer terminal.

A receive-only very-low-frequency (VLF) radio is also included. Ranges are 300,000 miles at TL7, 1 million miles at TL8-9, 5 million miles at TL10+. Divide ranges by 10 during atmospheric use. Divide ranges by 1,000 during underwater use and decrease capability to 10 characters per second. Typical operations call for the base station to send out a request for a communications link. The underwater craft then initiates a link when conditions permit, via either meson comms or tight-beam laser.

Each module also has a reactor slice to power it and a power cell permitting 5 hours of silent running at TL7-8 increased by 2.5 hours at each successive TL.

System	Range Active/Passive/Towed	Scan Active/Passive/Towed
Sonar/7	21/42/140	19/20/23
Sonar/8	24/48/160	19/21/24
Sonar/9	27/54/180	20/21/24
Sonar/10	30/60/200	20/21/25
Sonar/11	33/66/220	20/21/25
Sonar/12	36/72/240	20/22/25
Sonar/13+	39/78/260	20/22/25

Ranges are in miles.

Electronic Warfare Systems

Space combat takes place in more dimensions than simply the physical plane. Naval vessels must be able to attack and defend themselves from enemies using the electromagnetic spectrum. Electronic-warfare suites provide a wide range of offensive and defensive capabilities. At the ranges of most space battles, the effects of these systems are largely ignored. Let one side neglect its preparation in this arena, however, and their opponents will be quick to exploit the error.

Each suite consists of advanced radar/laser detectors, area jammers, blip enhancers, hardened macroframe computers (Complexity TL-2) with terminals, radio direction finders, radio jammers, 24-hour rechargeable power cell, and two crew stations. The listing for area jammers gives jammer rating/range in miles; the other listings are range in miles. See p. VE59 for further information on electronic-warfare systems. All area-jammer ranges are divided by 50 for use in an atmosphere; other ranges are divided by 10. See the table below for a list of what is included in each module. All ranges are in miles.

Electronic Warfare Systems Tables

System	TL7-8	TL9	TL10+
Adv. Radar/Laser Detector	1	1	2
Area Jammer	1	1	2
Blip Enhancer	1	1	2
Macroframe Computer	1	2	2
Radio Direction Finders	2	4	4
Radio Jammer	1	2	2

System	Area Jam. Rating/Range	Radio DF Range	Radio Jam. Range
Electronic Warfare/7	2/7.5	30K	300
Electronic Warfare/8	4/75	10M	1,000
Electronic Warfare/9	6/750	10M	10,000
Electronic Warfare/10	7/2,250	50M	50,000
Electronic Warfare/11	7/2,250	500M	50,000
Electronic Warfare/12	7/2,250	500M	50,000
Electronic Warfare/13	7/2,250	500M	50,000

Jammer Systems

This component is a smaller version of the Electronic Warfare module. While the general Electronic Warfare component can extend its protection to other vessels, the jammer unit is designed to cloak the carrying vessel alone. It contains a laser/radar detector, area radar jammer, deceptive radar jammer, chaff-decoy discharger (with 40 decoys), infrared jammer, and batteries. See p. VE59 for further information on area jammers. All area jammer ranges are divided by 50 for use in an atmosphere; other ranges are divided by 10. See the table below for specific information on capabilities. All ranges are in miles.

System	Duration Hours	All Jammers Rating/Range
TL7	1.5	6/1,500
TL8	3	6/1,500
TL9	6	7/2,250
TL10	12	7/2,250
TL11	18	7/2,250
TL12	24	7/2,250
TL13	28	7/2,250

Computer Systems

High-speed, high-complexity computer systems are at the heart of any naval vessel, particularly its fire-control network. This is common in large ships, which have a lot of weapons to control and want to be able to run numerous advanced targeting programs. Sophisticated computer systems are also vital to cutting-edge research and numerical analysis.

This system contains eight high-capacity (+50% to number of programs) computers for use in ships requiring more computing resources than the bridge can provide. Complexity of the computers is equal to TL-2.

CHAPTER SIX

Weapons and Defenses

The universe is a dangerous place, and most ships mount some form of armament.

Each ship's turret has room for up to three spaces of turret weapons. Each bay has room for a single bay weapon of the same size; a 50-ton bay mounts a 50-ton bay weapon. Mounting a smaller 50-ton bay weapon in a 100-ton bay is feasible, but the remaining 50 dtons are lost due to the additional bracing required to hold the smaller weapon in place. The "portable" design of bay weapons just doesn't allow the possibility of mounting two 50-ton bay weapons in a 100-ton bay.

Armament need not be specified when a vessel is designed, as shipyards can leave turrets or bays empty for the owner to customize. Merchant ships in safe subsectors or on a tight budget may have empty turrets or mount only one or two rather than the full three weapons. (Crews often find creative uses for the unused 500-1,000 cf, like illicit stills.)

Hull-Mounted Weapons: Turret and bay weapons can be built directly into the hull. Such a hull-mounted weapon takes up space just as if it were a component module. If it is a turret-sized weapon, it is fired from the bridge/cockpit crew stations (often by the pilot). Hull-mounted turret and hull-mounted bay weapons (also called Internal Bays) are assumed to be installed in casemate swivel-mounts enabling them to fire in a 90° arc on one side of the ship (specified during construction).

Spinal Mounts: Spinal mounts are huge weapons built into the centerline of the vessel (sometimes called a fixed mount). They are limited to firing directly forward, and aimed by pointing the ship. A ship can only have one spinal-mount weapon (but multiple fixed-mount weapons).

Pulse Mode: A beam weapon's gunner can use a special computer program called *Double-Fire* to adjust the pulse rate of his weapon to fire at a higher rate at lower power. This "pulse mode" gives an increased chance of hitting a target, at the expense of decreased range and damage. There are three additional rates of fire available beyond the default 1/60; 1/30 (RoF Bonus +8) for 2/3 damage and range, 1/15 (RoF Bonus +9) for 1/2 damage and range, and 1/8 (RoF Bonus +10) for 1/3 damage and range. The last rate is mainly used for point defense. All fractional values are rounded down. Each weapon firing in pulse mode requires a running copy of the program *Double-Fire* (see p. 72). If pulse mode is used for the entire round (instead of just for point defense), the pulse rate must be specified at the beginning of the round.

Turret Weapons

Turret weapons are the universal tools of space combat. Even on large vessels, they still fulfill valuable point defense and close-defense roles vs. missiles and small vessels.

The Imperial Navy, in an attempt to make battlefield swaps between partially damaged and inoperative ships easier, has made 1,500-cf (3-ton) turrets their standard size. Imperial ships only mount turrets of those sizes, and most weapons manufacturers follow suit by only producing weapons to fit the standard Imperial sockets. Custom designs are possible using ***GURPS Vehicles***.

Missile Racks

Missiles are launched from standardized launchers; 250mm missiles are launched from 250mm tubes, while heavy missiles (500mm) are launched from 500mm tubes. These are Imperial standards, and there is no reason to expect other polities to use the same weapons. An easy way to represent this is to decide that a Vargr world (for example) uses 253mm missiles – these are functionally identical to their Imperial counterparts, but will not fit in Imperial launchers (and vice versa, of course). However, the actual diameter of the launch tube itself does not affect its mass, cost, or volume. The same statistics could easily be used to represent a Vargr missile rack of a different diameter.

250mm Missile Racks

A slow autoloading launch tube, rated to fire 250mm, 700-pound, 6 cf (0.35 stons, 0.012 dtons) missiles. Missiles as light as 290 lbs. can be launched from the launcher. The system also includes a laser communicator used to control operator-guided missiles, plus magazine space for 70 missiles at TL7, 75 at TL8, 76 at TL9, and 77 at TL10+. Range of the launcher's laser communicator is six hexes at TL7, 20 hexes at TL8, 200 hexes at TL9, and 1,000 hexes at TL10. Divide ranges by 10 for use in an atmosphere and by 1,000 for use underwater.

Reloading missile racks on any ship smaller than 800 tons is a chore, as the missiles are 11' long. Military vessels, if expected to carry reloads, are usually designed with the cargo hold near the missile magazine to facilitate the transfer of the missiles. Civilian ships usually restock missiles when grounded dirtside or docked at an orbital facility.

The 250mm Missile Rack is the missile rack as described in the ***GURPS Traveller*** core book.

500mm Missile Racks/ EW Drone Launchers

A slow autoloading launch tube, rated to fire 500mm, 4,000-pound, 30 cf (2 stons, 0.06 dtons) missiles. Missiles as light as 2,000 lbs. can be launched from the launcher. The system also includes a laser communicator used to control operator-guided missiles, and magazine space for 10 missiles (8 at TL7). As these missiles are 15' long, the restrictions on reloading 250mm missiles usually apply here, as well. Range of the laser is the same as on the 250mm missile rack. The 500mm missile rack and missile are Legality Class 0 within the Imperium.

This module also doubles as an Electronic Warfare (EW) Drone Launcher. Any number of 500mm missile racks may be grouped together as a dedicated *EW Drone Control Center* – if used as such they are *not* counted as hull-mounted weapons and cannot be used as such. If used in a turret, the 500mm rack may double as a combat launcher and drone controller, but not both simultaneously.

Energy Weapons

Lasers emit powerful beams of coherent light. Most ships mount them as a missile defense; they are the most common weapons on civilian ships due mostly to their long range and high penetration. All versions are available in standard (1 dton) and heavy (3 dton) versions.

Turret Laser Weapons (TL8)

All turret laser weapons are constructed with a cyclic rate of 1/2 and the extreme-range option. A rechargeable power cell provides power for each shot while fusion-reactor components (fission at TL8) generate the power required to maintain the listed rate of fire. The laser is fully stabilized and installed in a universal mount (for turrets) or a casemate mount (if hull mounted). Turrets can fire in all directions, the casemate only to the side on which it is mounted.

Most weapons take up 1 space; the Imperial Navy also uses 3-ton "Heavy" Lasers on some ships to provide more power, range, and damage.

The UV Laser is one of the first ship-mounted energy weapons developed. Its range is very short by ***GURPS Traveller*** standards, being able to reach only 2,800 miles before its full energy dissipates by half. Most TL8 planetary navies mount lasers only as point-defense weapons because missiles are more effective as offensive armaments.

At TL9, lasers are designed to adjust their wavelength for optimal performance in various conditions such as adverse planetary atmosphere, dense fog, obfuscatory smoke, and even underwater. Such lasers are known as "rainbow" lasers. These become the first truly effective starship laser weapons. Their ranges measure in tens of thousands instead of just thousands of miles.

At TL10, lasers capable of X-ray wavelengths are developed. X-Ray lasers are able to penetrate through most conditions that hinder lasers at lower tech levels such as smoke, fog, bad weather, etc. X-Ray lasers can penetrate armor at least twice as thick as armor that can absorb a rainbow laser's damage, which makes them formidable weapons and the standard for most modern vessels.

At TL11, advances in optics technology produce a more powerful beam, and the costs of production are reduced; compact components become reliable and economically viable. TL11 lasers were used extensively by the Zhodani during the Fifth Frontier War, although they were not known to use the "heavy" versions adopted by some fleets in the Imperial Navy. The TL12 lasers used by the Imperial Navy utilize advanced optics and compact components so that they are the most powerful turret-mounted lasers in the Imperial arsenal. A few merchant companies and civilians who can afford them have been mounting TL12 lasers on their ships as well. The heavy version of this weapon is reserved exclusively for the Navy and is not for sale to civilians (Legality Class 1).

Turret High-Energy Weapons (TL9)

High-energy weapons are incredibly powerful. Plasma guns fire bolts of superheated gas, contained in a magneto-dynamic "bottle." Fusion guns are similar but heat the plasma until it is actually fusing – getting touched by a fusion bolt is like skimming a star! Although their magnetic containment decays in a relatively short time, making them viable only as defensive weapons, the powerful bolts are strong enough to blow any missile or drone into slag. They are also very useful in ground attacks – some of these weapons could even give a grav tank a rough time.

Plasma and fusion guns do *Spcl* damage (burn with no damage modifier) to anything they hit. In addition, anything within two yards takes one-quarter the listed damage from splattering hot plasma, and flammable objects will usually catch fire. (This usually isn't a concern on the scale of starship combat, but for ground attacks it may be.) They are identical to the plasma blaster weapons described on p. UT58, except when the output is below 6,400 kJ, the cost multiplier jumps from ×1.5 to ×15.

Turret Particle Beam Weapons (TL8)

This development at TL8 places a particle-beam weapon in a turret or casemate mount. The purpose of this weapon is to provide heavy firepower to patrol or escort craft. Particle beams have the ability to disable electronics (like unhardened computers) due to the radiation they produce. Unhardened electronics are automatically disabled (EMP Kill) when they receive too many rads of radiation. The rads delivered are equivalent to the damage done by the weapon. See *Radiation Shielding*, p. 33, and *Hardened Computers*, p. 42, for more information. The main drawback to this weapon is its short range when compared to lasers of the same tech level.

These particular weapons come standard at 3 tons. However, at TL9+, they may be reduced to 1.5 tons by cutting power, volume, mass, cost, and price in half, cutting damage and distance by 1/3, and dropping Accuracy by 1. This series of modifications was implemented on the *Gazelle*-class close escort, but tests revealed the weapon was rather ineffective except at extremely close ranges.

Particle beams accelerate hydrogen nuclei to relativistic velocities, strip them of their charge, and fire them. P-beams have less range but are more powerful than lasers; plus, sandcasters don't affect them. *Neutral* particle beams are absorbed by atmospheres; particle beams that have been configured to fire *charged* beams aren't absorbed, but will dissipate in space. This makes p-beams useless as orbital bombardment weapons – except against vacuum worlds!

Sandcasters

Sandcasters launch tiny reflective/ablative crystals, commonly called "sand," as a defense against lasers. These crystals are distant relatives of the tiny transparent spheres used to make street signs, reflective paint strips, and the like. Such a sphere will bounce a beam of light back in the direction of the source with a small amount of spread. The advanced crystals used in "sand" work similarly. When the laser first hits the crystal, part of the energy is reflected back in the general direction of the firing ship and the rest is absorbed. As the beads absorb more of the pulse, they heat up and melt quickly. However, in free fall a liquid will keep its spherical shape, so the liquid bead continues to reflect a portion of the energy away. Eventually, the bead will start boiling, the energy absorption jumps dramatically, and it flashes into vapor. This vapor continues to absorb more of the laser pulse until it ionizes and forms plasma. How much the vapor absorbs, and how easily it ionizes, will depend on the composition of the bead.

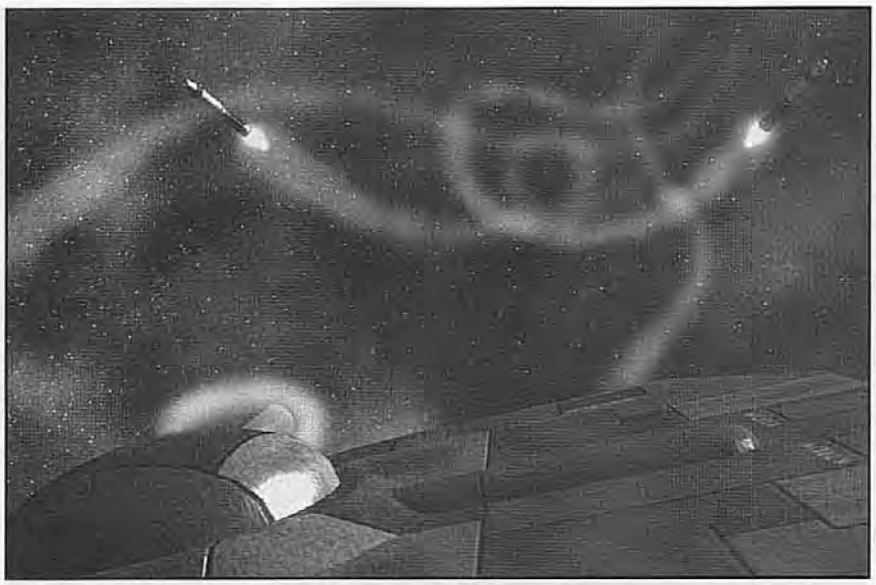
Once it becomes a plasma, it may be very transparent or very absorbent depending on the composition and the laser wavelength. Proper selection of crystal composition causes the plasma to be very opaque at common weapon-grade-laser wavelengths. At higher TLs, the efficiency of the sand continues to increase.

The crystals are shot out of the sandcaster so that a cloud is placed between the ship and enemy vessels that might fire on the ship. A single canister of sand provides the listed "effective DR" against laser attacks coming from a single enemy ship; defending against multiple ships requires multiple clouds of sand. As the sand absorbs an attack, its DR is reduced until it's gone. After each attack, the defender may choose to replenish the sand.

An enemy ship must be detected to be able to properly position the sand cloud. If the enemy isn't located before shooting, the ship won't be able to have sand in place. However, after the first hit, the defenders should know where the enemy is and be able to launch sand to protect against subsequent attacks.

Sandcasters must be targeted vs. a particular enemy vessel (or a group of vessels in *very* tight formation). A sandcaster adds an extra DR 400 vs. all laser fire originating from the targeted vessel, cumulative with armor DR. X-ray laser fire halves sandcaster DR just as it halves the DR of ordinary armor. Multiple sandcasters can concentrate on a single vessel's fire, but each extra 'caster only adds +50 DR. Each sandcaster holds 200 sand canisters.

Sandcasters also have useful melee applications. A sandcaster is treated as a grenade (albeit, a very large one) and does 10d fragmentation (cutting) damage to anyone in range – 300 yards, 30° cone. The base attack roll at point blank range (in front of the nozzle) is 24, -1 per hex distance.



Bay Weapons

Besides the weapon, power supply, and any ammunition, each bay weapon also includes a pair of roomy crew stations for two gunners (though the weapon can be fired by only one person), two hardened and dedicated mainframe computers (Complexity TL-3), a computer terminal, and a HUDWAC with pupil scanner. One of the mainframe computers runs a TL-2 Targeting program, the other runs a skill TL+5 Gunner program (pp. 71 and GT162).

Missile Bays

250mm Missile Bays

A 50-ton bay weapon housing 50 250mm missile racks plus magazine space for 3,500 missiles at TL7; 3,700 at TL8; 3,800 at TL9+. The missile bay can launch and control 50 250mm missiles per turn. This is the missile bay from ***GURPS Traveller***.

500mm Missile Bays

A 100-ton bay weapon housing 100 500mm missile racks plus magazine space for 800 500mm missiles at TL7; 1,000 at TL8-9; and 1,100 at TL10+. The 500mm missile bay can launch and control 100 500mm missiles per turn.

Energy Weapons

Bay weapons come in small (50-ton) and large (100-ton) varieties. Typically, only particle beams, plasma guns, fusion guns, meson guns, and repulsors are mounted in bays.

Particle Beam Bays (TL8)

This is a much bigger version of the turret particle-beam weapon (see p. 48). This powerful weapon is used on most large military ships to support their spinal weapons.

Particle beams were one of the first bay weapons to be deployed in space combat before the advent of meson guns. They are available starting as early as TL8 and improve continuously until TL11, where levels reach their peak and compact components are used to pack more weapon into a smaller space

Plasma Gun Bays (TL9) and Fusion Gun Bays (TL11)

High-energy-weapon bays hold larger, bay-mounted versions of the high-energy plasma and fusion guns. See p. 48.

Meson Gun Bays (TL12)

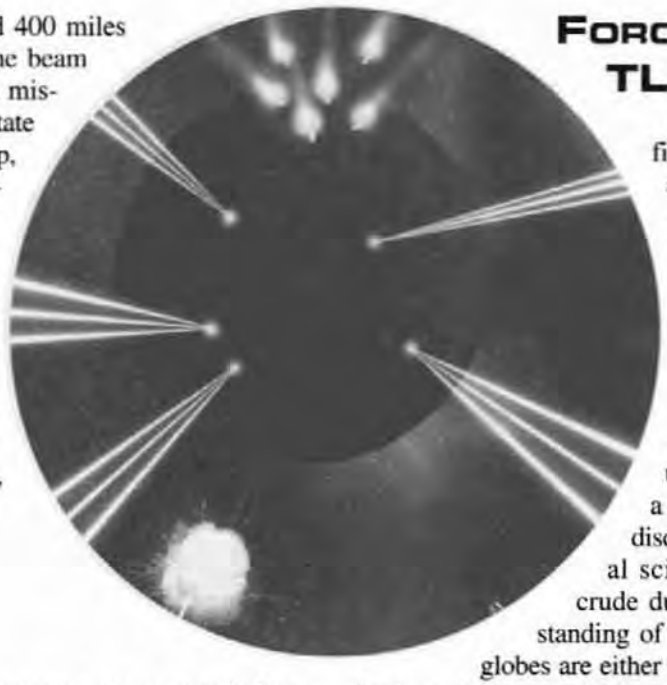
Meson guns use nuclear-damper and particle-beam technology to generate and aim a beam of high-energy mesons (subatomic particles that carry nuclear force). Mesons pass harmlessly through normal matter, but soon decay explosively in a storm of other energetic particles – with precise calculation a meson beam may be created and aimed so this explosion occurs inside an enemy vessel.

Repulsor Bays (Late TL9)

In order to supplement sandcasters and point-defense lasers, some large ships mount repulsor bays for point defense. These bays generate a beam of gravitic energy that can knock missiles off course. Repulsors are bay-mounted weapons and are capable of dispatching multiple missiles in a single round.

When the missile is around 400 miles away, the controller activates the beam and uses it to press against the missile. The missile is forced to rotate and thrust at an angle to the ship, causing it to bypass the defenders. These beams are only effective in the Collision and Point Defense Phase of the combat turn, as their range is extremely limited.

Repulsors are built as a ***GURPS Vehicles*** deflector screen, but their use is slightly different. See *Combat*, p. 104, for information on repulsor use.



Spinal Weapons

The most powerful beam weapons are mounted along the spine of a vessel – in many cases, the ship is literally built around the weapon. Spinal weapons are aimed by pointing the entire vessel, which may limit movement options (see p. 19). Spinal mounts include the weapon, a power slice (usually quite large), a rechargeable power cell (also quite large), one roomy crew station, a HUDWAC with pupil scanner, and two dedicated and hardened macroframe computers. One macroframe runs a TL-1 Targeting program; the other runs a skill TL+6 Gunner program (pp. 71 and GT162). Spinal particle beams are introduced at TL8, while spinal meson guns are introduced at TL10.

Screen Systems

In addition to targeted defenses like sandcasters and repulsors, large warships mount screens that protect against all attackers.

Nuclear Dampers (TL10)

A nuclear damper focuses a field that subtly interferes with the strong nuclear force, causing nuclear warheads to fail to detonate. A spacecraft damper field protects a 10-mile radius, increased by 5 miles each time the number of modules installed is doubled. A nuclear damper system requires four crew members to operate, regardless of the number of modules installed.

Meson Screens (TL10)

A meson screen disrupts incoming high-energy mesons. The system includes a screen generator and fusion-power components. The vessel's DR *vs. meson guns only* is 20.8 million times the number of meson-screen modules divided by its total surface area in sf. A meson screen requires four crew members regardless of the numbers of modules installed.

Force Fields (Late TL12)

Classic science fiction "force fields" or defensive screens come about at high tech levels because of an increased ability to manipulate subatomic particles and forces. Force-field generators project an energy-absorbing shell around a ship, and are known as *black globes*. The Third Imperium didn't acquire force-field technology until the late 11th century, when a cache of Ancient artifacts was discovered. Based on those, Imperial scientists were able to generate crude duplicates and gain some understanding of the technology involved. Black globes are either artifacts installed on a makeshift basis or temperamental experimental models installed on TL12 Imperial warships. The acquisition of any force-field generator is probably the result of a lucky find on the part of a government, individual, or corporation.

Since a black globe absorbs all energy, a ship with its field on is protected from all fire. Black globes store this energy in a capacitor bank. Unfortunately, the force field works in both directions; the ship may not fire, maneuver, or even see anything beyond the opaque darkness (except a few feet of light from the vessel if the GM thinks it's pertinent). These limitations would make the black globe of limited value in battle if not for the ability of the field generator to flicker – switch the field on and off many times per second – giving the ship part-time protection while still allowing it to fire, maneuver, and track enemy ships during the "off" intervals.

Using a black globe: Choose a flicker rate in multiples of 10%, up to the maximum listed for the globe installed. When flickering, the vessel can see normally, but sAccel is reduced by a percentage equal to the flicker rate. A flickering black globe increases the vessel's PD against all attacks, including meson guns, by (flicker rate/10%). If the globe's PD is responsible for an attack missing the vessel, the attack strikes the globe instead. See p. 104 for information on using a globe in combat.

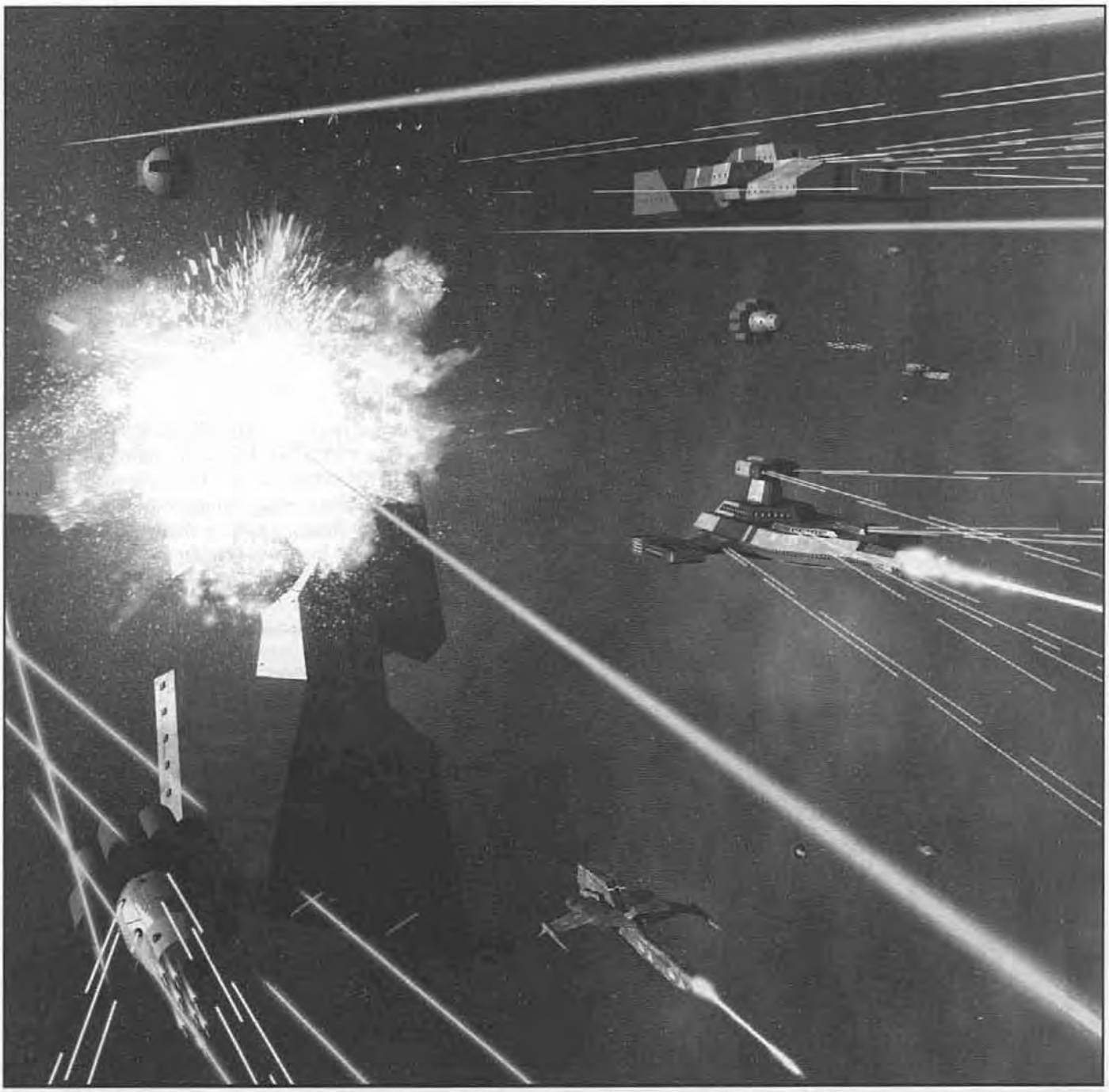
Damage points from attacks that strike the globe are absorbed by the globe's capacitors as hit points. The size of the capacitor bank is critical, as the globe will discharge catastrophically when it overloads. Stored hit points may be drained and converted to energy and stored in other energy banks or used to power the ship's systems (see *Energy Banks*, p. 37). Maximum conversion rate is 1% of capacity per second (240,000 HP or 960 MJ per dton per turn. See *Power Plant Slices*, p. 36, for information on increasing an energy weapon's RoF). Ships that do not have separate energy banks may use their jump accumulators. Each jump-drive module includes accumulators capable of storing 24 GJ (or 6,000 HP). Black globes come with a rudimentary capacitor bank able to store 10,000 HP worth of energy.

If the capacitors ever absorb more HP than their capacity, they discharge, releasing all their accumulated hit points at once against the ship as damage. Hull DR does not protect! The black globe and capacitor bank are automatically destroyed in the explosion.

Invisibility: Since a black-globe field absorbs all energy, a ship with its field turned on *without flicker* is, at any range over a few miles, effectively invisible. In battle, this will have little immediate effect, since a ship that suddenly disappears from enemy sensors in this way will have its current course predicted with 100% accuracy based on its last known position, speed, and facing. If the defenders maneuver to confuse the enemy, it is up to the GM as to how or when attacking ships can detect them. (Of course, the black globe would still show up visually if it had a backdrop of the system's main star, a planet, or even a particularly dense star cluster.)

However, the advantages to a team that has not yet been detected by the enemy are immense. Suppose that a task force were to jump into a system with its black globes on. It could drift unseen past an enemy fleet and drop its screens at a preplanned moment, to bombard a planet or to engage enemy squadrons by surprise. (Of course, this would require some precise pre-jump navigation that the GM might rule is particularly risky to pull off, in order to keep this from becoming a standard tactic.)

Quick Play Option: The preceding expands upon the description of black globes found in ***Alien Races 3***, p. 117. It adds more detail to use this cutting-edge technology. In so doing, it converts the globe's DR value to an ability to absorb hits of damage. GMs who don't desire this extra detail may continue to use the "quick and easy" version of the rules described there.



Chapter Seven
Launched Ordnance

Launched ordnance includes a variety of small, usually unmanned spacecraft. Other than as missiles, these also are used for roles in which larger vessels are unsuitable.

Missiles

The TL10+ 250mm missiles described in this book are usually only found in the hands of the military. All 500mm missiles are reserved exclusively for the Imperial Navy and are not for sale to civilians (Legality Class 0). The missiles from the ***GURPS Traveller*** core book (see pp. GT158-159) are legal for civilian usage within the Imperium.

All TL9+ missiles are semi-autonomous vehicles guided to their target by a gunner to within the range where the terminal guidance system takes over (anywhere from 400 miles to 1,000 miles depending on TL). TL7-8 missiles are handled as on p. GT169. While fire-and-forget missiles are possible, the technological limitations and sheer size of the required sensor system make a guided missile more practical than a completely robotic one. Missiles can cause damage by either exploding close to the target or by impacting the target at a high relative velocity. While some missiles are designed only for impact (or *kinetic*) kills, most missiles contain an explosive charge, giving the gunner two ways of causing damage – this flexibility outweighs the slight performance advantage of a purely kinetic-kill missile. (See pp. VE115-116 for more information on "terminal guidance.")

Missiles at TL7 use reaction thrusters and only have one round of thrust; at TL8+ they use reactionless thrusters and have three rounds of thrust.

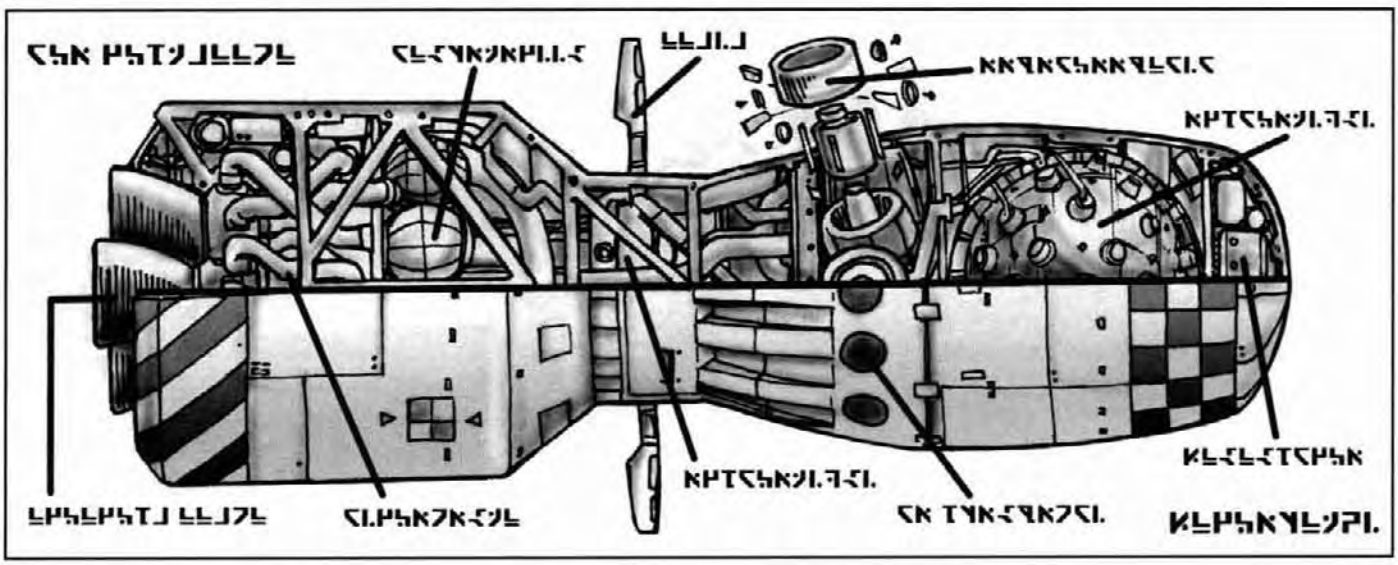
Extra missiles can be carried as cargo. Missile ammunition loaded as cargo will not be accessible during combat, but can be reloaded into missile launchers between battles (this takes about one man-hour per eight 500mm or 20 250mm missiles). Stored as cargo, each 250mm missile takes up about 9 cf (55 per dton of cargo), and each 500mm missile takes up 45 cf (11 per dton).

Missile Design

Missile design has evolved over the last few thousand years. Although there are more highly optimized designs, the designs presented in this book have proven to be the most effective. They are cheap enough to be a viable weapon either singly or in mass quantities, and their performance statistics are optimized in order to accomplish their mission: killing the enemy. However, most importantly, the specifications are generic enough to be built on nearly any planet in the Imperium. This doesn't mean there aren't other designs available. Keep the following guidelines in mind when designing custom missiles:

Nuts and Bolts

All missiles are built with ***GURPS Vehicles*** rules with the exception of the +3 DX boosters on the terminal guidance systems (see p. R10). All TL8+ missiles have the following options: Very Good streamlining, lifting body, standard metal armor and materials, robotic medium frame, basic emission cloaking, basic stealth, sealed, one small dedicated hardened robot-brain computer, one long-range receive-only laser



communicator, a rechargeable power cell for one hour of operation, and a vectored-thrust, reactionless thruster. TL7 missiles are identical except they use IR cloaking, a short-range laser, an advanced battery, and a 20-minute solid-fuel rocket. Missiles are either 250mm or 500mm. TL7-10 missiles use small High Explosive Armor-Tapping (HEAT) warheads; TL11-12 use modest HEAT; TL13 uses normal HEAT. All warheads have the self-destruct option.

All TL9+ missiles have terminal guidance systems consisting of two small hardened robot-brain computers (one with a +3 DX reflex booster) running Electronics Operations (Missile Sensors) and Piloting (Missile), and a cheap Passive Radar Homing (PRH) guidance system. One copy of each program must be purchased for the ship (then copies are downloaded to the missiles) if the terminal guidance system is to be used (program TL must match missile TL). Otherwise, the missiles must be guided manually (p. GT167). The combined programs cost: Cr6,000 at TL9-10, Cr10,500 at TL11, Cr43,000 at TL12, and Cr123,500 at TL13.

Standard Missiles

In the ***GURPS Traveller*** space-combat system, standard missiles maneuver like spacecraft under the control of the firing gunner. In a 20-minute combat round, a missile rack can fire and control one missile; a small missile bay may control as many as 50 missiles, while a large bay can control as many as 100.

When a missile ends its turn in a target vessel's hex, it may intercept and ram the target (doing impact damage) or detonate its warhead – which is typically an explosive-shaped charge. The 250mm missiles have 30 HP and Size Modifier 0; 500mm missiles have 90 HP and Size Modifier +1.

Missile Warheads

Missiles can be given one of the following warheads:

High-Explosive Armor-Tapping (HEAT) (TL7): This is a specially constructed and shaped explosive-charge warhead. It consists of a cone-shaped charge of high explosive which – detonated moments before impact by means of a remote control, fuse, or probe on the tip of the round – will explode in such a way that it transforms the metal liner of the round into a pencil-thin jet of hyper velocity metal traveling at up to the 25 times the speed of sound. The kinetic energy of this jet enables it to penetrate deep into very tough armor. Although the penetrating jet's diameter is very small, it is lethal by virtue of setting fire to fuel or ammunition, boring through vital components, or killing crew members. All missiles come equipped with HEAT warheads by default. Use the base cost on the *Module Tables*, p. 124.

Kinetic (TL9): A basic space-missile warhead; this is simply a dense rod that smashes into a target. A kinetic missile relies on the high relative speed gained from its own motor or from the launching ship's maneuvering. If reactionless thrusters are not available, kinetic weapons get *most* of their speed from the launching ship's maneuvering; their own drives are used mainly for steering. All TL9+ missiles come equipped with kinetic-kill capability in addition to any other warhead installed.

Nuclear (TL8): A fission, fusion, or antimatter explosive (the latter are not strictly nuclear, but possess equivalent effects), nuclear weapons are usually fused for proximity bursts. Typical yields are in the 10-kiloton range (250mm warhead) or 1-megaton range (500mm warhead). Nuclear weapons are of limited utility against capital ships equipped with nuclear dampers. Against smaller vessels (and spreads of missiles), their "one hit, one kill" capability can be devastating. Add MCr0.042 per 250mm missile, or MCr0.064 per 500mm missile to the base costs.

Concussion damage at the point of detonation for conventional nuclear munitions is 12d×20,000 for a 250mm warhead, and 12d×2 million for a 500mm warhead. In an atmosphere, quarter damage for every 256 yards (250mm) or 1,024 yards (500mm) from the point of detonation. In space, divide damage by the square of the distance to the target in *yards*.

X-ray Laser (TL9): These warheads detonate a small nuclear weapon in order to energize an X-ray laser beam – in fact, this is the only way such weapons can be built in the foreseeable future. The warhead consists of a nuclear bomb, an array of beam-generating laser rods, and a targeting system. Instead of physically intercepting the target, the missile stands off at a distance of several hundred miles, orients itself on the target, and detonates. The nuclear blast destroys the missile but also pumps energy into the laser array; as the rods vaporize, they produce powerful X-ray laser beams directed at the target. Consequently, X-ray laser warheads free missiles from having to close on their target and risk being shot down by point-defense weapons or suppression by nuclear dampers. This warhead is only available for 500mm missiles; add MCr0.11 at TL9, MCr0.064 at TL10, or MCr0.041 at TL11+.

X-ray laser warheads do 5d×200 (2) at TL9, 7d×200 (2) at TL10, and 9d×200 (2) at TL11+.

Nuclear and X-ray laser warheads are very hard to find (Legality Class -3) within the Imperium, but their use is not prohibited outright if restricted to space-to-space combat.

Deadfall Ordnance

Missiles for planetary bombardment have different requirements than those intended for space combat. (For worlds with vacuum or trace atmospheres, use regular space combat missiles and rules.) Because they depend on some combination of gravity and aerodynamic braking, they are collectively referred to as *deadfall ordnance*.

Spike Submunitions (SSM)

Spikes are "smart" bombs – narrow (80mm) depleted uranium, superdense penetrators with a guidance package and steering fins strapped to their back. They are launched in clusters of seven (250mm) or 38 (500mm) using a standard space-combat missile as a delivery vehicle. The gunner maneuvers the missile to the release point, burns out its rocket motor to accelerate it toward the designated target area, and releases the spikes. The spikes fall the rest of the way to the target using their onboard sensors to lock onto and attempt to hit particular targets.

Guidance: Spike submunition missiles are laser command guided to their release point; they maneuver in the same manner as space-combat missiles. Standard spikes come equipped with infrared or optical homing sensors. Other options are available at additional cost (per missile, 250mm/500mm): imaging infrared (+MCr0.004/0.019), semi-active laser homing (+MCr0.021/0.12), or neutrino homing (TL10+, +MCr0.019/0.10).

Procedure: The launching vessel must be in low or high orbit over the target world. The gunner aims at a point on the ground called the *target reference point* or TRP. He attempts to fly the missile to a position 11 miles (20,000 yards) above the TRP, and releases the submunitions; this takes one space-combat turn (20 minutes). He rolls against his Gunner (Missile) skill (p. B116) to hit, adds the target size modifier as well as the weapon accuracy modifier and subtracts -23 for range. If the attack is successful, the submunitions are distributed around the desired TRP. If the attack missed, refer to the *Size and Speed/Range Table* (p. B201). Take the amount by which the attack roll was missed and look it up on the Speed/Range column, then read over to the adjacent Linear Measurement column. This is the distance by which the spread of submunitions will scatter from the TRP, to a maximum of 9,000 yards. For example, a miss by 16 would be a -16 on the speed/range column, and hence a miss by 1,000 yards. Determine scatter direction randomly (p. B119). Once the submunitions are released, each one may make one attempt to lock on targets according to the homing-missile rules (p. VE193), starting from the point to which they scattered. If the lock is successful, the spike will maneuver to impact the target. If not, it will impact the ground somewhere within a radius around the scatter point: 1,000 yards for 250mm missiles, 3,000 yards for 500mm.

Glide Bombs

Glide bombs are precision munitions. They are designed to be launched from the 250mm or 500mm missile launchers of a ship in close orbit, using a small booster motor to enter the upper atmosphere. Once there, the missile automatically glides to the target area, aerobraking all the while to kill its considerable orbital velocity. The aerobraking phase ends with the missile in a near-vertical descent over the TRP at an altitude of 5,000 yards. The missile then activates its onboard sensors and searches for a target as it continues to fall.

What happens in the terminal phase depends on the type of missile. *Kinetic kill* (KK) missiles fire a terminal rocket motor, accelerating to their maximum velocity in a matter of seconds before impacting on the target. *Explosive* and *nuclear* munitions use steering fins and a small motor to maneuver to the target, where they detonate. In either case, ground range is 8 miles (14,000 yards) from the original target reference point.

Guidance: All glide bombs are "brilliant" (p. T:GF119 or p. VE195) and use inertial guidance (p. VE195) to reach the target area. Standard glide bombs come equipped with either infrared or optical homing sensors. Other options are available at additional cost: semi-active laser homing (+MCr0.02), PESA homing (TL8+, +MCr0.03), or neutrino homing (TL10+, +MCr0.015).

Procedure: The missile must be launched from a vessel in low or high orbit. The selected target reference point must be 1/4 of the planet's circumference (3/4 planetary diameter) ahead of the vessel along the vessel's ground track (the path its orbit traces over the ground) at the time of launch, plus or minus 500 miles in range and 250 miles left or right of ground track.

The flight time of the missile is one space-combat turn (20 minutes). (See p. VE193 for rules on "homing missiles.")

Nuclear Ordnance: Nuclear warheads may be substituted on HEAT missiles, as discussed above (p. 53). At TL7-8, add MCr0.042 per 250mm missile or MCr0.064 per 500mm missile. Halve this extra cost at TL9-13.

Saturation Nuclear Cluster (SATNUC) munitions are also available at TL9+. Add MCr0.5 per 250mm missile, or MCr2 per 500mm missile.

Probes/Drones

An IISS long-range probe is a 6-cf missile with an instrument package instead of a warhead. They are used for many purposes: soundings of planetary atmospheres, close-range photographic sweeps of planetary surfaces, asteroid flybys, and wide-aperture astronomy.

Stealth Surveillance Drone (TL12)

This is the most common orbit-to-ground drone used by IISS exploration vessels. It comes with robot brain (Complexity 6), acute vision +3, night vision, peripheral vision, telescopic zoom (16×), thermograph, super-hearing, long-range radio, radiation shielding, intruder chameleon system, stealth and IR cloaking, flashlight, self-destruct device with 1 lb. of explosive, and inertial compass. A rechargeable D cell powers all systems, with endurance of 10 hours.

Statistics: Design weight 20.58 lbs., total volume 0.275 cf, price Cr7,745, aSpeed 77 mph, PD 4, DR 20 laminate armor, 5 HP, and Legality Class 2.

Electronic Warfare (EW) Drone (TL9)

An EW drone is a small robotic jammer node that runs alongside a larger vessel, projecting an area-effect jamming field. EW drones are based on the 500mm missile, with the warhead and power cell replaced by smaller engines, an area jammer, and a nuclear power unit (NPU). Drones are typically no faster than the ships of their respective TL. The jammer rating is 3 at TL9, 4 at TL10, 5 at TL11-12, and 6 at TL13. (See pp. VE59, VE171, and T:GF112 for further information on "area jammers" and "radar.")

Any 500mm operator-controlled missile launcher can launch the drone. There's no benefit to having more than one drone jamming the same area.

Short-Range Probe (TL12)

This probe is based on an advanced variant of the SIM-12 missile (p. GT159) with the warhead removed and an improved sensor suite added. A modular socket carries custom-built scientific packages. It comes with a receive-only, very-long-range laser communicator (1 million miles), passive electromagnetic sensor array (PESA) (20-mile range), an inertial navigation system, a modular socket with 0.2 cf capacity, and radiation shielding. Additionally, a rechargeable E-cell supplies enough power for one hour of operation.

Statistics: Ewt. 265 lbs., usual payload is 70 lbs., lwt. 335 lbs. (0.17 stons), volume 6 cf, Size Mod +0, price MCr0.070, HT 12, PD 4, DR 120, and 30 HP.

Water Performance: wSpeed 150 mph, wAccel 180 mph/s, wMR 1, wSR 4, wDecel 5 mph/s (100 mph/s), and draft 0.63 feet.

Aerial Performance: aSpeed 740 mph, aAccel 180 mph/s, aMR 6, aSR 3, and aDecel 24 mph/s.

Space Performance: sAccel 9 G.

Probe Launchers

This system is designed for the launch and control of short-range probes (but it is not an EW drone). A probe-launcher system consists of three launchers, each including a launch tube, laser communicator, computer terminal, and crew station for probe control. There is storage space for 13 probes, and 40 modular instrument packages. Depending on the exact composition of the load, the module with a full complement of probes would weigh roughly 4 stons and cost MCr2. This module may also be placed in a turret and operated remotely.

*Why **do** they call it a morgue anyway?*
– Anton Wilson Peale

Jump Troop Systems

Jump troops are lightly armed infantry equipped with *Reardon* medium battledress (T:GF86) and either PGMP-11 plasma guns or FGMP-11 fusion guns (p. GT110).

Their purpose is to assault from orbit, penetrating planetary defenses in small, one-man drop capsules.

Standard Drop Capsule

This is a generic, disposable atmospheric-reentry capsule. It has a compartment for 10 cf of specialized equipment including ECM gear or cargo; this equipment must be designed to fit the limited space. With additional buffers and padding, just about any size battledress can also be used in it, turning it into a meteoric assault capsule. There is an additional 5 cf (250 lbs.) of space for generic cargo. The standard drop capsule includes primitive controls and has Fair streamlining. (See p. T:SM62 for the "assault capsule" statistics used by the Imperial Marines.)

Capsule Racks

This module stores up to 16 capsules (with mass of up to 2,000 lbs. each) in ready racks with room for maintenance and (machinery for) launcher-loading operations. The component statistics do not include the mass or cost of the capsules.

Drop-Capsule Launchers

A pair of 700mm missile launchers in a fixed mounting. Rate of fire is 1/10 each, so in one space-combat phase the pair can launch 240 capsules. This system can also function as a pair of one-man airlocks.

Battledress Ready Rooms ("Morgues")

This module includes space for 20 sets of battledress (weighing up to 1,000 lbs. each) and accessories such as flight packs, with room for *minor* maintenance and loading equipment. The component statistics do not include the weight or cost of the carried suits.

CHAPTER EIGHT

Crew and Passenger Accommodations

When creating a ship, the designer must consider how many beings the ship will carry, and how much space and luxury they need. Quarters are not strictly *necessary*, even for long voyages – if there is sufficient life-support capacity, passengers can be carried in the hold. This is uncomfortable, and illegal within the Imperium. Captains only resort to this in emergencies or when shipping refugees, slaves, or animals. Most of the time, passengers travel in a combination of the modules described in this chapter.

For systems that come in half-sized or small versions, divide all statistics by 2 unless otherwise noted and round any fractional spaces to the nearest 1/2 space.

Modules for Crew and Passengers

There are many different ways in which the various sophonts of the Imperium travel. Everything from steerage to palatial multiroom suites are available – for a price. Typically, there are only three different levels of comfort: low, middle, and high passage. See ***GURPS Traveller: Far Trader*** for the various costs and requirements associated with these different modes. In addition to staterooms, there are also recreation facilities: gyms, swimming pools, large lounges and bars, and theater entertainment. Only the larger liners are capable of maintaining anything other than a simple lounge.

Life Support

Limited Life Support provides basic lights, air conditioning, heating and also provides additional "bottled" oxygen and water for as long as power and supplies last. This is the most common kind of life system on small craft. Its endurance is measured in man-days; i.e., 100 man-days of endurance sustains one man for 100 days, two for 50 days, three for 33.3 days, etc. Life support can be turned on or off, thus conserving it when not needed; a shuttle flying through a breathable atmosphere would have no need for it. At TL11+, these systems become obsolete in favor of full life support.

Full Life Support is a self-regenerating oxygen and water purification plant typically found on long-duration non-starships with minimal crew requirement. Full life support does not provide food, so supplies must be carried if the sophonts are to eat.

Total Life Support has all the benefits of full life support but also provides food (see *Parts and Stores*, p. 27). This is the standard aboard all starships and large non-starships in the Imperium.

Alien Environment Suites

This is an individually controlled environment designed for the comfort of up to two passengers (or livestock) with exotic atmospheric requirements. It includes a full life-support system for two (four at TL11+, with half of the standard capacity as backup), separate from and independent of the starship's main life system; a two-man airlock; and 24 hours of battery power (as a backup) to keep the occupants alive should repairs be required. As *total* life support is not provided, rations sufficient for the journey will have to be carried as cargo. At TL10 or less, two man-days of *limited* life support is provided, instead.

Note that alien races with different metabolisms, such as the Inheritors (see ***GURPS Traveller: Alien Races 3***), would consider quarters designed for humans to be "alien environment suites."

Bunkrooms

This type of room has bunks for six personnel at TL7; nine at TL8; 14 at TL9; and 16 at TL10+. All include total life support. Conditions are very cramped. Imperial protocol is to only load up to 25% capacity per bunkroom, except for missions of very short duration or emergencies.

Small-Craft Cabins

Also known as "small-craft staterooms," cabins are much like staterooms (see p. 58), but more basic and spartan – some would say cramped. In the Imperium, cabins are not considered suitable for passengers or crew on interstellar vessels (including Imperial Navy starships) due to these "cramped" conditions, but are often employed on interplanetary vessels and small craft (however, see *Traveling*, below).

Traveling

Aside from the bridge, the cargo deck, and engineering, passengers are normally allowed the run of the ship during the week in jump, although smaller vessels encourage them to remain in the staterooms or in the passenger lounge. Food service is provided as part of the passage, and is served in the lounge.

Low Passage is the fiscal and social equivalent of traveling steerage in a 19th-century passenger liner. Low passengers spend the entire trip in suspended animation, and thus have no life-support requirement other than a trickle of power to run the low berth (see below).

Middle Passage is a step up from low passage, and is substantially more expensive. On large passenger liners, middle- and high-passenger staterooms are segregated on different decks, each with separate lounge areas, galleys, and so on. Smaller vessels often mix the two types of passengers on the same level.

High Passage is more expensive than middle passage, and is virtually identical except for a higher standard of service and food. On large liners, high passengers have their own decks, lounges, and food service. Some ships give high passengers larger, more luxurious staterooms. On smaller ships, the main difference is in the quality of food and the behavior of the stewards. Converting middle-passage accommodations to high passage usually involves simply upgrading the fittings. Luxury fittings are available for just about any crewed compartment at 5× cost.

Some ships also have much more room than others. Some are crowded. To determine exactly how much room your vessel has for the crew, perform the following calculations. Divide the total number of dtons devoted to a crew's comfort (staterooms, bunkrooms, rec facilities, etc.) by the total crew not in low berths. Spartan accommodations are 2 to 2.25 dtons per person, average is 2.26 to 3, above average is 3.01 to 4, and luxurious is over 4. Anything below 2 dtons per person is considered cramped and results in a -1 penalty to all shipboard operations. For passengers (including troops) not in low berths, divide the total number of dtons devoted to passengers' comfort (staterooms, bunkrooms, rec facilities, etc.) by the total passenger count. Use the same descriptions as above.

Note that luxurious high passage may demand a higher price than average high passage . . .

Low Berths (TL9)

A low-berth system contains four cryonic freeze capsules, each containing power components, and capable of holding one person in suspended animation ("low passage") and 10 cf of personal belongings. See pp. UT103, S91, or BIO115 for detailed rules. Low berths are often used to carry replacement crews (see *Frozen Watch*, p. 26) aboard naval vessels, or as emergency life support for disaster survivors or severely injured crew members. Also see *Low Berths*, p. GT108.

To convert a Low Berth to an Emergency Low Berth, add MCr0.004 at TL9 or MCr0.003 at TL10+ and 0.01 stons to the mass for both. It has an integral radiothermal generator or "RTG" (see p. VE85) providing enough power for 14 years. The RTG is usually refurbished during the annual maintenance overhaul. Each module also includes four dedicated, hardened, small computers to control the immersion procedure, allowing an occupant to enter unassisted at assisted speed (5 minutes). Emergency low berths do not have storage space for personal belongings.

Another form of low berth is used to transport livestock. Instead of four capsules, there are only two. Each is rated for 1,000 lbs. (1/2 stons). No supervision is required to put the animals in cryo-sleep, but anesthesia might be a good idea depending on circumstances. Animal Empathy or Animal Handling should give bonuses, if appropriate. Reviving livestock is the responsibility of the colony's veterinarians (usually recruited as professionals). Revival is very similar to the process for standard cryonic freeze capsules, but failure indicates that the livestock is dead (all occupants share the same revival roll). Whether the results of a failed revival are still suitable as food is left to the GM.

When sizing livestock berths, determine the mass of animals to be transported and refer to the following table.

That's Entertainment

"My best advice if you want to be a shipboard entertainer: don't. You're in for long hours of high-stress performance with no chance of getting away from your audience, even if they hate you – and believe me, after a week in jump some will. Still, nobody ever listens to that little nugget of wisdom, so here's my next-best advice.

"First, make sure you're doing it for the right reasons. ***Don't*** *do it just because you want to travel – though you need to like traveling – and don't do it for the money. Do it because you like meeting new people and making them happier.*

"Second, generalize. It doesn't matter if you're not the best singer in the Marches or the funniest comedian, so long as you can do a bit of both and half a dozen other things, and make them all entertaining. A week is a long time in jump space, and you can't get away with the same act every night.

"Third, know your audience. Check the manifest before launch; it'll tell you how many family groups you'll be dealing with, what races are on board, things like that. You don't want to be making Aslan jokes in front of one! Mingle during the flight to jump point and try to gauge the mood. Pick up every scrap of information you can.

"Fourth, make friends with the crew. Help them out and they'll come to your rescue when things get rough.

"I could go on, but those are the most important points. There's always too many of them and not enough of us, no matter how big the ship is – the only thing you can do is practice. Or quit.

"Don't say I didn't warn you."

– Enli Rivera, in an interview for the ***Spinward Times****, 137-1119*

Livestock Stowage Table

Size	Mass	Live	Cold	LS	Examples
Very Large	10,000	0.5	n/a	15	Elephant
Large	1,000	2	1	3	Horse, Cow, Camel
Medium	100	15	10	0.7	Pig, Goat, Dog
Small	10	30	100	0.1	Chicken, Duck, Cat
Very Small	1	160	1,000	0.03	Rat, Quail, Dove

Mass: Given in pounds.

Live: Animals that can be stowed per dton when not transported in a low berth.

Cold: Animals that can be stowed per low berth.

LS: Human-equivalent life-support needs per animal.

Generic livestock is worth approximately Cr1/lb. (Cr2,000/ston), but this may vary greatly (see pp. B140-145).

Passenger Couches

This system is only available for small craft. It incorporates 11 (TL7-9) or 12 (TL10+) roomy seats and one man-day limited life support per passenger, plus the necessary power components to operate the life-support system. All seat bottoms can be used as a flotation device in case of water landing or as a rescue bubble in the case of a vacuum evacuation. All seats fold up into the bulkhead, reducing their volume by 50%, and allowing the passenger compartment to be used as an ad-hoc cargo hold (at 20 cf stowed per seat). For systems without the added safety/fold-up features, divide cost by 10. Half-Sized versions are available; round down the number of passengers.

Staterooms

Staterooms are the long-term quarters called for by interstellar flight; they include 50% additional space for access and other facilities (galleys, rec areas, etc.). Standard passenger comfort demands a certain level of amenity in the stateroom. In order to meet this standard, staterooms are self-contained living areas which need never be left during a voyage. The stateroom contains a bed, a fresher, entertainment consoles, a small kitchen, and miscellaneous furniture. All basic items in the stateroom retract into the floor, wall, or ceiling when not in use.

Staterooms provide a standard bed which folds into the wall at a command. Grav plates (from a utility module, p. 40) can be adjusted to provide a range from 0 to 3 G for personal comfort, plus an intercom and controls for light and heat.

Meals may be taken on a collapsible table and storable chair. The stateroom is large enough for four people to eat around the table comfortably. Meals must be delivered by hand from the galley; there is no automated delivery system. A small refrigerator stores snacks and a small quantity of food for immediate availability. See *Ship's Galley*, p. 60, for another design option on vessels that have more than 20 staterooms.

Sanitary necessities are handled by the fresher, which includes a multifunction shower, a toilet, a sink, and a small washer/dryer (for the benefit of middle passengers). All components fold unobtrusively out of the way when not in use.

Storage of personal necessities is handled by several collapsible compartments and cabinets. Passengers can store up to 10 cf of baggage in their staterooms; high passengers can store an additional 500 cf in the cargo compartment. Note that stowage in cargo and access thereafter requires the assistance of the crew.

Install enough staterooms for the estimated crew and passengers – crew or middle-passage passengers often endure double-occupancy; high-passage passengers and (some) officers should have a room of their own. The staterooms themselves take up only about 50% of the rated volume; the rest is used for common areas (lounges, kitchen, meeting rooms, etc.), total life support, a power slice, and access ways. Staterooms are not available on small craft unless the craft is designed with bridge and engineering systems – not a cockpit/systems module.

Offices

Each office module holds four offices, with room for three visitors each, or 16 cubicles with no room for visitors. Includes full life-support for 16 and space for conference rooms, office supply storage, etc.

Life Support and Provisions

A manned ship should have at least one space of life support if it is intended to operate for more than a couple of days – unless it contains other systems that include life support (i.e., staterooms). Thus, short-range shuttles or fighters do not require life support.

A life-support system can be overloaded if necessary. Roll 3d after each day of overloading, at +1 per full 10% by which the number of people aboard exceeds current capacity. On an adjusted roll of 13 or more, the system begins to break down, losing 10% of its *current* capacity for each point by which the roll was missed. A Mechanic (Life Support) roll can be attempted once per day; if it succeeds, it will restore 10% of *full* capacity. Once the life-support system begins to fail, the effect snowballs. If the ship remains overloaded, life support will eventually reach 0% and fail. At that point, all the oxygen in the air will be used up within a few hours, and everyone will die. Those in cold sleep are unaffected if life support fails . . . as long as the power stays on.

Life-Support Module

This module contains extended accommodations for craft equipped with bridges but no staterooms. Includes full life support for five personnel, one folding bunk at TL7-8, two folding bunks at TL9, two bunks at TL10+, the associated power plant slice, and 9.5 cf of storage for personal gear.

Luxury Fittings and Entertainment Facilities

Leisure activities are considered a necessary part of stateroom life. They relieve the boredom of long jump voyages by providing entertainment, research facilities, and computer access. The wide range of entertainment activities includes holographic theatrical productions, video shows, interactive drama, and audio programming. There are also games (played against a computer or against other passengers). The computer terminal also allows access (on a restricted basis) to the main computer for data processing, word processing, and library data inquiries.

While the phrase "entertainment facilities" conjures images of passenger liners, these modules are also useful in military vessels. The value of exercise rooms and shooting ranges are obvious, but even theaters have their place – not only for entertainment, but as briefing rooms and a place to stage activities between combat.

Gymnasiums/Exercise Rooms

A gym usually contains a wide variety of exercise machines and facilities for both strength and aerobic training. The standard gym can be used by up to four people at once. Gyms aren't necessarily a luxury – long voyages cooped up in a small starship can cause a significant loss of conditioning. Exercise is also a good way to relieve stress and deter psychological problems. Military ships usually have sufficient gym facilities to support 5% of the crew at once.

Halls, Bars, or Conference Rooms

A large room with tables that can serve as a restaurant, bar, conference room, casino, etc., this can comfortably accommodate 50 people per module (smaller lounges and conference rooms are included in stateroom volume). Weight and cost include furnishings.

Holoventures (TL9)

Civilian: A 1,200-square-foot holoventure zone with a roomy operator's crew station. The computer terminal at the station runs holoventure programs on a dedicated mainframe computer. It includes a fusion power slice to run it.

Military: As above, but with DR100 composite armor for training with live ammo.

Shooting Ranges

A 25-yard sighting/training range for two men with a single computer terminal. It is armored to DR100 and is most often used with plastic bullets. Troop ships use it to provide traveling soldiers some time on the trigger. Combining multiple ranges could provide a longer range or even a mock village for rehearsing house-clearing and hostage-rescue missions.

Stages

A 20'×20' stage area for dancing, plays, nightclub acts, and so on, this includes sophisticated electric lights and sound systems. Normally attached to a Hall or Theater containing the audience.

Swimming Pools

Large commercial ships (or those catering to aquatic sophonts) will often have swimming pools. Includes 100 square feet of pool (10' deep), 100 square feet of deck area, and overhead clearance. Multiple modules can be combined to make larger pools. The finished design should add one Space Dock system (1 ston, MCr 0.005) per complete pool, to contain the water in case of loss of artificial gravity. The module only weighs 1.5 stons when empty.

Theaters

A small auditorium with 100 seats for the audience, a large holoprojector (can be stowed), and an operator's workstation. Can be used for entertainment, for presentations, or as a briefing or situation room. A stage is not included – a Stage module may be attached if needed.

Null-G Handball Courts (TL8)

While artificial-gravity generators eliminate the need for space travelers to experience zero-G conditions, some travelers nevertheless like the challenge of experiencing those conditions for recreation. Null-G handball is typical of any number of null-gravity games that have become popular in most space-faring cultures. It is played in a court 20'×20'×40' by either two persons or two two-person teams. Players wear a lightly padded and webbed glove extending their reach by several inches, with which they strike a small resilient ball. The object of the game is to bounce the ball off of any three surfaces of the court (walls, floor, or ceiling) without the opposing player or team touching it. The Null-G Handball Court includes separate artificial-gravity generators to maintain the zero-G environment, a locker room with shower and facilities for the players, and a gallery for an audience of 12 (larger audiences require Theater seating).

Ship's Galleys

A compact food-preparation area with capacity for up to 770 lbs. of food (385 man-days if a life-support system is installed, 64 otherwise). Mass and cost both assume a full pantry at the appropriate TL. Each module provides cramped but usable space for preparation of up to 28 meals at a time. Exact features will depend on TL and may include rough-weather options for low-tech ocean vessels, zero-G options for pre-CG space vehicles, and/or refrigerators and freezers. Galley modules may be stacked to create a much larger facility.

This module should only be purchased for ships requiring more food preparation area than is included in staterooms (see p. 58). A galley may be consolidated from the total kitchen space provided by multiple staterooms. If a ship is designed and built in this manner, the "galley" is considered a common area separate from the staterooms. It would take 20-40 staterooms to make such a galley, depending on level of service and spaciousness desired.

Chapter Nine

Accessories and Unusual Items

In addition to all the equipment crew and passengers see just walking through the ship, ships require many more systems to operate smoothly and/or fulfill its mission: everything from cargo holds to weapon-storage lockers to medical systems is needed.

Cargo

Virtually every starship needs some cargo space. Even the most optimized military vessel will have a ship's locker to store equipment.

Cargo Holds

Each Hold module has space for 500 cf (18.5 cubic yards) of cargo. Multiple modules may represent a single large hold or a number of smaller holds. Holds in half-size increments (250 cf) may also be installed. Holds normally carry 5 stons per dton; maximum rated load is 25 stons per dton. See pp. 57-58 for information on transporting livestock.

Smuggler's Holds

If a vessel has cargo space, some or all of it may be divided into one or more concealed compartments (called *smuggler's holds*, after their most common use). If someone searches the vessel, a smuggler's hold can be found on a roll vs. Holdout or Shipbuilding (Starship) skill, whichever is *lower*. Subtract 10 from skill; add +1 for every 2% of the ship's hull class hidden. Smuggler's holds cost MCr0.005 per 1/2 dton.

Ship's Lockers

The Ship's Locker is a catchall name for the miscellaneous stores and supplies a ship maintains to support its operations and crew. On small ships, it may be a physical locker; on larger ships, it is a storeroom or hold. Contents of a ship's locker may include environmental and survival gear, personal convenience items and consumables for the crew (the *slop chest*), and medical supplies. Most equipment is issued as needed and remains the property of the ship's locker.

Slop chest items (junk food, mild recreational drugs and alcohol, toiletries, entertainment or education chips, T-shirts and even uniforms sometimes) are purchased in bulk by the Purser and sold to the crew at cost or charged against their unpaid salaries. On small merchant ships or those carrying only a few passengers in addition to their cargo, the passengers may have access to the slop chest through the Purser, but on a cash-only basis. Large liners run separate concessions for the convenience of their passengers.

See *Zero-Space Systems*, pp. 68-69, for more information on Ship's Lockers.

Weapon Storage

Small arms and most other conventional weapons are easily stored in cargo holds or the ship's locker. However, some weapons and accessories require special handling and storage if a vessel is to remain safe from accidents and terrorists. Nuclear warheads, antimatter warheads, and even conventional explosives all pose a serious risk to a ship's integrity if not handled correctly.

Anti-Blast Magazines

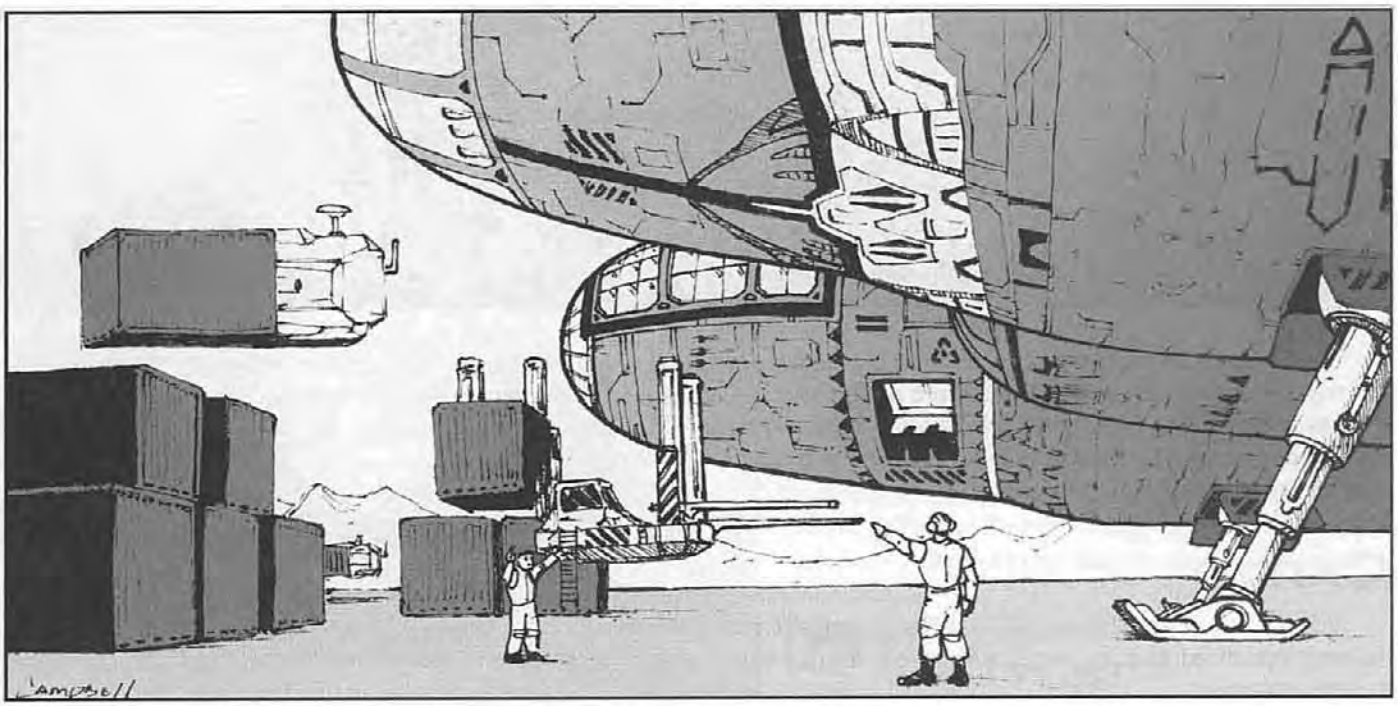
These magazines are special compartments used to store missiles and other hazardous goods. They are designed to channel the blast of an ammunition explosion away from other internal systems, reducing the severity of accidents. A magazine holds 55 250mm missiles, 11 500mm missiles, or 500 cf of other weapons. They should be installed near the outer hull of the ship to operate effectively.

Damper Boxes (TL11)

Damper boxes prevent radioactive decay of unstable isotopes. They weigh 80 lbs., take up 1.6 cf, cost kCr40 and require 0.16 MW for *each* cf of cargo capacity that they possess at TL11. Halve all attributes at each higher TL. The *Module Tables* contains a TL11, TL12, and TL13 box capable of holding 55 250mm or 11 500mm missiles equipped with nuclear warheads; each provides a nuclear power unit (NPU) to run it, allowing containment even when the ship loses power. Smaller units (holding no more than a couple of warheads) should be constructed using the *Zero Space Modules* (see pp. 68-69).

Antimatter Bunkers (TL12)

Antimatter cannot be produced or stored in useful amounts until TL12, and is not used in engines or reactors until late TL13. Antimatter bunkers (or "traps") each hold up to 50 grams of antimatter (usually anti-hydrogen). Since antimatter is worth several million credits per gram (assuming one could find it on the open market), larger bunkers are rarely required. They include a dedicated internal nuclear power unit; containment will be maintained even if the vessel loses power.



An antimatter fuel bunker will explode on a roll of 16 or less if it or the vehicle location containing it is disabled or destroyed. It can be made to self-destruct by turning off the containment system. Failsafe systems, each with the volume, mass, and cost of the original system, can be added. These backups make a damaged trap less likely to explode (-1 to explode per extra module). Damage from a bunker explosion is equal to 6d×25 million points *per gram* – enough to vaporize any ship in ***GURPS Traveller*** and pose a significant hazard to vessels nearby. (The crew's personal armor does protect normally if they are wearing it . . .)

Cargo-Handling Gear

All but the most primitive starports have equipment and facilities for loading and unloading cargo, available for a price. Large ships, or ships designed to access primitive starports, may include their own cargo-handling equipment. Usually, this will consist of winches and hoists, but very advanced ships may choose to include gravitic manipulators (see below).

External Cradles/Grapples

See *Surface Features, External Cradles/Grapples*, p. 35.

Gravitic Manipulators (TL11/13)

These devices generate a gravity field at a distance, pulling objects toward or pushing them away from the ship.

Repulsor Beam (TL11): Each repulsor-beam system generates a ST 8,500 repulsive force. Multiple systems can work together, adding their ST together.

Tractor Beam (TL13): As the repulsor beam, but generates a ST 8,500 attractive force, instead. Multiple systems can work together, adding their ST together.

Combination Beam (TL13): Usable as either a tractor beam or a repulsor beam, but not as both simultaneously. In either mode, the beam generates a ST 8,500 force. Multiple systems can work together, adding their ST together.

Mass Catchers (TL8)

A large cargo net and arrestor system designed to catch up to 625 stons of mass (typically shot by the *Mass Driver*, p. 64) as long as it is less than 1,500 spaces in size and traveling at less than 600 mph. Multiple units will either increase the speed, mass, *or* volume (choose one per additional unit).

It is designed for zero-G operations by producing a strong counter-force (usually thrusters) to catch a load without moving off its stationary position and axis. This system must be mounted on some other structure (at a minimum, a 2,000-ton vessel or platform of some type), as it is not a stand-alone unit.

Optional Detail: Hatches and Openings

Any ***Traveller*** campaign taking advantage of the cargo-handling equipment described here may benefit from information on standardized cargo hatches in the Imperium. Cargo vessels with 7 dtons of cargo space or less have a small cargo hatch, which is 12' wide by 12' high. Larger ships have one standard hatch per 25 dtons (or fraction) of cargo space; standard hatches measure 24' wide by 12' high. Very large ships may combine several hatches into a single opening that is a multiple of these dimensions.

Alien or unusual ship designs may have radically different cargo hatches, requiring some on-the-scene thinking for quick loading or offloading of cargo.

Additional Equipment

While too minor to be individually purchased or inventoried in the starship-design process, the following items are commonly found at starports or in large cargo vessels throughout the Imperium. See pp. T:SP102 and T:FT77 for more information. Any starport employee should know where to find one, and they'll often be lying about in the cargo-handling areas. Travelers should be able to get their hands on most of these without much difficulty.

Hand Truck: A two-wheeled dolly that carries up to 1,000 lbs. or 4 cf of breakbulk product. The speed at which it can be pushed depends on the user, but the weight is normally divided by 10 or 20 (see p. B89) for encumbrance purposes. $50, 30 lbs.

Dock Cart: A four-wheeled cart than can hold up to 4,500 lbs. or 180 cf of breakbulk product. The speed at which it can be pushed depends on the user, but the weight is normally divided as per the hand truck, above. $100, 300 lbs.

Bulk Liquid Pump: A rugged pump used to move liquids such as water, gasoline, milk, etc. For double cost and weight, a heavy-duty version can move cryogenic fuels. For quadruple cost and weight, increase transfer rate by 50%.

A TL7 unit can move 3,000 gallons per hour at a distance of up to 150 feet (multiply rate by 1.5 per TL after TL7). Multiple pumps may be connected in-line to move a liquid a longer distance. There are usually 4-6 of these pumps operating during shipboard cargo operations. The pump's price includes a short-range communicator and a dedicated computer so operators can control the pump at a distance.

The pump with hose weighs 185 lbs., costs $600, and takes up 5 cf. Both pump and hose have DR 5, HP 5.

The pump uses a D cell (or equivalent advanced battery at TL7) for every 12 hours of operation. It takes 15 minutes and a Freight Handling skill roll to set up.

Dry Bulk Auger: As above, but uses a screw mechanism to move bulk dry goods like beans, wheat, rice, etc. A TL7 unit can move about 4,000 cf of bulk product per hour at a distance of up to 50' (multiply rate by 2 per TL after TL7). Multiple augers can be connected in-line to move a product a longer distance. These are often used during shipboard cargo operations. The auger's price includes a short-range communicator and a dedicated computer so operators can control the auger at a distance. An auger with hose weighs 320 lbs., costs $1,700, and takes up 10 cf. Both auger and hose have DR 5, HP 15.

The auger uses a D cell (or equivalent advanced battery at TL7) per 6 hours of operation. It takes 15 minutes and a Freight Handling roll to set up.

Conveyor Belt: A 15'×2' (or a multiple thereof) motorized conveyor belt. A TL7 unit can move up to 625 cf of breakbulk or bulk product per hour (multiply rate by 2 per TL after TL7). There are usually four to six of these conveyors operating during shipboard cargo operations. The conveyor's price includes a short-range communicator and a dedicated computer so operators can control it at a distance. Non-powered roller conveyors are half weight and one-tenth cost, but are obviously limited in utility.

The conveyor weighs 70 lbs., costs $500, takes up 3 cf, and has DR 5, HP 15. It uses a D cell (or equivalent advanced battery at TL7) per 12 hours of operation.

Portable Hydrogen Fueling Unit: This handy unit often supplements or replaces starship-standard fuel-processing modules for starport fuel-refining needs. Each unit produces its rated gallons per hour × 1.58 in liquid hydrogen and its rated gallons per hour × 0.76 in liquid oxygen. The TL7 unit uses a 4C55/7 container and the TL8 uses a 4C55/8 container (see p. T:FT57 for information on standard cargo containers). The TL9+ units each use a 4D55/8 container. The TL7-8 versions use a fission reactor, the TL9 version uses a NPU, and the TL10+ versions use a fusion reactor. A cutter can carry two HFUs (one at TL8-) and eight empty 4A70/8 fuel tanks in one trip.

Vehicle Storage

Starship designers have several options for storing smaller vessels within a larger one.

Vehicle Bays

A vehicle bay is custom-designed to snugly hold a single, specific small craft within the skin of the ship. It is not usable for other sorts of vehicle, except an externally identical variant of the original small craft.

To simulate the way that many small craft were carried in ***Traveller***, vehicle bays may be considered partially recessed into the hull. The full volume is still subtracted from available volume. The mass of any craft carried in this recessed vehicle bay plus any external stores still may not exceed the limits as imposed by hardpoints (see p. 34). Total volume of all recessed vehicle bays may not exceed 20% of hull class due to structural limitations. Use intrinsic modular couplings instead (p. 35) to overcome that limitation.

Example: A 100-ton ship has 12,150 HP and a recessed 20-ton vehicle bay. The external-store limit is 121.5 stons, therefore, the vehicle bay can only store a craft that does not exceed that mass. There would be no limit if the vehicle bay was fully enclosed.

Vessels in vehicle bays can only have maintenance performed that can be accomplished from within the vessel itself – since these vehicles often are short-duration small craft, that means they often cannot have large repairs made except at a starport or other dock facility.

Hangar Bays

A vehicle can be given a large bay in which other smaller vehicles can be stored, ready for instant launch. Unlike a vehicle bay, a hangar bay is not specific to a single vehicle type; any vehicle can be carried in it. The weight of a hanger bay includes all necessary elevators or ramps to move the vehicle or vehicles into launch position. Each module provides hangar space for 500 cubic feet (1 hull class) of vessel; decide if multiple modules form one large or several smaller hangars. Hangar bays are *not* sealed against vacuum and thus have very limited use in space.

Hanger bay mass and cost is paid only once per hangar, regardless of the number of modules from which it is formed – it mainly represents the mass and cost of the elevators and ramps. Hangar bays may be purchased in half-sized increments, but cost and mass remain unchanged.

Spacedocks

This is an airlock hangar bay; it is treated as a hangar bay, except that it can be totally evacuated or filled with air (or water if this is specified during construction) with doors or landing-pad elevators opening into space. Each module provides hangar space for 250 cf (1/2 hull space) of vessel; decide whether multiple modules form one large or several smaller spacedocks.

Spacedock mass and cost is paid only once per spacedock, regardless of the number of modules forming it – it mainly represents the mass and cost of the hangar doors and air pump. Spacedocks may be purchased in half-sized increments, but cost and mass remain unchanged.

Launch Tubes/ Mass Drivers (TL8)

A launch catapult (electromagnetic or gravitic) can be installed in any vessel intended to launch spacecraft (such as a carrier). They allow the fast deployment of fighters or other craft (40 per 20-minute space combat turn); see p. GT169 for information on recovering small craft. (The craft does not fly back into the launch tube, but is instead docked in its appropriate storage location.) Craft launched from one of these may use their full acceleration on the turn they are deployed (e.g., a 5-G fighter's vector is 5 hexes longer than the vector of its launching ship). One Launch Tube module is required for every 25 stons of the heaviest craft to be launched from the facility, then add enough spacedock/vehicle bay modules to contain the largest craft accommodated by the launch tube to make a complete launch tube. This additional bay is used to store the vessel until launched and contains the feeding mechanism to move the second and subsequent vessels into the launcher. When a vessel is launched, another vessel is moved into the bay.

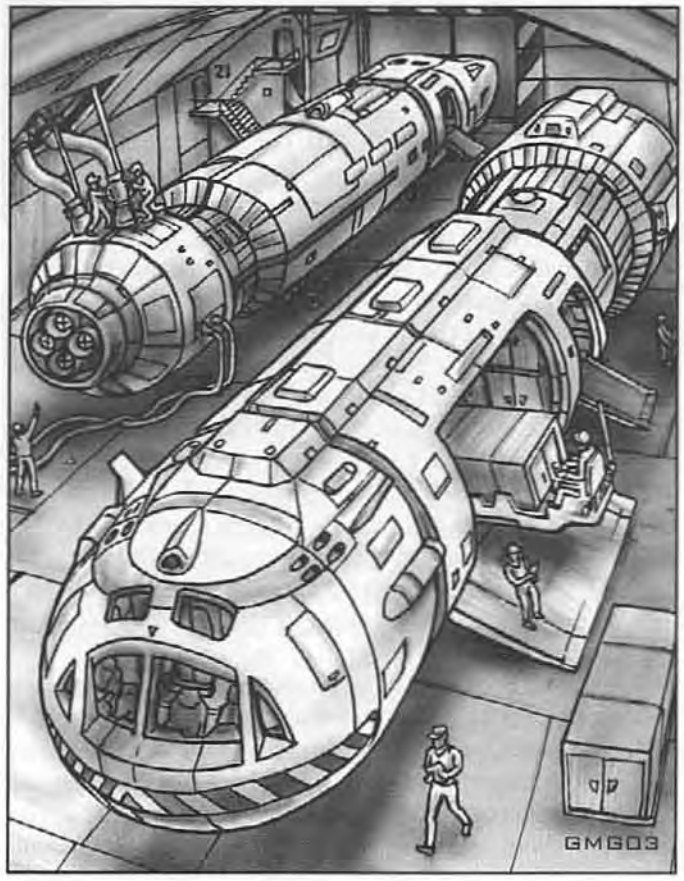
If used as a mass driver, the tube can launch up to 25 stons per module at 60 mph. Multiple modules will either increase the speed by 60 mph or increase the maximum mass that the tube can launch by 25 stons. Usually, a mass driver is designed for use in conjunction with a *Mass Catcher* (p. 62). Their performance should reflect one another's capabilities.

Labs and Workshops

A laboratory provides workspace and equipment for scientific research. A workshop includes workspace, tools, diagnostic equipment, raw stock, and bench parts for performing minor repair and construction work. Small parts can be made from scratch and medium-sized parts can be repaired or modified.

Laboratories

A laboratory dedicated to one scientific skill (e.g., Geology) as well as room for one or two scientists to work. For larger teams, multiple labs are a necessity! It gives +2 to skill in situations where the lab equipment would be beneficial; the GM can also rule a lab is required for a task – it gives no bonus, but work would be impossible without it. Physics laboratories are identical, but also include provisions for the increased power requirements of high-energy research.



Isolation Laboratories

A large, sealed laboratory with an airlock and other equipment certified to provide P4 protection (see p. BIO21). There is room for up to five people to work. It can be used for any sort of dangerous experiment: genetic engineering, chemical warfare analysis, psionics, nanotechnology, and so forth. Only in extreme cases (almost always the result of skilled sabotage) would any contamination spread beyond the lab.

Simulation Labs (TL9)

In scientific research and engineering design, the ability to visualize and manipulate data is often key to understanding and solving problems. The Simulation Lab is designed to assist in this visualization. It consists of a stand-alone holographic-imaging tank, a powerful macroframe computer (Complexity TL-2) to run it, and an operator's terminal. Although it can create images directly using data coming from onboard sensor systems, it is intended to accept and integrate large amounts of data from numerous science labs or design teams, and display it in a coherent, fully realized 3-dimensional picture. Multiple Sim Labs can be combined to create a much larger holographic-display volume (and more workstations) or enhanced displays may be added (see *Computer Lab*, below).

Computer Labs

These modules are designed for applications where reliable high-capacity number-crunching is needed. With a large number of associated workstations, they may also be used for archive and library functions. Each trio of macroframe computers is built as Compact, Genius, and Hardened with one level of High Capacity. Complexity is TL-1. Only dedicated scientific installations routinely use this costly module.

The *Enhanced Display* option consists of a 100 sf holoventure zone used to display the data instead of using flat screens (terminals are still included). These displays may be used with any of the listed laboratory modules as long as it has access to a computer of Complexity 7+. The required holographic program is included in the cost of the display system. Enhanced Displays may be also be used with Sensor Suites or Sim Labs to increase the display volume.

Workshops

Starships intended for long-range operation need to be somewhat self-sufficient, able to manufacture their own spare parts from found materials. The complete workshop contains all the tools needed for the Armory, Electronics, Engineering, and Mechanic skills, plus storage space. Workshops all have the same statistics though higher-TL shops will have better equipment. Up to three people can work in the workshop at the same time; one workshop should be provided for every 60 maintenance personnel onboard. Two of these workshops together make up the Logistics Module from p. T:FI35. Mini-workshops are similar, but not as capable; they are designed for vessels where space is at a premium (such as small craft).

Each complete workshop provides a +2 to repairs, while a mini-workshop negates the penalty for *not having* a workshop when making repairs.

Shipyards (TL7/9)

A shipyard or dry dock is capable of building or repairing 100 dtons of vessel at a time. It operates efficiently with 100 workers or robots and contains warehouses, workshops, offices, minifacs, etc., as well as a power element. There are two versions of this module, one for non-starships at TL7 and one for starships at TL9.

Medical Facilities

A normal sick bay provides workspace for medical personnel to treat wounds and illnesses on an outpatient basis. Other versions are dedicated to performing surgery, providing intensive care, or boarding inpatients.

Emergency-Aid Stations

Emergency-aid stations are designed for use in small ships where a full sick bay is not needed or space is at a premium. At TL7, it includes two bunks and a stretcher; at TL8, two bunks with emergency support units (ESUs) and a stretcher; and at TL9-13 one automed, one diagnosis table, one ESU, and one stretcher. All systems have a computer terminal and reactor slice to power it. See pp. UT94 or S87 for medical-equipment statistics. On ships without sick bays, one of these should be installed for every 60 staterooms or fraction thereof not covered by *Sick Bays*, below.

Sick Bays

Sick bays vary considerably by TL, as medical science advances. At TL7, each module consists of two beds, one operating table, and one stretcher; at TL8, an operating table and two beds equipped with ESUs; at TL9 and higher, an operating table, a diagnostic table, and either two (TL9-10) or three (TL11-13) automeds. All models include a computer terminal and sufficient power components to run all features. Ships should have one sick bay per 120 staterooms or fraction thereof.

Military Sick Bays/ Aid Stations

Naval vessels are often depressurized, either deliberately or because of battle damage. In order to maintain a habitable volume, military sick bays come with their own life support. This system is a sick bay as above (except the operating rooms are fully stabilized), with two 6-man airlocks, radiation shielding (PF 10 at TL7, ×10 for each additional TL), room for 10 ambulatory or two litter patients, and limited life support and energy banks for 15 man-days. A full fire-suppression system is included to augment those in the engineering spaces. Military sick bays are used individually as aid stations (often carefully placed along main corridors to act as blow-out shelters), or added to conventional sickbays to form a larger ward.

Evacuation Bays

Basic: Contains 12 stretchers and 12 Emergency Support Units (TL8+) with plenty of access space to move people in and out of them. Also includes 12 man-days of limited life support and a power slice. It is mostly used by small craft for medevac to a waiting starship.

Advanced (TL9): This contains 12 automeds and plenty of access space to move people in and out of them. Also includes 12 man-days of limited life support (*full* at TL11+) and a fusion power slice. Mostly used by small craft for medevac to a waiting starship.

Operating Theaters

This contains two complete, fully stabilized operating tables, two Emergency Support Units, 50 cf of storage space for medical supplies, and two computer terminals.

Habitat Modules

Some large vessels (such as colony ships and space stations) contain large urban or green areas inside them. Each module described below is about the size of a city block and includes lighting, temperature control, air recycling, and a power slice to run it.

Housing: This module contains one or more apartment buildings or a few dozen houses, plus grounds, walkways, etc., providing long-term accommodation for up to 100 people (half that many in luxury, twice that many in cramped conditions). Life support is not included. It should be supplied by a farm module (below).

Factory: A large industrial park capable of operating efficiently with a few dozen workers or robots. Contains warehouses, minifacs, etc.

Farm: An acre or so of open space with a few buildings devoted to agriculture and food processing. Up to 10 people or robots can work it effectively; each worker can grow food to feed 10 people. Using crop rotation, the farm can serve as total life support (providing air, food, and water) for about 100.

Park: A landscaped green space, possibly with entertainment or exercise facilities (pool, stream, playground, etc.). In a pinch, it can provide camping grounds for about 100 people.

Plaza: A mall or concourse area with about a dozen medium establishments, plus open space for several hundred people to congregate.

Null-G Handball Arena: Like a Null-G Handball Court (see p. 60) but represents either multiple courts or larger courts for bigger games (most often aboard stations rather than ships). For example, grav-ball (played by teams of seven armored players) uses a court 120'× 60'×60' (i.e., 27 handball modules, 20,000 Seats, 900-person Hall).

Security Systems

Civilian vessels require security measures against theft; exactly how many and what type will depend on the owner's paranoia and Imperial liability laws (no system is completely error-free). Warships often have lethal security measures, especially when on duty.

Electrified Surface

See *Surface Features*, pp. 31-35.

Locks, Alarms, and Security Systems

See p. 69.

Cells/Armories/Safes

This is a single cabin with reinforced walls (DR 200), restraints, and barred door – a place to hold unruly passengers, crew, etc.

The same module can be used to construct an armory for secure storage of small arms and ammunition, or a safe for high-value cargo. These versions are not interchangeable, however, and their use must be specified at the time of construction. All versions include an independent high-security alarm and an observation camera. Each module normally holds 1-2 people (up to 25 for a limited period), 4,000 lbs. of racked weapons and ammunition, or 400 cf of valuables.

Dedicated mail carriers should install as many safes as required for the service.

Brigs

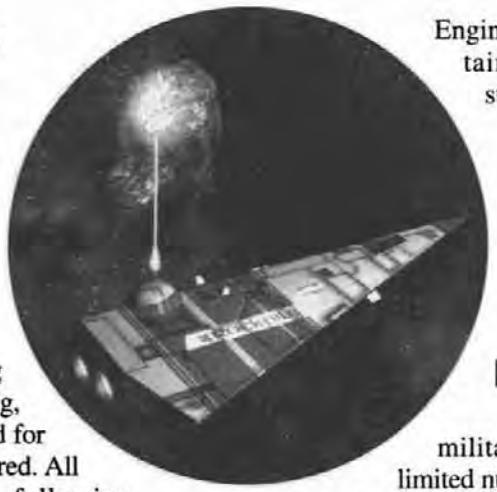
This is an ordinary stateroom equipped with reinforced walls and door (DR 200), restraints, and a high-security alarm and observation system. It normally holds 1-2 people. Up to 50 could be crammed in for a limited time, but this will overwhelm the two-person life support. A ship or starport with one or two brigs usually will monitor them from the bridge. A larger number of brigs probably will have its own dedicated security station (see *Auxiliary Control Station/Duplicate Controls*, p. 43).

Double-Cell Brigs

As per the brig, above, but does not contain the security station. Multiple double-cells are usually installed together with one or two security stations to form a much larger secure area or prison.

Miscellaneous Systems

These round out the many equipment needs of a starship, though many are useful only in specialized applications.



Turreted Mining Lasers (TL8)

This is a powerful mining or cutting laser used by ultra-tech mining, engineering, and rescue vehicles. Mining lasers are sized for continuous fire, so no energy bank is required. All mining lasers are constructed with the following options: close range, universal mount (or casemate if hull-mounted), energy drill, and no stabilization. All TL11+ mining lasers are built with the *compact* option to represent the advances in laser technology found in normal shipboard weapons. See p. B125, *Attacking Inanimate Objects,* for more information.

Although the mining laser can be used as a shipboard weapon, it is impractical to do so because damage is so low and range is so short. If a mining laser is used as a weapon, damage is calculated somewhat differently; the target is no longer a big dumb rock, but is theoretically trying to avoid being hit. All damage ratings are divided by 4 and the RoF becomes 4, subject to the laser-autofire rules. More damage is *not* possible; indeed, just the opposite, as all four shots must hit to do listed damage. The modified damage ratings thus become 6d at TL8, 12d at TL9, 5d×5 (2) at TL10, 7d×5 (2) at TL11, 9d×5 (2) at TL12, and 5d×10 (2) at TL13.

Ore Processors

This is a multi-stage facility for extracting valuable materials from raw ore and concentrating it for transportation or further processing. Fed a steady stream of ground rock, it produces bars of metal, glass rods or fibers, and tanks of condensed volatiles for storage. The system's power plant is self-contained for greater efficiency, and hold space for several hours' feedstock is provided.

Capacity is in dtons of ore processed per hour, for hard rock. For soft rock, rate is doubled. Products depend on concentrations present in ore: multiply input volume by concentration, and reduce by 10% for wastage.

Crew is per shift; three shifts are required for full-time operations.

Passage Tubes

This flexible tube connects the airlocks of two ships in space. It holds pressure, permitting occupants to move between the vessels without space suits. A standard tube is 600' long and 8' in diameter, and hooks to generic fittings around external airlocks. It normally takes an hour or so to rig in free fall (30 minutes with two or more people working) – this requires a Mechanic (Starships) roll. A standard tube has PD3, DR 12; the armored tube increases to DR 20. Engineering and entry modules each contain a 100' armored passage tube as standard equipment.

Entry Modules

An entry module consists of a 100' armored passage tube and either a four- (small module) or eight-man (large module) airlock.

Escape Capsules

Escape capsules are common on military vessels, which typically have a limited number of ship's boats and a crew difficult to assemble under combat conditions (commercial vessels use lifeboats, instead). Each capsule holds four crew members at TL7, six at TL8, eight at TL9, or nine at TL10+ and provides three days of limited life support at TL7-9, four days at TL10, or full life support at TL11+. They have 0.03 G and 0.003 GRds of thrust at TL7, 0.05 G at TL8, 0.6 G at TL9, 0.8 G at TL10, and 1 G at TL11+. A capsule also provides contragravity for landing at TL8+, plus survival packs as defined on p. T:FT70.

Escape capsules are installed under panels in the vessel's hull; to launch, explosive bolts blow the panel clear and the thrusters accelerate the capsule away from the ship (rockets at TL7). Reconditioning and reinstalling escape capsules is only possible at a shipyard or spacedock; they are used only in emergencies! There are normally 25% more seats provided in the capsules than a ship's regular personnel capacity not otherwise provided for in the ship's small craft or lifeboats.

Boarding Clamps

This is an advanced grapple designed to latch onto an enemy ship for boarding purposes. It differs from an ordinary grapple in its reach (12'), strength (ST 800), and the method in which it attaches to the target vessel. The boarding clamp does significant damage to the hull of the target vessel, whereas normal grapples are designed to attach without damage.

Survival Shelters

Survival shelters are reinforced and shielded rooms intended to protect occupants from environmental dangers (such as sudden decompression, fire, radiation, and extreme temperature). Each shelter provides limited life support and power for its rated number of occupants: eight days at TL7, 20 days at TL8, 25 days at TL9, 30 days at TL10, and unlimited duration at TL11+. A medium-range radio is provided to contact rescue personnel. In addition, at TL8 every multi-person shelter has a number of ESUs. At TL9-13, these ESUs are replaced with automeds.

Model	Capacity	Airlock Size	ESU/Automed
Locker	1	1	0
Small	4	2	1
Medium	8	4	2
Large	25	6	5

Optional: Zero-Space Systems

The modular ship-design system presented in this book is intended to be simple; efficiency is a secondary consideration. In particular, many modules contain varying amounts of empty space to bring them up to half- or full-space size. It is certainly possible to simply ignore this fact and assume the extra space makes *GURPS Traveller* starships more roomy and livable. It is also possible to infer that some of this space is taken up by items that, by their nature, are too small to add up to even half a dton on any but the largest ships, but are nevertheless important enhancements of the ship's capabilities.

This section details a selection of such items. On small ships – generally less than 1,000 dtons – one zero-space system (about 10 cf) can be added per dton of internal space *not* devoted to cargo holds, fuel, or vessel storage, at additional cost and mass but no extra volume. Remember that streamlining reduces internal volume.

This option is completely at the GM's discretion, however, due to its potential for abuse. Most systems are rated for the number of "units" that will fit in a 10-cf "zero space" or a 250-cf half-space module. Larger vessels should simply purchase these systems in half-space lots. The GM can justifiably insist that small ships do so, too.

Ship's Lockers

Normally, the ship's locker (or *slop chest*) should be separate from the ship's cargo holds. It contains things that the crew may need during flight or in an emergency, but aren't used every day. The cargo holds are inconvenient to dig through during an emergency and may be entirely inaccessible depending on the nature of the problem. The ship's locker usually contains small tools, vacc suits, equipment, survival gear, hull patches, etc. On small ships without an armory, it may also serve as a storage space for weapons, although it is not intended to be secure. (It's supposed to be easy to get into, for emergencies.) Each ship's locker is 10 cf, and holds up to 200 lbs. of gear.

Emergency Life-Support Packs

This is a portable air-supply apparatus. It provides 2 hours of air, weighs 10 lbs., and costs Cr100 (1 hour, 30 lbs. at TL7). One hour of oxygen-nitrogen, or ordinary compressed air, weighs 4.2 lbs., so most of the weight is the compressed air.

For game purposes, assume all adults breathe at the same rate and children under 12 use half as much. Thirty units will fit into 10 cf. See p. S61 for more information.

Tool Kits

Basic tool kits are described on p. GT116. These are normally installed behind panels in any workspace with the appropriate type of equipment. Mechanic or engineer tool kits are 15 cf, 300 lbs., Cr800. Armory or electronic tool kits are 7 cf, 100 lbs., Cr1,200. A half-space module contains five tool kits of each type, for a total of 20.

Damage-Control Lockers

A damage-control locker contains the various equipment used to perform emergency repairs to the ship: hull patches, environment suits, testing and sensing gear, emergency-power conduits, short-range radios, portable emergency-power generators, fuses, etc. An unstocked damage-control locker might as well be used for cargo; it won't help the crew at all in an emergency.

A standard damage-control locker is 50 cf, weighs 1 ston stocked, and costs MCr0.25 in equipment and parts, which must be replenished for every 2,000 HP restored. See pp. 106-107 for information on repairs.

Survival Kits

Imperial safety regulations require commercial ships to carry one survival kit per passenger in lifeboats designed for surface landings. They are a good idea on any craft that may be forced down on a planet with a (more-or-less) breathable atmosphere. Survival kits are standardized at TL10; any vessel in the Imperium will use the same type, regardless of TL. Their contents are described in detail on pp. T:FT69-70. Nine kits are 10 cf, 450 lbs., and cost Cr24,300.

Computer Terminals

Each crew workstation includes a computer terminal; each cabin or stateroom also comes with a monitor and keyboard to access the ship's computer (though access is typically restricted to library, communications, and entertainment functions). Additional terminals may be added for redundancy or to facilitate certain types of research. Five terminals are 10 cf, 200 lbs., and Cr5,000 at TL7-8; this becomes 10 terminals at TL9, and 20 at TL10+.

Heavy-Duty Fire-Suppression

A fully automatic array of extinguishers or hoses mounted inside the vehicle, this uses inert gases to put out fires in milliseconds. This system has the equivalent capability of both a full and compact fire-suppression system in one, giving an *additional* +5 bonus to putting out fires (Engineering, Cockpit, and Bridge modules each already contain a fire-suppression system; see pp. 42-43, p. 36). Each system is 5 cf, 250 lbs., and Cr5,500. See ***GURPS Vehicles***, p. 185, for information on fire suppression. Particularly on large vessels, the GM may rule that each of these systems only benefits a particular section of the vessel.

Security Systems

All ships come with electronic locks. Some starship owners install after-market intruder defenses (including digital cameras, motion sensors, and weapons) and a high-security alarm system (Cr3,000; effective skill 20).

All vessels also come equipped with an internal communications and security system, consisting of a microphone, loudspeaker, optical-data cable jack, and short-range radio repeater in each compartment. Each compartment also has its own pressure, temperature, smoke, and radiation detectors; these are connected through the communications system to the bridge. The microphone and radio pickups can be activated from the bridge, providing some additional information on events in other parts of the ship. Each door, including the external airlocks and sensitive-area access panels, has an electronic lock opened by a keypad, electronic card, or biometrics sensor (chosen before construction).

Communications and security systems are installed on the basis of one "unit" per compartment (room). For ships without detailed deck plans, a good rule of thumb is three compartments per crewman (quarters, workspace, and corridor), not including ship's troops or frozen watch.

The electronic locks cannot be picked. Bypassing the security system requires a contest of skills vs. the security system's skill of 15, using Electronics Operations (Security Systems)/TL or Traps/TL, with modifiers as per Lockpicking skill (p. B67). If the roll fails, the ship's computer alerts the crew and takes other actions as programmed.

Hardened Communications: Military vessels are normally equipped with a fiber-optic backup communications network. This can be assumed (at negligible weight and cost) unless the ship is low-tech or very large. Twenty-five units are 10 cf, 50 lbs., and Cr20,000 at TL7; 100 units are 10 cf, 100 lbs., and Cr16,000 at TL8. This becomes 200 units at TL9 or 400 at TL10+ at 10 cf, 50 lbs., and Cr800.

Basic Security: Internal sensors can be added for additional security. The basic security package upgrades the ship's intercom and internal sensors to include monocular color, low-light television (1×) and imaging ladar. An integral rechargeable B cell provides (TL-6)×360 uses for the ladar in the event of loss of ship's power. The security system's skill is improved to 20. The additional sensors allow the use of the Anti-Hijack program (see p. 71).

The basic package also includes a spray tank, capable of creating a cloud of any standard gas or liquid chemical 3 yards in diameter at a range of 10 yards. The spray automatically hits and lasts for 2 minutes in atmosphere (less in vacuum). Sprayers are normally loaded with sleep gas (p. S78: LC 2, Cr75 per unit for 20 shots; Cr45,000 per 600 units); this cost is not included with the security package.

Twenty units are 10 cf, 230 lbs., and Cr115,000 at TL8; 10 cf, 190 lbs., and Cr57,000 at TL9. Twenty-five units are 10 cf, 220 lbs., and Cr38,000 at TL10; Cr20,000 at TL11+.

Advanced Security: Advanced security systems are designed to actively resist hostile boarding actions and hijacking attempts, even if isolated from the ship's central computers. In addition to all the systems listed for the basic package, each unit incorporates a hardened, high-capacity, Complexity 4 robot brain running Targeting, Gunner, Internal Security, and Optical Recognition programs and a concealed snub revolver (p. GT110) on a retractable mount. Each chamber can be loaded with a different type of ammunition (ammo cost and mass is not included) and individually selected for firing. Sixteen units are 10 cf, 200 lbs., and Cr470,000 at TL9; 20 units are 10 cf, 220 lbs., Cr70,000 at TL10; or 10 cf, 190 lbs., and Cr28,000 at TL11+.

Automated defenses are of dubious legality within the Imperium (LC 0 or worse). Under laws modeled on the Shadusham Accords (p. GT59) and common throughout the Imperium, the owner of such a system is responsible for its actions as if he had performed them himself.

Window Boxes

These are greatly scaled-down versions of *Total Life Support* (see p. 56), designed to provide some greenery aboard ship as well as supplemental fresh vegetables and herbs for the galley, or to support a small pet (up to 2 lb.). Each window box (sometimes called a *terrarium*) includes an underpressure filter kit to prevent airborne contaminants from escaping into the general ship's environment. One window box is 10 cf, 100 lbs., and Cr1,000.

Beacons

A small sphere dotted with solar panels, a beacon holds a tiny battery/capacitor and transmitter. It is designed to emit a 1-second pulse each 10 seconds at 1 AU from a standard star, with both pulse length and interval varying if the beacon is closer or farther. Along with basic data on the local star, this yields the beacon's location; a receiver can intersect signal direction with indicated orbital path. (Technically, a receiver farther out than the beacon has *two* potential locations to choose from, but a skilled radio operator usually can determine which is correct by signal quality.)

A beacon can be set to transmit on emergency or standard navigation radio channels. They come in two sizes: small and large. The range depends on the size of the beacon and the TL at which it is built.

Size/TL	Lbs.	Cf	Cr	Range
Small Beacon/7	219	4	4,076	3
Small Beacon/8	108	2	2,040	10
Small Beacon/9	53.7	1	1,021	100
Small Beacon/10	26.7	0.5	519	500
Small Beacon/11	26.3	0.5	519	500
Small Beacon/12+	25.9	0.5	519	500
Large Beacon/7	2,091	40	12,315	30
Large Beacon/8	1,040	20	6,170	100
Large Beacon/9	518	10	3,090	1,000
Large Beacon/10	257	5	1,578	5,000
Large Beacon/11	256	5	1,578	5,000
Large Beacon/12+	254	5	1,578	5,000

Range is in Space Combat Hexes.

Computers and Programs

This section expands upon the computer rules on p. GT161, describing new programs and explaining what programs are usually used. A *dedicated* computer may only run one program, the one for which it is designed.

Using Programs

All ships in ***GURPS Traveller*** have bridges or cockpits; each has *three* computers. These computers run everything on board from the environmental controls to the weapons to the drives. Experienced captains know that it doesn't pay to skimp on good programs! A complete package for a free trader costs KCr240 (at TL10), and consists of three Datalink programs (one for each communicator), three Targeting (skill +8; one for each turret and one for a missile fire director on the bridge), Damage Control with ship's specifications in a database, Autopilot (normal space, skill of 12, Cr 2,000, Complexity 2), Astrogation (Jump-1), and Library Database. Add a Limited (Cr 2,000, Complexity 4) or Full (Cr 5,000, Complexity 5) Personality Simulation to make the ship more user-friendly, if desired.

There are four different types of programs that run on shipboard computers:

Utility Programs are used to perform many of the day-to-day operations of the ship. They usually require no input from the user and run autonomously in the background, consuming minimal resources. They are not scalable, but they can be tied to RVO programs or Bonus Programs (see below) to swap and/or enhance data. Only the ubiquitous programs or the ones most likely to be interfaced with the crew are included.

Routine Vehicle Operation (RVO) Programs are the programs that actually operate the ship and perform the "day-to-day" operations. They are scalable; more advanced versions of the programs are available, but at higher cost and higher computer complexity requirements. For each increase in skill level above the base level, double the base cost of the program and increase Complexity by 1.

Example: Anti-Hijack has a base Complexity 5 and Criminology-14. If the owner wants a skill level-16 program (an increase of two levels), he pays 4× the cost and increases the complexity of the program by 2.

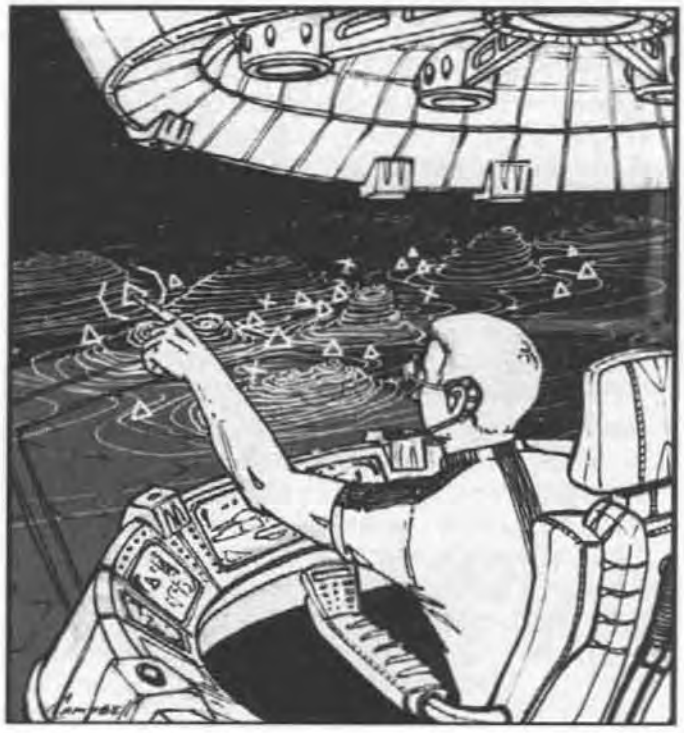
RVOs do not enhance a user's skill. If equipped with a database, they can also be used as an Expert System, but take twice as long to arrive at a solution as a human being would and are subject to the same flaws (e.g., incorrect assumptions). They also are not very good at "thinking outside the box." Databases can be shared between programs that are running concurrently. For more information on RVO programs, see pp. VE63 and T:FT68.

Skill Bonus Programs add a bonus to some skill a user possesses. Skill bonus programs, like RVO programs, are scalable. For each increase in bonus above the base level, double the base cost of the program and increase Complexity by 1. GMs are advised to prevent these programs from generating bonuses that may be too high.

Example: A Targeting program gives a +1 bonus to a human gunner. If he wants a +2 bonus (1 extra level) he pays 2× the cost and adds 1 to the Complexity.

Robot Skill Programs are used by ships equipped with robotic hulls and robotic brains. Considering their rarity in the ***Traveller*** universe, they are not described in detail here. See p. VE63 for more information.

GMs should be advised to not let RVO programs do the work of robot skill programs. The line between them is fine but distinct. The major difference between robot skills and RVOs is RVOs are a lot less forgiving if they encounter a situation even slightly outside their programming. For example, an Autopilot skill program will fly a fairly straight course, making minor corrections to ensure it arrives at a predetermined spot. In an emergency, it is capable of landing or docking the ship, but simple failure results in a mishap, and critical failure results in disaster. Wilderness landings are typically outside the range of "known circumstances" for autopilots, for example. Meanwhile, a robot piloting program is treated as a sophont pilot. Almost any RVO program can also be a robot skill program and vice versa – just remember the differences in capabilities.



GMs should also be advised not to let RVOs do the work of good, old-fashioned die rolls against the adventurers' skills. Anybody trusting his ship's Astrogation (Jump) program without checking the results first is asking for trouble.

All programs have a base TL. This is the earliest TL at which the program is available. For instance, a jump-5 Astrogation program is not available until TL11, whereas a jump-1 program is available at TL9.

The cost of all TL6-8 programs is halved at TL9 and halved again at TL10+.

The cost of all TL9-10 programs is halved at TL11 and halved again at TL12+.

The cost of all TL11-12 programs is halved at TL13+.

Utility Programs

Program	TL	Cost	Complexity
Astrogation (Jump-1)	9	10,000	2
Astrogation (Jump-2)	9	20,000	3
Astrogation (Jump-3)	10	30,000	4
Astrogation (Jump-4)	10	40,000	5
Astrogation (Jump-5)	11	50,000	6
Astrogation (Jump-6)	12	60,000	7
Astrogation (Normal)	7	3,000	2
Cartography	7	5,000	3
Computer Navigation	7	500	2
Datalink	7	400	1
Double-Fire	8	1,000	1
Library Data	7	100,000	1
Personality Sim (Full)	8	20,000	5
Personality Sim (Ltd.)	8	8,000	4
Transmission Profiling	7	8,000	3

RVO Programs

Program	TL	Cost	Complexity	Skill
Anti-Hijack	8	10,000	5	14
RVO Astrogation (J-1)	9	10,000	2	12
RVO Astrogation (J-2)	9	20,000	3	12
RVO Astrogation (J-3)	10	30,000	4	12
RVO Astrogation (J-4)	10	40,000	5	12
RVO Astrogation (J-5)	11	50,000	6	12
RVO Astrogation (J-6)	12	60,000	7	12
RVO Astro. (Normal)	7	3,000	2	12
Autopilot (Jump Space)	9	8,000	2	12
Autopilot (Normal)	8	8,000	2	12
Autopilot (Tactical)	9	200,000	3	12
Gunner	7	45,000	4	12
RVO Routine Skill (E)	8+	3,000	2	12
RVO Routine Skill (A)	8+	6,000	3	12
RVO Routine Skill (H)	8+	12,000	4	12
RVO Routine Skill (VH)	8+	24,000	5	12

Skill Bonus Programs

Program	TL	Cost	Complexity	Bonus
Damage Control	8	2,000	2	+2
Fire Direction	6	2,000	1	+2
Targeting	7	1,000	1	+2
Routine Skill (E)	8+	3,000	2	+1
Routine Skill (A)	8+	6,000	3	+1
Routine Skill (H)	8+	12,000	4	+1
Routine Skill (VH)	8+	24,000	5	+1

Anti-Hijack: This program constantly monitors conditions within the starship and automatically locks the access doors to the bridge and controls when a hijacking occurs (usually by accessing the various utility programs controlling the different subsystems). Because this system is not foolproof, would-be hijackers may gain access in spite of the program. Whenever a situation arises where the program must act or notices "suspicious activity," it alerts the captain. It requires the Basic Security package (see p. 69).

Astrogation (Jump Space): This program comes in two different versions. The RVO program is needed if the computer is to plot an interstellar jump course. The Utility program is required if the navigator is doing it himself. This is similar to the Navigation program in ***Traveller***.

Astrogation (Normal Space): This program comes in two different versions. The RVO program is needed if the computer is to plot a normal space course. The Utility program is required if the navigator is doing it himself. This is similar to the Generate program in ***Traveller***.

Autopilot (Normal Space): This RVO program enables the ship's computer to control the vessel in normal operations, especially en route to/from the jump/breakout point. The program will avoid obstacles and respond to simple instructions from traffic control, but will not perform dangerous maneuvers, "push the edge," or Dodge in combat. If a situation arises beyond its capacity to handle or at preset intervals or events, the program will sound an alarm and rouse the pilot to take over.

Autopilot (Tactical): This RVO program is a much more advanced version of the Autopilot (Normal) program. In addition to the basic version's capabilities, it *will* perform dangerous maneuvers, "push the edge," and Dodge in combat. If a situation arises beyond its capacity to handle, the program will attempt to flee, engaging targets with any weapons given it to control (via the gunner programs) if they try to prevent it from leaving the area; it has Tactics (3D) equal to its skill level. It borders on a true robot program and is Legality Class 0.

Autopilot (Jump Space): Needed for the computer to pilot the ship into jump.

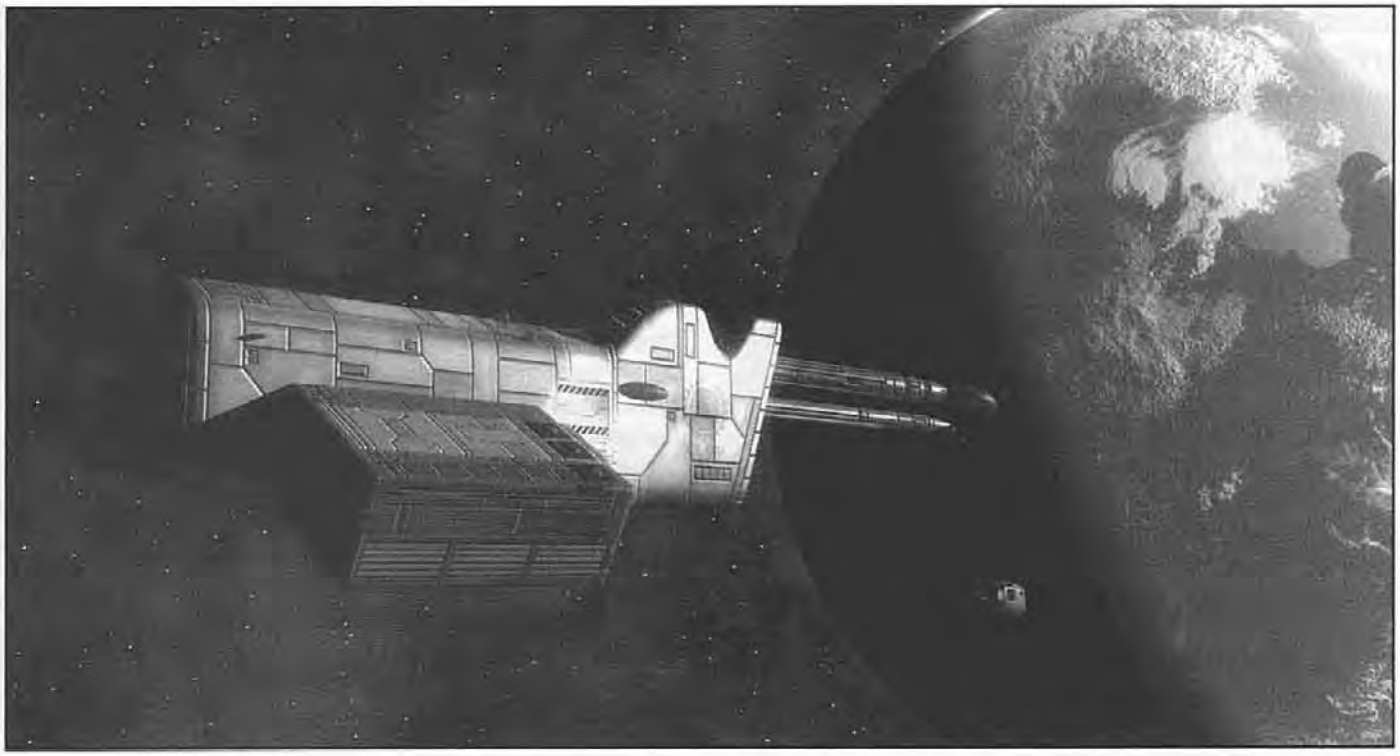
Gunner: In conjunction with a Targeting program (required), it lets the computer act as a gunner. The bonus to skill is *not* cumulative with a Targeting program – use the *lower* of the Targeting bonus or Gunner program skill. One program is required per gun or battery.

Routine Skill: This is a placeholder for any skill program not covered. It comes in four different levels of complexity, depending on the ***GURPS*** skill it is emulating: E for easy, A for average, H for hard and VH for very hard. This program comes in two different versions; the RVO program is needed if the computer is to perform the skill itself, while the skill-bonus version provides a bonus to a sophont using the skill.

Damage Control: Monitors systems status and gives bonuses to repairing ship damage. One is required per damage control (DC) party performing repairs. Also requires ship blueprints (1 gigabyte and Cr1,000 per ship). Multiple DC programs may share the same blueprint database.

Fire Direction: This is used to calculate trajectories for indirect-fire weapons, enabling more accurate aiming of artillery barrages or naval gunfire. This program is typically only found on ships carrying ballistic-type weapons (see ***GURPS Traveller: Ground Forces*** for more information). One copy per gun or battery is required.

Targeting: Predicts target positions and helps aim weaponry, adding a bonus to a gunner's skill equal to the program's Complexity+1. One is needed per human or computer gunner. Due to the long ranges at which spacecraft engage their opponents, a targeting program giving a +7 to +10 bonus is *strongly* recommended for all armed spacecraft!



Cartography: This is a package enabling aircraft equipped with radar or planetary survey arrays to map areas over which they fly. It also allows spaceships or satellites to produce entire planetary maps if orbiting within sensor range, provided they make enough orbits. See ***GURPS Traveller: First In*** for more information on mapping and surveys.

Computer Navigation: This software allows a computer to determine its position by comparing input from a high-resolution sensor with a map database of the region. It requires a LLTV, radar, ladar, AESA, thermograph, or PESA (if underwater, a ladar or active sonar), plus an accurate map database of the local terrain. Combined with a robot brain, this allows the vehicle to pilot itself to a specified location on the map automatically.

Datalink: Used to share real-time data with other computers, sensors, missiles, etc. One is required per active communicator (e.g., laser, radio, missile laser, maser, meson).

Double-Fire: This program allows any energy weapon to be fired at a much higher RoF. See *Pulse Mode*, p. 46. One copy must be running for each weapon so configured.

Library Data: An encyclopedia program containing detailed non-classified information on the Imperium. Not always up to date for all worlds, but licensed owners can often download supplementary data at local starports. 100 gigs.

Personality Simulation: A "persim" enables the ship's computer to simulate emotions, quirks, etc., and use highly idiomatic speech. The "limited" version gives the computer a simple personality (up to five quirks and a single mental disadvantage are appropriate). The "full" version gives the computer a simulation of a real or made-up personality with the same behavior (and quirks and mental disadvantages) as the person it simulates.

Transmission Profiling: This program takes input from a communications receiver, radar detector, or radscanner and compares it with a database to determine what sort of equipment produced the signal. This can be fairly detailed if the GM desires – e.g., "The transmitter is a Zloukalev Industries 500-kW Air Search Radar, from a lot with model numbers beginning with XJ3K4. It isn't using the frequency-shift pattern used by the Zhodani, which means it is probably one of the four sold to the Sword Worlds." Of course, information is critically dependent on the database!

Future Developments

"These aliens are just as fragile as we are. You just have to work through their technology, which is, I'm sad to say, far in advance of our own."

– anonymous scientist from old Solomani 2D movie

Most people assume the Ancients had technology bordering on magical. In reality, Ancient technology is far in advance of the best the Imperium has to offer. One Imperial think-tank, upon being tasked with determining the Imperium's chances of resisting an incursion by a TL13 society, responded after much deliberation, "*A full TL13 society is not to be trifled with.*" GMs should be aware of the extremely game-unbalancing effects of introducing even one of these higher tech fields into the game. ***GURPS Vehicles***, ***GURPS Space***, ***GURPS Ultra-Tech***, and many world books all contain many different technological marvels not common to the ***Traveller*** universe. That doesn't mean they don't exist . . .

TL13+ components (if they are available at all) could be artifacts, experimental prototypes, or in limited production; many are classified. Their prices should be increased by 100-400% to reflect this. Components purchased on the black market will cost at least 500% of this *increased* price.

Here are some guidelines for introducing TL13+ vessels into an existing campaign. In general, most ships are 50-100% faster, weapons do 50-100% more damage, and

metallurgical sciences have produced lighter armor and structural materials (or perhaps vessels don't use metal at all; new plastics or "living ships" may be the norm). Of course, the computers are much more powerful as well, enabling and controlling this new technology while changing many aspects of shipboard life, as well. Medical technology is capable of rebuilding a person from just a few scattered brain cells (see *Chrysalis Machine*, p. S91). The Emergency Aid Station/13, Sickbay/13, and Evacuation Bays/13 are built using these machines. GM may freely ignore these and use the TL12 versions of the modules, instead.

Aside from the typical "wow" effect surrounding TL13+ equipment, there is also the issue of survivability and endurance. The only fleet known to possess TL13 ships belongs to the Darrians in the Spinward Marches, and they are not new designs. The Imperium does not expect any of its TL12 warships to remain in service nearly as long as the Darrians' ships, even with heavy maintenance. The Darrian TL13 starships apparently have very advanced characteristics for survivability and endurance that are currently unknown to the Imperium.

Reactors and Energy Banks

There isn't much improvement in fusion reactors past TL11 other than less maintenance. However, at TL14 antimatter reactors become available (see below) and possibly cosmic power or total conversion at TL16. Both of these halve the size of most power-hungry modules.

Energy banks at TL13 and each successive TL pack more power in them for the same mass and volume but other differences are negligible.

Antimatter

Antimatter plants generate energy through the mutual annihilation of matter and antimatter (usually anti-hydrogen). A gram of anti-hydrogen powers a 1-MW plant for 2.5 years and costs MCr0.001 at TL14 (though in a TL10 society like the Imperium, 1 gram can run into the millions of credits). At TL15+, 1 gram powers the plant for 5 years. It is more expensive to run an antimatter power plant, but they are slightly smaller and cheaper to build. They are much more deadly to the crew if the reactor is injured.

Antimatter bombs (or warheads) are something to be feared; anyone with a magnetic bottle and a gram or two of antimatter is a threat to the safety of everyone and everything around him for miles. Antimatter bombs are simple to build – so simple in fact, that they tend to go off during their construction and are thus rarely used.

Megathrusters (Late TL13)

At late TL13, megathrusters come into being. The Darrians, being an early TL13 society, have yet to stumble onto the megathruster secret. Past TL13, GMs should feel free to make them even more efficient (requiring less power) with each successive TL.

Weapons

Meson-weapon technology tops out at TL14. Other possibilities are grasers and disintegrators at TL13. Missiles become so deadly and move so fast that ships of lower TL don't stand any chance of shooting them down or surviving more than a few hits. The late TL13 versions presented move at 55 G. Sensors may not even detect them until too late.

Turret Meson Gun, 1.39-GJ (TL13): An experimental weapon design based on the TL11 particle-beam turret weapon. This weapon was developed in order to produce small ships and fighters with meson capability. Results from testing the prototype have been favorable so far. It is rumored a few megacorps have produced a top secret "advanced" fighter using this weapon as its main gun. This unit consists of a TL13 meson gun with a 1,390-MJ output, cyclic rate 1/2, extreme range, and the compact option. A TL12 2,780-MJ rechargeable power cell provides the energy for each shot, and TL12 fusion-reactor components generate the 46.3 MW required to fully recharge it every minute. The weapon is fully stabilized and installed in a universal mount (for turrets) or a casemate if hull-mounted.

Teleporters (Late TL13)

Teleporters in the ***Traveller*** universe are based on "circumvention," using an alternate dimension or pocket universe to bridge the gap between two points. Circumvention does not violate the law of conservation of energy, but usually the pocket universe used for the transport contains a large mass, capable of absorbing or providing the extra energy. See pp. T:ARIII114-116 for more information about teleportation and portals. A portal is a circular frame, ranging from about 1-10 yards across. Portals are connected in a network of between two and 60 portals, all attached to the same pocket universe. Transport is allowed only between these portals. There is a control pad on each portal to select the destination portal. Changing the portal destination takes 1 minute.

Once connected, the portals remain open, allowing traffic in either direction. At TL13, the pocket universe is unstable, requiring a vast expenditure of energy to recreate it. The pocket universe lasts for a few days, never longer than one week. The generator module contains a fusion-power slice (antimatter at TL14) to recharge the power cells in 1 day. Generating the pocket universe requires 1 hour and a full power-cell charge. Charging the power cell takes a full day, and cannot be done while the portal is open; the pocket universe is inaccessible during cell recharges.

At TL14, the pocket universe is stable, no longer requiring the expensive generator modules. The stable pocket allows 95% of the portal machinery, including power supply, to be located in the pocket universe, but the remainder must be located on the ship or station where the portal is located. The remaining 5% is subsumed in the cost of the portal.

Item	Capacity (cf)	Range (miles)
Teleport Portal, Personal	1	200,000
Teleport Portal, Small Cargo	500	200,000
Teleport Portal, Large Cargo	5,000	200,000

Chapter Ten

Starship Designs

This chapter contains some of the more common (or more interesting) vessels that ply the space lanes of the Third Imperium. The ***Traveller*** universe is a vast setting; the ships in this chapter are only a small sampling of the ship classes available to be encountered. Alien starships can be found in the ***GURPS Traveller: Alien Races*** series; warships in ***GURPS Traveller: Star Mercs***, ***GURPS Traveller: Ground Forces***, and the upcoming ***GURPS Traveller: Imperial Navy***; merchants in ***GURPS Traveller: Far Trader***; and scout ships in ***GURPS Traveller: First In***. Other sources include the online magazine *Journal of the Travellers' Aid Society*, which publishes new starship designs on a regular basis, and BITS, which has a free compendium of starships on its web site at **www.bits.uk.org**.

Starship Writeups

GURPS Traveller starships are presented in a standardized format. *Subassemblies* describes the basic hull and any attachments with their size modifiers; VGSL indicates very good streamlining while USL means unstreamlined. *Powertrain* describes the motive systems. *Fuel* describes hydrogen tankage; it is not listed for vessels without tanks. *Occ*, or occupancy, gives crew/passenger capacity other than in the cockpit or bridge. *Cargo* indicates volume available for storage of goods.

Armor is listed by facing; often the hull will have one value across all faces with turrets and bays having another value across all faces. *Weaponry* describes any arms carried, with notes on facing or battery groupings. *Equipment* describes the gear installed in the vessel other than that described elsewhere in the writeup.

Size gives the vessel's length, width, and height. *Payload* is the weight of crew, consumables, and cargo, with cargo assumed to weigh 5 stons per dton. *Lwt.*, or loaded weight, is the final weight of the vessel in service; subtract payload from this figure to determine empty weight. *Volume* describes the hull's size. *Maint.*, or maintenance, either gives the number of hours that the vessel can safely operate before a service checkup, or gives the man-hours of maintenance required for each day in operation (*mh/day*). *Price* is the cost of a new vessel.

HT is the vessel's Health in game terms, and *HPs* gives the hit points of its various subassemblies. Finally, performance data is listed below these.

A component listed without a quantity means quantity is 1. Those with capacity measured in dtons list their capacity, *not* their own size. Unless noted, vessels are sealed with medium frames and expensive metal armor. Also see pp. 12-13.

Small Craft

Shuttling between planets, small non-starships run errands, make deliveries, and generally do much of the dirty work that larger craft can't or won't do. Small craft displace less than 100 dtons and are thus incapable of interstellar flight. They are classified as starships are, by tonnage and acceleration, although minor variations can make identification difficult. By tradition, "launches" are small craft in the 10-dton range, "gigs" in the 20-dton range, "ship's boats" in the 30-dton range, "pinnaces" in the 40-dton range, and "cutters" in the 50-dton range. "Shuttles" may vary from 30 to 100 dtons.

The small craft described here are typical interplanetary vessels. They should not be construed as the only types available, as shipyards can construct almost anything that can be designed. Though most small craft have stations for two or more crew members in the cockpit or bridge, in practice it is usually possible to operate the craft with only one crewman (the pilot); the other couch may be used by a co-pilot or flight engineer, or it may be allocated as an additional passenger seat.

The 50-ton Modular Cutter is explained in *great* detail in ***GURPS Traveller: Modular Cutter***, so is not detailed here.

10-ton Launches

The *launch* is a 10-ton vessel intended for routine errands. The first TL9 launches were designed as lifeboats. As thruster technology improved, more space became available, permitting more advanced launches to take on a variety of short-run tasks.

Launches are typically unarmed.

Harper-Class 10-ton Launch (TL9)

The *Harper* class is an obsolete design, derived from a Terran launch of Interstellar Wars vintage. It is still encountered in backward star systems off the main Imperial trade routes. An airlock and fresher are behind the bridge.

A typical two-man crew consists of pilot and steward, assuming that important passengers are carried. In other circumstances, the extra cockpit seat can be used to carry a total of 23 passengers.

Subassemblies: VGSL Hull +6.
Powertrain: Contragravity, Maneuver.
Occ: 2 Passenger Couches **Cargo:** 1.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: Light Cockpit.

Statistics
Size: 30'×15'×15' *Payload:* 9.9 stons *Lwt.:* 46.9 stons
Volume: 10 dtons *Maint.:* 7.17 hours *Price:* MCr7.78

HT: 12 *HPs:* 3,000 [Hull].

sAccel: 0.6 Gs/0.8 Gs empty *aSpeed:* 1,060 mph

Quatermain-Class 10-ton Hunting Launch (TL10)

A standard design found in much of the Imperium, this is often used as an auxiliary craft by most variants of the Safari ship (pp. 87-89). It is divided into three sections: bridge and seating forward, a cargo bay amidships (for the short-term carriage of specimens), and the engineering section aft, which is generally inaccessible from within the craft.

The typical crew is a single pilot.

Subassemblies: VGSL Hull +6.
Powertrain: 3 Short Term Maneuver.
Occ: Half-Sized Passenger Couch **Cargo:** 5.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: Liquid Crystal Skin; Electrified Surface; Light Cockpit.

Statistics
Size: 43'×20'×8' *Payload:* 28.2 stons *Lwt.:* 51.5 stons
Volume: 10 dtons *Maint.:* 14.9 hours *Price:* MCr1.8

HT: 12 *HPs:* 3,000 [Hull].

sAccel: 2 Gs/4.5 Gs empty *aSpeed:* 1,985 mph

20-ton Gigs

The *gig* is a larger version of the launch. Most Imperial gigs are primarily designed for cargo, carrying up to seven dtons; they can also carry 24-36 passengers for a duration of 24 hours or less. The gig is also seen on occasion as a fighter with a single forward-mounted laser. This is becoming increasingly rare as better thrusters are manufactured, making dedicated fighters cheaper to build. Other gig designs are equipped with low berths and pressed into service as lifeboats.

Faun-Class 20-ton Gunned Gig (TL11)

The gunned gig is designed as a general-purpose small craft. It can act as an improvised fighter using the laser, a lifeboat (carrying the crew in low berths), or a utility boat carrying passengers and cargo. It is most often seen as an auxiliary for the *Gazelle* close escort (p. 97); it is carried under the *Gazelle* in a partially recessed docking bay.

The typical crew is a single pilot. The vessel uses TL11 standard metal armor.

Subassemblies: VGSL Hull +6.
Powertrain: 5 Maneuver.
Occ: Passenger Couch, 3 Emer. Low-Berths **Cargo:** 6.5 dtons

Armor	F	RL	B	T	U
All:	4/200	4/200	4/200	4/200	4/200

Weaponry
390-MJ Turret Laser [Hull:F].

Equipment
Hull: Basic Emission Cloaking; Basic Stealth; Cockpit.

Statistics
Size: 59'×43'×8' *Payload:* 35.1 stons *Lwt.:* 108 stons
Volume: 20 dtons *Maint.:* 6.9 hours *Price:* MCr8.41

HT: 12 *HPs:* 4,500 [Hull].

sAccel: 4.6 Gs/6.9 Gs empty *aSpeed:* 3,540 mph

20-ton Customs Gigs

Designed to complement the Type T patrol cruiser (p. 84), the 20-ton customs gig can carry a security squad with powered armor – usually *Colom* light-duty battledress at TL12 (see p. T:GF86), standard battledress at TL10-11 (see p. GT118), or simple sealed combat armor at TL9. Personal weapons must be taken from the armory on the patrol cruiser. While it may seem strange to keep the battledress in the gig, fully suited troopers are not used for normal customs inspections – and neither is the gig. Usually, the patrol cruiser directly connects to the ship to be inspected (see p. GT123). The customs gig is primarily designed as a support vehicle for boarding actions.

Seating is provided for up to 24 (22 at TL9); half the seats include restraints for any prisoners. Apart from some light scouting, the customs boat does not normally leave the cruiser except during boarding actions (when the target ship is disabled and the boat is protected by the cruiser's guns) or to ferry landing parties (when it is not advisable to land the cruiser). The spacedock on the boat is normally used for seized cargo, but can be used to hold any grav APC the patrol cruiser carries.

Harvey Walbash-Class 20-ton Customs Gig (TL9)

The *Harvey Walbash* gig is a TL9 design, but was developed comparatively recently; the first examples were built in the century just before the foundation of the Third Imperium. It is unusually reliable for its type, and remains fairly popular on backwater worlds.

The typical crew complement is two – a pilot/gunner and a navigator/sensor operator – with the craft also carrying up to 22 troops. The vessel is heavily compartmentalized.

Subassemblies: VGSL Hull +6.
Powertrain: Small-Craft Bridge Add-On, 4 Maneuver.
Occ: 2 Passenger Couches **Cargo:** 4 dtons (in Spacedock)

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Weaponry
225-MJ Plasma Gun [Hull:F].

Equipment
Hull: Modest Emission Cloaking; Modest Stealth; compact, hardened Basic Bridge; 2-dton Spacedock.

Statistics
Size: 50'×25'×8' *Payload:* 22.9 stons *Lwt.:* 104 stons
Volume: 20 dtons *Maint.:* 4.59 hours *Price:* MCr19

HT: 12 *HPs:* 4,500 [Hull].

sAccel: 1.2 Gs/1.5 Gs empty *aSpeed:* 1,730 mph

Connor McBane-Class 20-ton Customs Gig (TL10)

The *Connor McBane* is the standard customs gig across much of the Third Imperium. The typical crew is again pilot/gunner and navigator/sensor, but carrying up to 24 troops. The vessel is heavily compartmentalized.

Subassemblies: VGSL Hull +6.
Powertrain: Small-Craft Bridge Add-On, 4 Maneuver.
Occ: 2 Passenger Couches **Cargo:** 5 dtons (in Spacedock)

Armor	F	RL	B	T	U
All:	4/200	4/200	4/200	4/200	4/200

Weaponry
430-MJ Plasma Gun [Hull:F].

Equipment
Hull: Modest Emission Cloaking; Modest Stealth; Battledress Ready Room; compact, hardened Basic Bridge; 2.5-dton Spacedock.

Statistics
Size: 50'×25'×8' *Payload:* 37.9 stons *Lwt.:* 117 stons
Volume: 20 dtons *Maint.:* 6.98 hours *Price:* MCr8.21

HT: 12 *HPs:* 4,500 [Hull].

sAccel: 1.4 Gs/2 Gs empty *aSpeed:* 2,000 mph

Blain Virishii-Class 20-ton Customs Gig (TL11)

The *Blain Virishii* was first developed in the rimward provinces just after the Solomani Rim War. Examples of the class were widely deployed in occupied Solomani territory and have often played a part in thwarting anti-Imperial activity. Crew and troop capacity are as for the *Connor McBane* class. The vehicle is heavily compartmentalized.

Subassemblies: VGSL Hull +6.
Powertrain: Small-Craft Bridge Add-On, 4 Maneuver.
Occ: 2 Passenger Couches **Cargo:** 5 dtons (in Spacedock)

Armor	F	RL	B	T	U
All:	4/400	4/400	4/400	4/400	4/400

Weaponry
700-MJ Fusion Gun [Hull:F].

Equipment
Hull: Modest Stealth; Modest Emission Cloaking; Battledress Ready Room; compact, hardened Basic Bridge; 2.5-dton Spacedock.

Statistics
Size: 50'×25'×8' *Payload:* 37.9 stons *Lwt.:* 121 stons
Volume: 20 dtons *Maint.:* 6.29 hours *Price:* MCr10.1

HT: 12 *HPs:* 4,500 [Hull].

sAccel: 3.3 Gs/4.8 Gs empty *aSpeed:* 3,160 mph

Jared Al'Kaseel-Class 20-ton Customs Gig (TL12)

The *Jared Al'Kaseel* is a new and somewhat untried design; most starports and planetary navies are retaining older models while the class proves itself in action. It, too, has the crew and troop capacity of the *Connor McBane* class. The vehicle is heavily compartmentalized.

Subassemblies: VGSL Hull +6.
Powertrain: Small-Craft Bridge Add-On, 4 Maneuver.
Occ: 2 Passenger Couches **Cargo:** 5 dtons (in Spacedock)

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

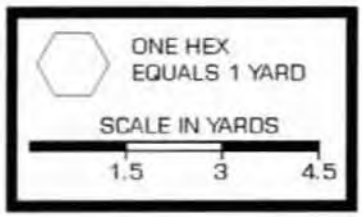
Weaponry
700-MJ Fusion Gun [Hull:F].

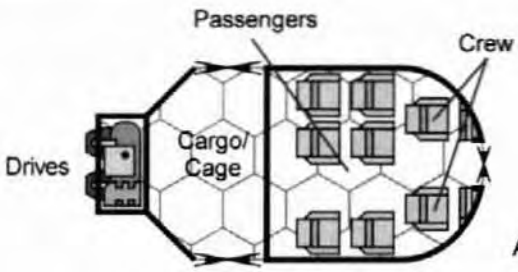
Equipment
All: Modest Stealth; Modest Emission Cloaking; Battledress Ready Room; compact, hardened Basic Bridge; 2.5-dton Spacedock.

Statistics
Size: 50'×25'×8' *Payload:* 37.9 stons *Lwt.:* 113 stons
Volume: 20 dtons *Maint.:* 6.35 hours *Price:* MCr9.91

HT: 12 *HPs:* 4,500 [Hull].

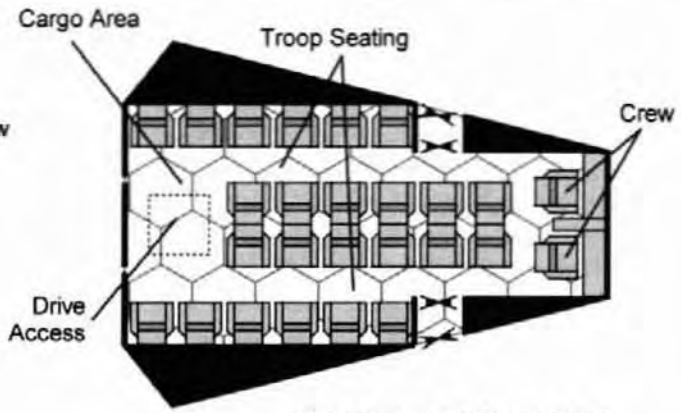
sAccel: 3.5 Gs/5.3 Gs empty *aSpeed:* 3,160 mph





***Quatermain*-Class 10-ton Hunting Launch**

***Connor McBane*-Class 20-ton Customs Gig**



Note: Drives and Power Plant mounted under hull.

30-TON SHIP'S BOATS

The *ship's boat*, as it is known today, is a holdover from Vilani conservatism. During the First Imperium and the Rule of Man, it was the most economically viable non-starship in production and was used almost exclusively by commercial firms as their main passenger and cargo lifter. As is so often the case where this conservatism is concerned, it was modified instead of redesigned when new technology became available. It is a comfortable, familiar design that looks to stay around for a long time to come. If you are looking for a vessel to start a small planetary courier business, it is unlikely that you would find a better candidate.

Fuego-Class 30-ton Ship's Boat (TL11)

The *Fuego*-class ship's boat is the most current incarnation of the venerable design; TL12 variants are beginning to appear, but have not yet attained wide acceptance. The typical crew consists of pilot, engineer, and steward.

Subassemblies: VGSL Hull +7.
Powertrain: Engineering, 4 Maneuver.
Occ: 8 Passenger Couches **Cargo:** 8.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: Basic Bridge.

Statistics
Size: 84'×15'×15' *Payload:* 52.6 stons *Lwt.:* 99.1 stons
Volume: 30 dtons *Maint.:* 7.44 hours *Price:* MCr7.23

HT: 12 *HPs:* 6,000 [Hull].

sAccel: 4 Gs/8.6 Gs empty *aSpeed:* 2,740 mph

40-TON PINNACES

Pinnaces are primarily used by unstreamlined starships in a planetary-interface capacity. Highly configurable, they carry an assorted mix of passengers and cargo. They come in many different designs, from the extremely fast to the overloaded.

Tiger-Class 40-ton Slow Pinnace (TL10)

This is a very reliable transfer vehicle with a proven design. The typical crew consists of pilot, co-pilot, engineer, and up to four stewards if passengers are carried.

Subassemblies: VGSL Hull +7.
Powertrain: Engineering, Combination Gravitics System, 3 Maneuver.
Occ: 17 Passenger Couches **Cargo:** 8 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: compact Basic Bridge.

Statistics
Size: 84'×24'×15' *Payload:* 60.7 stons *Lwt.:* 128 stons
Volume: 40 dtons *Maint.:* 7.46 hours *Price:* MCr7.18

HT: 12 *HPs:* 7,500 [Hull].

sAccel: 0.9 Gs/1.8 Gs empty *aSpeed:* 1,340 mph

Variants

A variant popular among mercenary companies replaces cargo and passenger capacity with a vehicle bay or spacedock. Some versions include one or two "stern-chaser" or turret-mounted weapons for repelling pirates (or law enforcers), or for helping the pinnace deliver its payload into a combat zone.

100-ton Interplanetary Shuttles

In every civilization, the dawn of the reactionless thruster age extends the high frontier. Thrusters shrink the size of a planetary system in the same way that jump drives shrink the distance between the stars. Thruster-equipped vessels can make interplanetary voyages faster and cheaper, by several orders of magnitude each. Planets that were months or years away by rocket are only days or weeks away by thruster drive. As a result, the invention of the reactionless thruster has probably ushered in more industrial revolutions and colonization programs than any other invention except the jump drive.

When the second generation of reactionless thrusters arrives, space becomes open to all. The cost of comfortable interplanetary space travel falls until it comes within the reach of most citizens. For example, when the Terran Confederation developed second-generation thrusters, the price of a one-way ticket to Mars dropped by a factor of ten to around Cr500, and the outer reaches of the solar system were reachable for no more than twice that amount.

The invention of jump drive also placed an added expectation in the mind of the public – that the trip would take no more than a week. ("Why should a trip to Mars take two weeks, when I can go to Proxima Centauri in one?") It was not economic to make in-system voyages by jump craft, but shuttles were made faster to match expectations. Later, the expectation was that the trip would be as short as comfort allowed, and shuttles were made that worked at the limits of grav compensation. They could now reach Mars in less than three days.

Interplanetary shuttles (or IP shuttles), thrusting continuously, can reach enormous speeds relative to the system. A 3 G ship on the Earth-Mars run can achieve a relative velocity at turnover of about 2,000 miles per second. To protect the shuttle from micro-meteorites at these velocities, is it usually equipped with heavy armor protection at least twice as thick as that of normal commercial craft.

TL12 shuttles are so expensive that they are very rarely encountered except for very specialized (and possibly covert) applications. TL11 shuttles, though much more expensive than the TL10 version, are the most economic. Many high-TL worlds prefer to import their small craft from lower-TL systems, leaving their shipyards to concentrate on higher-specification military ships.

Macla-Class 100-ton IP Shuttle (TL8)

The *Macla*-class shuttle is a very widespread design, most often found in backward systems in the coreward regions of the Imperium. It has seen centuries of improvement within the constraints of its low technology basis, and is now extremely reliable. Similar shuttles are found everywhere, although designs developed independently tend to be more crude. Typical crew count is 11 and consists of pilot, co-pilot, eight engineers, and a steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, Combination Contragravity System, 22 Maneuver.
Occ: 12 Staterooms **Cargo:** 2.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: compact Basic Bridge.

Statistics
Size: 90'×48'×18' *Payload:* 14.9 stons *Lwt.:* 350 stons
Volume: 100 dtons *Maint.:* 26.2 mh/day *Price:* MCr29.8

HT: 12 *HPs:* 15,000 [Hull].

sAccel: 0.1 Gs *aSpeed:* 500 mph

Tikuma-Class 100-ton IP Shuttle (TL9)

The *Tikuma* class dates to the Sylean Confederation, and was the "standard" IP shuttle design in the earliest years of the Third Imperium. Advanced thruster technology soon rendered it obsolete. Today, it is found in service only in very out-of-the-way star systems. The usual crew of four is pilot, co-pilot, engineer, and steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, Combination Contragravity System, 5 Early TL9 Maneuver.
Occ: 14 Staterooms **Cargo:** 12.5 dtons

Armor	F	RL	B	T	U
All:	4/200	4/200	4/200	4/200	4/200

Equipment
Hull: compact Basic Bridge.

Statistics
Size: 90'×48'×18' *Payload:* 65.3 stons *Lwt.:* 317 stons
Volume: 100 dtons *Maint.:* 22.6 mh/day *Price:* MCr22.1

HT: 12 *HPs:* 15,000 [Hull].

sAccel: 0.1 Gs *aSpeed:* 435 mph

Liris-Class 100-ton IP Shuttle (TL11)

The *Liris*-class shuttle appeared just after the Civil War, and was one of the new designs that first brought the firm General Products to megacorporate status. It is still very widespread. It usually has a crew consisting of pilot, co-pilot, engineer, and steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, 6 Maneuver.
Occ: 16 Staterooms **Cargo:** 6.5 dtons

Armor	F	RL	B	T	U
All:	4/200	4/200	4/200	4/200	4/200

Equipment
Hull: compact Basic Bridge; Small Utility.

Statistics
Size: 90'×48'×18' *Payload:* 35.7 stons *Lwt.:* 176 stons
Volume: 100 dtons *Maint.:* 14.9 mh/day *Price:* MCr9.62

HT: 12 *HPs:* 15,000 [Hull].

sAccel: 3.4/4.3 Gs empty *aSpeed:* 2,120 mph

Fighters

Even in an era of massive battleships, small armed vessels – fighter craft – have a role to play. Fighters permit unparalleled force projection. In a matter of minutes, a carrier can deploy scores of independent weapon platforms that must be eliminated one by one. No single shot, no matter how lucky, can erase the threat posed by a swarm of fighters.

While a fighter individually carries a smaller complement of weapons than a full starship, a finely tuned fighter squadron acting in concert can still deliver a punishing blow to the enemy. A squadron of fighters has little hope of taking out a battleship, for example, but could well turn the tide of a battle by destroying its primary weapons or weakening its point-defense grid in a key spot.

Fighters are also well-suited to long-range reconnaissance or scouting missions. A handful of fighters can efficiently check an asteroid belt for lurking pirates, or take a close-up look at a seemingly deserted moonlet for powered-down system defense boats. Any vessel on such duty is at great risk of attack far from help, but the potential loss of a fighter pales in comparison to the prospective loss of a kiloton-sized, fully crewed starship on the same task.

Finally, fighters are very versatile. Varied missile loadouts can customize fighters for particular tasks. They can be deployed to counter missile fire, engage enemy fighters, conduct bombing runs, escort shuttles or other small craft, deliver pinpoint attacks, and complete other missions as necessary.

Valor-Class 50-ton Heavy Fighter (TL12)

The *Valor*-class heavy fighter is an attempt to provide a powerful, fast, agile, armored, and dependable small craft for space combat. It has bunking arrangements (integral to its Command Cockpit, per p. 42) that allow the craft to remain on station for long periods at a time.

The weaponry on the *Valor* is variable, and can be altered by service crews to fit a specific situation. Courier versions are known to carry three sandcasters and no offensive armament. Specific versions may also carry all missile racks, or all lasers, with appropriate alterations in acceleration for the craft.

Heavy fighters are not usually named, although crews may adopt unofficial names based on sweethearts or common themes. Imperial fighters do bear tail numbers assigned by the Navy. These currently reach into the six digits, and generally the craft will be referred to by the last two or three digits.

The heavy fighter is reasonably standard in the Imperium, and most (though not all) Imperial warships with launch tubes can handle small craft in the 50-dton, 600-ston range.

The usual crew is pilot and gunner. This vessel is built with an extra-heavy frame.

Subassemblies: VGSL Hull +7.
Powertrain: 34 Maneuver.
Occ: (only in Cockpit) **Cargo:** 0.5 dtons

Armor	F	RL	B	T	U
All:	4/2,900	4/2,900	4/2,900	4/2,900	4/2,900

Weaponry
1.3-GJ Heavy Laser [Hull:F].

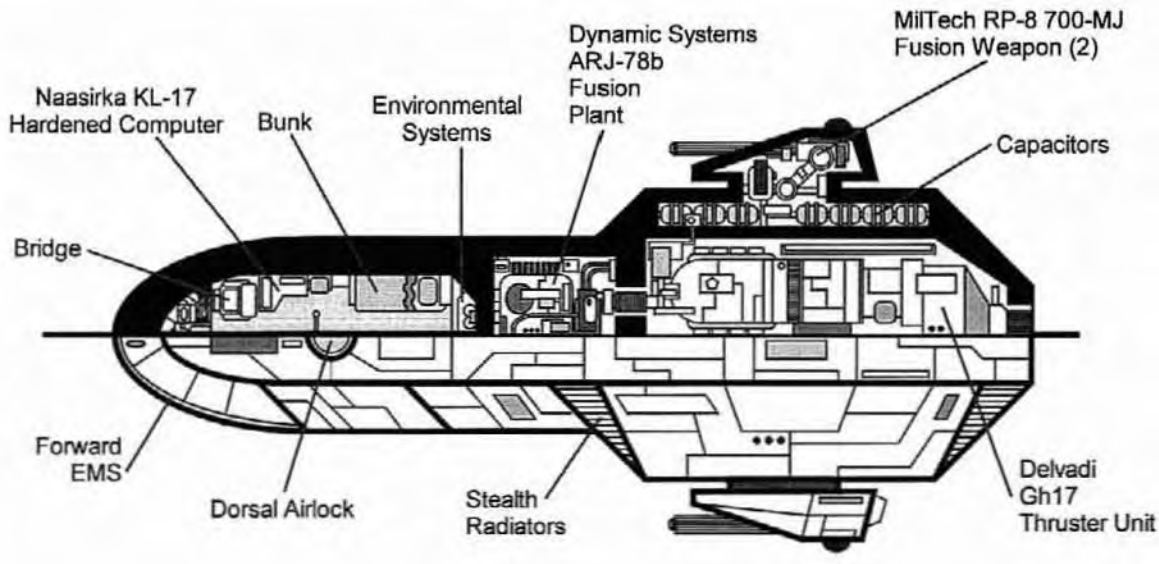
Equipment
Hull: Radical Emission Cloaking and Stealth; Command Cockpit.

Statistics
Size: 93'×23'×12' *Payload:* 2.7 stons *Lwt.:* 571 stons
Volume: 50 dtons *Maint.:* 2.76 hours *Price:* MCr52.5

HT: 12 *HPs:* 39,000 [Hull].

sAccel: 6 Gs *aSpeed:* 6,265 mph

Valor-Class Heavy Fighter

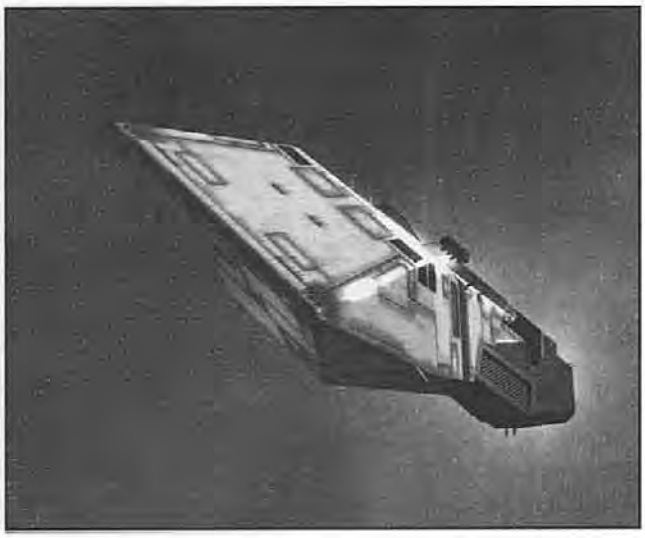


System Defense Boats

Non-starships can allocate more tonnage to power plants and arms, thus should defeat a starship of equal tonnage. From this principle has evolved the concept of the system defense boat, a small non-starship built for battle. Fleets of such boats are stationed in star systems and charged with their defense.

All of these vessels require the crew to share accommodations. Because of this, and the lack of other crew amenities, they are given the nickname "pig boat" in many services.

Deployment



In most systems, SDBs are deployed in five general areas: the cometary halo, the gas giants, the planetoid belts, on the major world, and near the major world. Only the last mission type doesn't involve long periods spent at isolated stations.

SDBs in the cometary halo are in deep reserve, committed to attacks on invading ships if possible and to guerrilla-type raids if the invader succeeds in seizing the star system.

Local gas giants provide another site for SDB deployment. Boats are actually placed deep within the gas giant, and are poised to attack enemy ships in the process of refueling. Even if invaders take the region of the gas giant and establishing a refueling foothold, they must contend with SDB raids.

The asteroid belt also provides concealment for SDBs. When enemy ships present themselves, the boats can dash out for the kill and then retreat quickly to the protection of the belt. Caches of SDB supplies are often pre-positioned in the belt.

If the world has any large bodies of water, some SDBs take long-term station beneath their waves, because deep water is reasonably opaque to sensors. They are often connected to in-place sensor arrays or alert systems if not equipped with their own sonar. They remain hidden until needed, and are ready to act at a moment's notice. By necessity, most SDBs are built to take the pressures of ocean depths, but some require auxiliary equipment to operate without problems. All of the versions presented here have submersible hulls (see p. 24).

The remaining SDBs in a system are positioned around the major world. Many of them occupy close orbits and are routinely committed to anti-smuggling duties, augmenting any customs cutters that run into trouble. Additional boats are assigned to far orbit and maintain safety or rescue operations when a dedicated emergency-response team is unavailable.

Variants

SDBs can, of course, carry weapons other than those modeled here. Some basic designs also lack full equipment for underwater stations, or use a cheaper bridge system. These are usually sold to worlds whose loyalty may be in question, or who don't have the need for more expensive electronics.

Bandersnatch-Class 400-ton SDB (TL9)

From its earliest beginnings, the Imperium found it necessary to standardize on certain designs. Even though better technology was available, existing production facilities, infrastructure, crew familiarity, and military intelligence all dictated that the basic SDB design change as little as possible. The ubiquitous *Dragon*-class SDB is the most common such vessel. The *Dragon* is an evolutionary descendant of the *Bandersnatch* class, a late-TL9 design that utilized innovative (for the time) thruster technology.

The *Bandersnatch* class was first developed in the last century of the Sylean Federation. The original goal of design was piracy suppression, system defense, and whatever else a local government might need done. Considering the length of time these vessels were expected to stay on station, long-duration crew fittings were installed.

As technology advanced, the venerable *Bandersnatch* design was updated, producing the *Dragon* class (p. GT144). Better armor, better electronics, more thrusters, and a modern fusion reactor make a more deadly warship, more than adequate against pirates and Vargr corsairs, but slowly left behind in the military arms race.

Typical crew count is 22 and consists of four command personnel, 14 drivehands, and four gunners.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 2 Combination Contragravity Systems, 2 Contragravity, 250 Late-TL9 Maneuver.
Occ: 13 Staterooms **Cargo:** 2.5 dtons

Armor	F	RL	B	T	U
Hull:	4/600	4/600	4/600	4/600	4/600
Turret:	4/300	4/300	4/300	4/300	4/300

Weaponry

4 Turrets with 4×303-MJ Heavy Turret Lasers [1 per Turret].

Equipment

All: Radical Emission Cloaking, Sound Baffling, and Stealth.
Hull: Emergency Aid Station; compact ×3, hardened Command Bridge; Underwater Electronics Package.

Statistics

Size: 104'×42'×29' *Payload:* 15.1 stons *Lwt.:* 2,507 stons
Volume: 400 dtons *Maint.:* 86.7 mh/day *Price:* MCr326

HT: 12 *HPs:* 150,000 [Hull], 4,800 [each Turret].

sAccel: 3 Gs *aSpeed:* 4,470 mph *uSpeed:* 40 mph
Crush Depth: 830 yards

Variant **Dragon**-Class 400-ton SDB (TL10)

The *Dragon* class was once the cutting-edge SDB design; it is still found everywhere in the Imperium and in many Imperial client states. Planetary navies that can't wait for a more advanced unit to be decommissioned out of Imperial service will usually order the tough and reliable *Dragon*.

The "standard" *Dragon* can be found on p. GT144. This version is a somewhat more advanced variant, used by the Imperial Navy. This variant generally is not released to the service of planetary navies or Imperial client states, unless they are of undisputed loyalty and can prove a need for "uprated" SDBs.

The typical *Dragon* crew is 11: captain (who serves as pilot and navigator), second officer (who handles sensors and commo), five engineers, and four gunners.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, Contragravity, 2 Combination Contragravity Systems, 283 Maneuver.
Occ: 6 Staterooms **Cargo:** 2 dtons

Armor	F	RL	B	T	U
Hull:	4/1,000	4/1,000	4/1,000	4/1,000	4/1,000
Turret:	4/500	4/500	4/500	4/500	4/500

Weaponry
4 Turrets with 4×810-MJ Heavy Turret Lasers [1 per Turret].

Equipment
All: Radical Emission Cloaking, Sound Baffling, and Stealth. *Hull:* Emergency Aid Station; Underwater Electronics Package; compact ×3, hardened Command Bridge.

Statistics
Size: 104'×42'×29' *Payload:* 11.2 stons *Lwt.:* 2,584 stons
Volume: 400 dtons *Maint.:* 60.5 mh/day *Price:* MCr159

HT: 12 *HPs:* 150,000 [Hull], 4,800 [each Turret].

sAccel: 4.4 Gs *aSpeed:* 5,490 mph *uSpeed:* 45 mph
Crush Depth: 1,290 yards

Wyvern-Class 400-ton SDB (TL11)

The *Wyvern*-class SDB represented the pinnacle of Imperial technology when it was first used during the Third Frontier War. Four times the armor, 6 Gs acceleration, faster missiles, and a heavier laser often provided a nasty surprise to Zhodani raiders assuming they were up against a *Dragon*.

The usual crew of 15 includes four command officers, five drivehands, four gunners, and two maintenance personnel.

Subassemblies: Hull +9, 4×Turret +5.
Powertrain: Engineering, 2 Combination Contragravity Systems, Contragravity, 271 Maneuver.
Occ: 8 Staterooms **Cargo:** 2.5 dtons

Armor	F	RL	B	T	U
Hull:	4/4,000	4/4,000	4/4,000	4/4,000	4/4,000
Turret:	4/2,000	4/2,000	4/2,000	4/2,000	4/2,000

Weaponry
4 Turrets with 4×1.3-GJ Heavy Turret Lasers [1 per Turret].

Equipment
All: Radical Emission Cloaking, Sound Baffling, and Stealth. *Hull:* Emergency Aid Station; Gym; compact ×3, hardened Command Bridge; Underwater Electronics Package.

Statistics
Size: 104'×42'×29' *Payload:* 14.1 stons *Lwt.:* 4,548 stons
Volume: 400 dtons *Maint.:* 85.3 mh/day *Price:* MCr316

HT: 12 *HPs:* 150,000 [Hull], 4,800 [each Turret].

sAccel: 6 Gs *aSpeed:* 8,490 mph *uSpeed:* 60 mph
Crush Depth: 5,370 yards

Wyrm-Class 400-ton SDB (TL12)

The *Wyrm* class is the newest addition to the line, first deployed during the Fourth Frontier War. Although not much of an improvement over the *Wyvern*, it takes advantage of the latest TL12 metallurgical and electronic advances. It also introduces an electronics warfare suite. Room for this system was taken from the engine compartment.

While the *Wyrm* class mounts more armor than ever before seen on a 400-ton SDB, it is still not enough to allow it to go toe to toe with a real warship. Crew members sometimes refer to a *Wyrm*-class SDB as a "scalpel," because its strikes must be lightning fast and surgically precise; it can't stand up to heavy bombardment. Considering most pirates are not armed or armored to military specs, it is more than a match for them. It is also used in a picket role as a hunter-killer.

Many *Wyverns* and *Dragons*, and a few *Bandersnatches*, still serve in the Imperial Navy, but the *Wyrm* is slowly replacing them. The high cost of the *Wyvern* and *Wyrm* means planetary forces usually wait for one to retire from Imperial service; those that can't wait order the low-cost *Dragon*.

The usual crew of 14 has five command personnel, two drivehands, four gunners, and three maintenance personnel.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 2 Combination Contragravity Systems, Contragravity, 268 Maneuver.
Occ: 8 Staterooms **Cargo:** 2.5 dtons

Armor	F	RL	B	T	U
Hull:	4/6,000	4/6,000	4/6,000	4/6,000	4/6,000
Turret:	4/3,000	4/3,000	4/3,000	4/3,000	4/3,000

Weaponry
4 Turrets with 4×1.3-GJ Heavy Turret Lasers [1 per Turret].

Equipment
All: Radical Emission Cloaking; Radical Sound Baffling; Radical Stealth. *Hull:* Emergency Aid Station; Gymnasium; compact ×3, hardened Command Bridge; Electronic Warfare System; Underwater Electronics Package.

Statistics
Size: 104'×42'×29' *Payload:* 14.1 stons *Lwt.:* 4,559 stons
Volume: 400 dtons *Maint.:* 85.6 mh/day *Price:* MCr318

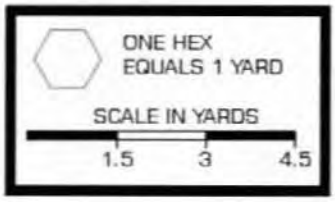
HT: 12 *HPs:* 150,000 [Hull], 4,800 [each Turret].

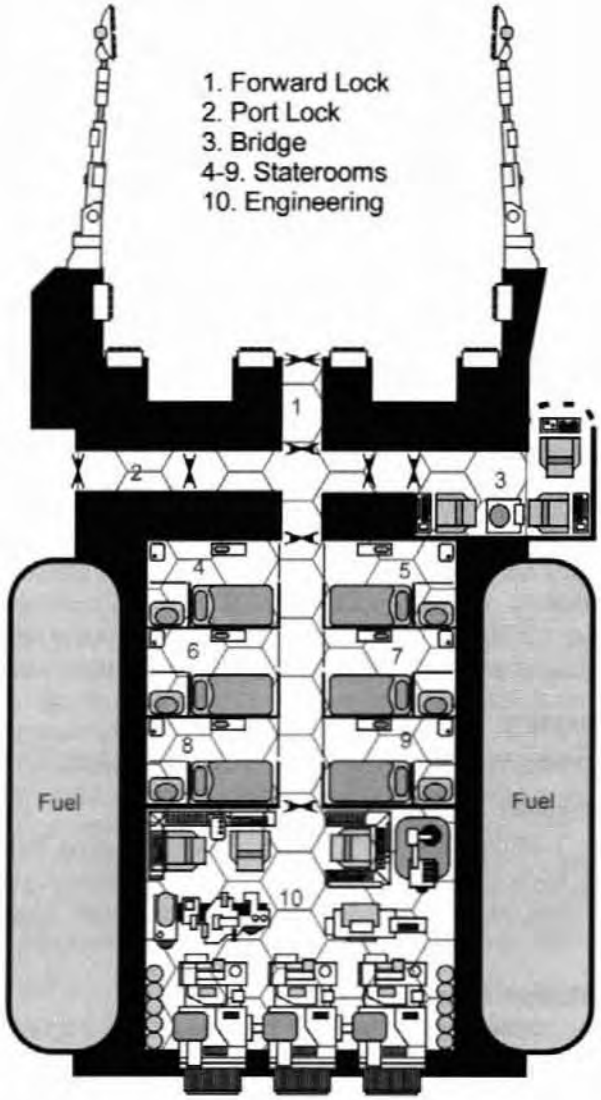
sAccel: 5.9 Gs *aSpeed:* 8,445 mph *uSpeed:* 60 mph
Crush Depth: 8,180 yards

Dragon-Class SDB and Jump Shuttle

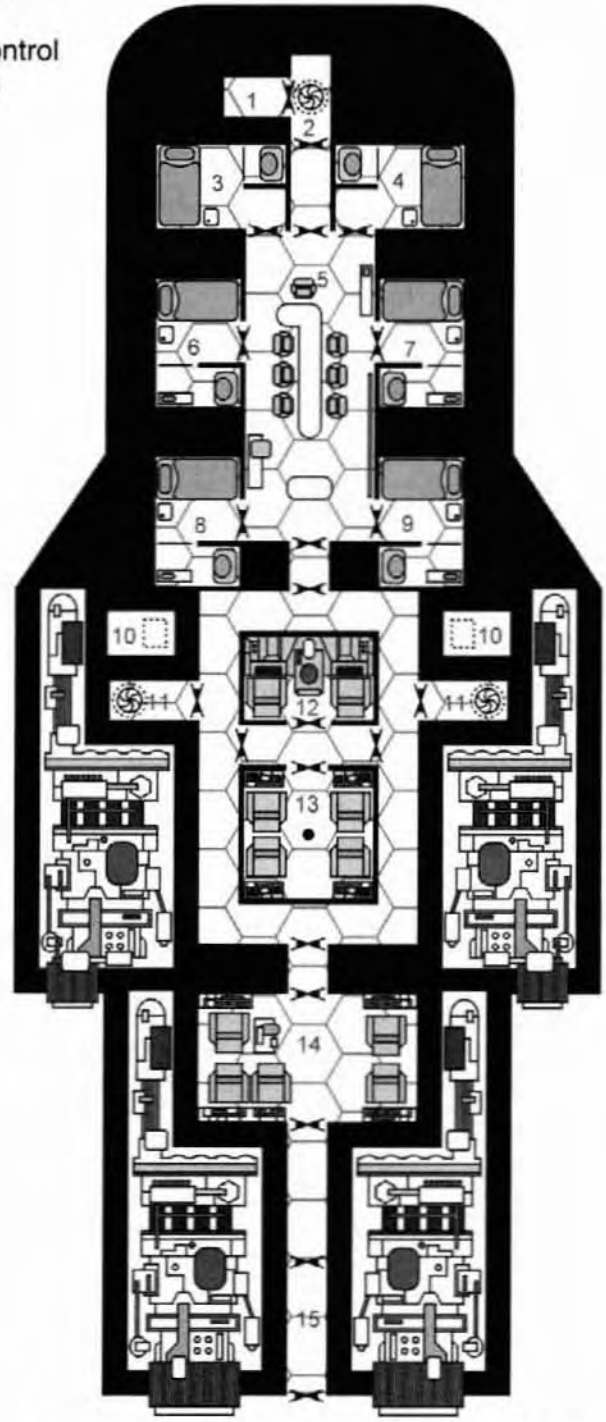
In order to deploy SDBs outside of their home system, Jump Shuttles are used. The shuttle connects to the aft of the SDB and clamps on, allowing its jump bubble to encompass the boat. While slow, it allows for SDBs to be transferred between systems.

1. Storage Closet
2. Forward Lock
3-4. Staterooms
5. Common Area
6-9. Staterooms
10. Missile Magazine
11. Turret Access
12. Bridge
13. Gunnery Control
14. Engineering
15. Aft Lock





Jump Shuttle



***Dragon*-Class 400-ton SDB**

System Defense Boat Jump Shuttles

System defense boats have no jump drives. Transferring them to new star systems is most easily handled by a dedicated jump shuttle, essentially a tender with a large jump drive and fuel and intrinsic couplings (p. 35) for holding the SDB.

When mated, the two craft have crew access to one another. At TL10 and higher there is spare berthing to give the SDB crews some additional privacy. The primary drawback to the coupling system is that a period of several hours is necessary to connect or disconnect the craft; the jump shuttle is not an ideal way to transfer SDBs to active combat theaters.

In practice, most fleets maintain one jump shuttle for every 10 SDBs in situations where interstellar capability is required. All of the jump shuttles can carry any of the gunboats designed on the *Bandersnatch*-class hull configuration. Shuttles are unable to enter any atmosphere, even for gas-giant skimming; refueling requires a tanker or similar arrangement.

Note that, when empty, the jump shuttle behaves as a ship of 300 tons (its actual hull size), which improves its sAccel, jump number, and fuel endurance. All the shuttles here have extra-heavy frames and total compartmentalization.

Bandersnatch/S-Class 700-ton SDB Jump Shuttle (TL9)

The usual crew of 10 has three command staff, two jump and three maneuver drivehands, and two maintenance crew.

Subassemblies: USL Hull +9.
Powertrain: Engineering, 14 Jump Drive, 59 Late-TL9 Maneuver.
Fuel: 180 Jump Fuel Tank.
Occ: 6 Staterooms **Cargo:** 1.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: compact Basic Bridge; Utility; 4,800-ston Intrinsic Coupling (400 dtons).

Statistics

Size: 63'×90'×29' *Payload:* 2,516 stons *Lwt.:* 3,420 stons
Volume: 300 dtons *Maint.:* 60.8 mh/day *Price:* MCr160

HT: 9/12 empty *HPs:* 120,000 [Hull].

sAccel: 0.5 Gs/2 Gs empty *Jump:* 1/2 empty

Dragon/S-Class 700-ton SDB Jump Shuttle (TL10)

The usual crew of six has three command staff, an engineer, and two maintenance personnel.

Subassemblies: USL Hull +9.
Powertrain: Engineering, 14 Jump Drive, 59 Maneuver.
Fuel: 180 Jump Fuel Tank.
Occ: 6 Staterooms **Cargo:** 19 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: compact Basic Bridge; Utility; 4,800-ston Intrinsic Coupling (400 dtons).

Statistics

Size: 63'×90'×29' *Payload:* 2,680 stons *Lwt.:* 3,417 stons
Volume: 300 dtons *Maint.:* 46.3 mh/day *Price:* MCr93.1

HT: 9/12 empty *HPs:* 120,000 [Hull].

sAccel: 0.7 Gs/2 Gs empty *Jump:* 1/3 empty

Wyvern/S-Class 700-ton SDB Jump Shuttle (TL11)

The usual crew of eight has three command staff (generally commander/pilot, navigator, and sensors/comm operator) a single engineer, and four maintenance personnel.

Subassemblies: USL Hull +9.
Powertrain: Engineering, 14 Jump Drive, 59 Maneuver.
Fuel: 180 Jump Fuel Tank.
Occ: 6 Staterooms **Cargo:** 19 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: compact Basic Bridge; Utility; 4,800-ston Intrinsic Coupling (400 dtons).

Statistics

Size: 63'×90'×29' *Payload:* 4,644 stons *Lwt.:* 5,361 stons
Volume: 300 dtons *Maint.:* 52.5 mh/day *Price:* MCr120

HT: 9/12 empty *HPs:* 120,000 [Hull]

sAccel: 1.1 Gs/2 Gs empty *Jump:* 1/3 empty

Wyrm/S-Class 700-ton SDB Jump Shuttle (TL12)

The usual crew of seven has three command staff, an engineer, and three maintenance personnel.

Subassemblies: USL Hull +9.
Powertrain: Engineering, 14 Jump Drive, 59 Maneuver.
Fuel: 180 Jump Fuel Tank.
Occ: 6 Staterooms **Cargo:** 19 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: compact Basic Bridge; Utility; 4,800-ston Intrinsic Coupling (400 dtons).

Statistics

Size: 63'×90'×29' *Payload:* 4,655 stons *Lwt.:* 5,340 stons
Volume: 300 dtons *Maint.:* 52.4 mh/day *Price:* MCr119

HT: 9/12 empty *HPs:* 120,000 [Hull]

sAccel: 1.1 Gs/2 Gs empty *Jump:* 1/3 empty

Type T Patrol Cruisers

The 400-ton patrol cruiser is used for customs inspections, piracy suppression, and normal safety patrols, especially in frontier regions. Unlike an SDB, which attempts to remain hidden to maximize effectiveness, a patrol cruiser (like a police car) attempts to be highly visible – the ship's primary value lies in deterrence, not combat. If required, however, the Type T is capable of defeating civilian ships much larger than itself.

The Imperial Navy uses the TL11 and TL12 versions. Local forces often use the TL9 and TL10 versions, with a noticeable decline in efficiency. There will usually be about one patrol cruiser for every six SDBs present in a system.

Type Ts spend most of their time patrolling the space between a main world's 100D limit and its highport's orbit. They are sometimes sent on longer patrols to other planets, if there appears to be activity where there should be none. To some extent, the patrol cruiser provides an efficient way for the Imperium to "show the flag," as Imperial cruisers tend to rotate from one system to another every few weeks.

A patrol cruiser has one crucial edge over the SDB – it can pursue fleeing ships to another system and quickly strike pirate or smuggler bases up to three parsecs away. It often is impossible to single out the destination of a fleeing starship, unless jump masking and the verified jump range of the ship leave only a single candidate. Still, dispatching a single patrol cruiser to each possible destination often is effective. Even if the fleeing ship is not found, the news that it is wanted quickly spreads through channels both official and unofficial.

The patrol cruiser carries a 20-ton customs gig (p. 76) designed for combat boardings. The cruiser will only dock with another ship if the captain feels it is safe. If the other ship's crew is suspected of serious crimes, or the ship was just subdued in combat, the customs gig is dispatched under the protection of the patrol cruiser's weapons. Some cost-conscious users substitute a civilian gig for this job, however.

The security detail usually consists of eight troops. These will be local forces except in Imperial cruisers, which deploy Imperial Marines. If the troops use battledress (at TL10 and up), it is stored on the customs gig.

While technically a warship, the Type T is not intended to fight anything more formidable than a corsair vessel or, perhaps, military scout craft. Actual defense of a system is left to SDBs and larger warships. Type Ts have been used with fair success as scouts in time of war, being more capable than the smaller *Sulieman*-class vessels in a purely military role.

Patrol cruisers are usually commanded by a junior officer (Rank 4), often in his first independent command. Given their small crew and semi-autonomous duties, these ships are well-suited for campaigning. Each player could have two PCs (one for boarding actions and another for normal ship operations).

All of the patrol cruisers presented here have a heavy frame and are heavily compartmentalized.

Variants

Some cruisers have the jump drives removed in favor of larger thrusters or more troops and another gig. The former encroaches (poorly) on the duties of the SDB, while the latter makes for a good in-system troop transport and assault vessel.

Rudra-Class 400-ton Patrol Cruiser (TL9)

One of the first starship designs standardized by the Third Imperium; the *Rudra* class was often found guarding commercial traffic in the Core. Today, it is rarely encountered. The typical crew of 27 consists of captain, pilot, sensor/comm operator, navigator, 10 engineers, medic, four gunners, two small-craft crewmen, and an eight-man security detail. The captain has a single stateroom; everyone else double-bunks.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 2 Combination Contragravity Systems, 8 Jump Drive, 136 Late-TL9 Maneuver.
Fuel: 40 Jump Fuel Tank.
Occ: Low-Berth, 14 Staterooms **Cargo:** 20 dtons

Armor	F	RL	B	T	U
Hull:	4/400	4/400	4/400	4/400	4/400
Turrets:	4/200	4/200	4/200	4/200	4/200

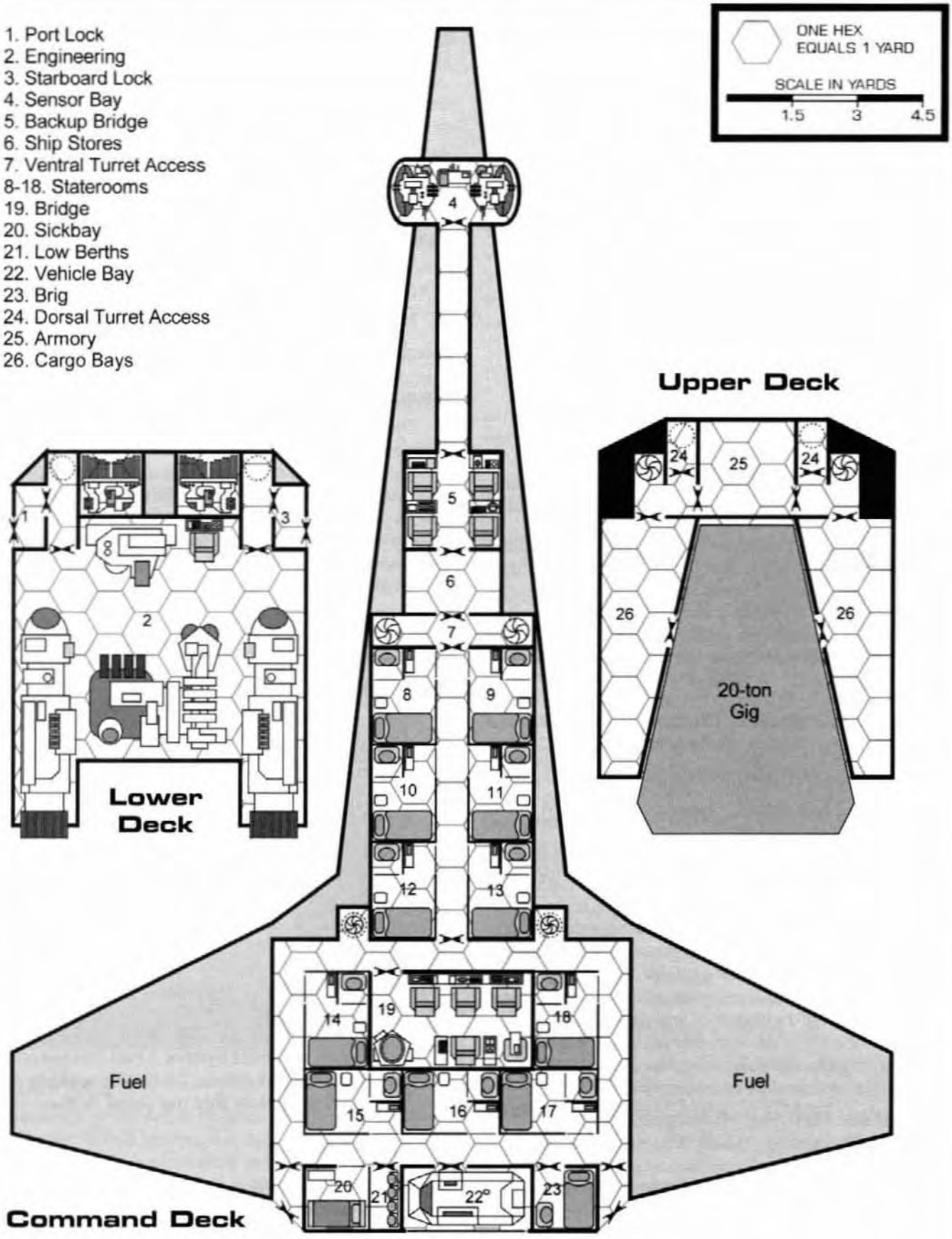
Weaponry

2 Turrets with 6×250mm Missile Racks [3 per Turret].
2 Turrets with 6×101-MJ Turret Lasers [3 per Turret].

Equipment

All: Basic Emission Cloaking and Stealth. *Hull:* Armory; Brig; Emergency Aid Station; Auxiliary Control Station; Enhanced Communication System; Enhanced Sensor System; hardened Basic Bridge; 2 Fuel Processors; Utility Grav Sled; 2 5-ston Exo-Skeletons; 2.5-dton Spacedock; 20-dton Vehicle Bay (for *Harvey Walbash*-class Customs Gig).

VAYU-CLASS PATROL CRUISER



Statistics

Size: 115'×30'×20' *Payload:* 217 stons *Lwt.:* 2,072 stons
Volume: 400 dtons *Maint.:* 73 mh/day *Price:* MCr231

HT: 12 *HPs:* 75,000 [Hull], 2,400 [each Turret].

sAccel: 2 Gs/2.2 Gs empty *Jump:* 1 *aSpeed:* 3,295 mph

Vayu-Class 400-ton Patrol Cruiser (TL10)

The *Vayu* class is the standard design used by most Imperial member worlds. Usual crew count is 20: captain, pilot, sensor/comm operator, navigator, engineer, medic, four gunners, two small-craft crewmen, and eight-man security detail.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 12 Jump Drive, 118 Maneuver.
Fuel: 80 Jump Fuel Tank.
Occ: 11 Staterooms, Low-Berth **Cargo:** 17.5 dtons

Armor	F	RL	B	T	U
Hull:	4/600	4/600	4/600	4/600	4/600
Turrets:	4/300	4/300	4/300	4/300	4/300

Weaponry

2 Turrets with 6×250mm Missile Racks [3 per Turret].
2 Turrets with 6×250-MJ Turret Lasers [3 per Turret].

Equipment

All: Basic Emission Cloaking and Stealth. *Hull:* Armory; Brig; Emergency Aid Station; Auxiliary Control Station; hardened Basic Bridge; Enhanced Communication Suite; Enhanced Sensor System; 2 Fuel Processors; Utility; 2 5-ston Exo-Skeletons; Grav APC; 2.5-dton Spacedock; 20-dton Vehicle Bay (for *Connor McBane*-class Customs Gig).

Statistics

Size: 115'×30'×20' *Payload:* 220 stons *Lwt.:* 1,926 stons
Volume: 400 dtons *Maint.:* 57.9 mh/day *Price:* MCr145

HT: 12 *HPs:* 75,000 [Hull], 2,400 [each Turret].

sAccel: 2.5 Gs/2.8 Gs empty *Jump:* 2 *aSpeed:* 3,545 mph

Skanda-Class 400-ton Patrol Cruiser (TL11)

The *Skanda* class was only in service about 40 years before being superceded by the *Dyaus*. Its primary claim to fame is the *Iigashir*, a *Skanda*-class patrol cruiser which engaged in an epic (and ultimately tragic) two-subsector pursuit of a Vargr corsair in the Third Frontier War. Afterward, the final voyage of the *Iigashir* was documented in an extremely popular war novel which remains one of the classics of Imperial military fiction.

The usual crew is 20, with captain, pilot, sensor/comm operator, navigator, engineer, medic, four gunners, two small-craft crewmen, and an eight-man security detail.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 16 Jump Drive, 65 Maneuver.
Fuel: 120 Jump Fuel Tank.
Occ: 12 Staterooms, Low-Berth **Cargo:** 21.5 dtons

Armor	F	RL	B	T	U
Hull:	4/800	4/800	4/800	4/800	4/800
Turrets:	4/400	4/400	4/400	4/400	4/400

Weaponry

2 Turrets with 6×250mm Missile Racks [3 per Turret].
2 Turrets with 6×390-MJ Turret Lasers [3 per Turret].

Equipment

All: Basic Emission Cloaking; Basic Stealth. *Hull:* Armory; Brig; Emergency Aid Station; Auxiliary Control Station; hardened Basic Bridge; Enhanced Communication Suite; Enhanced Sensor System; 3 Fuel Processors; Utility; 2 5-ston Exo-Skeletons; Grav APC; 2.5-dton Spacedock; 20-dton Vehicle Bay (for *Blain Virishii*-class Customs Gig).

Statistics

Size: 115'×30'×20' *Payload:* 244 stons *Lwt.:* 1,669 stons
Volume: 400 dtons *Maint.:* 66.2 mh/day *Price:* MCr190

HT: 12 *HPs:* 75,000 [Hull], 2,400 [each Turret].

sAccel: 3.9 Gs/4.6 Gs empty *Jump:* 3 *aSpeed:* 4,160 mph

Dyaus-Class 400-ton Patrol Cruiser (TL12)

The *Dyaus*-class patrol cruiser has become the high-end standard for the design, common in the service of the Imperial Navy as well as in the planetary navies of high-population, high-technology worlds. Particularly against TL10 civilian designs converted to pirate or smuggling purposes, it is quite capable of putting up a fight against ships that are several times its own size.

A typical crew complement is 20 and consists of captain, pilot, sensor/communications operator, navigator, engineer, medic, four gunners, two small-craft crewmen, and an eight-man security detachment.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 16 Jump Drive, 65 Maneuver.
Fuel: 120 Jump Fuel Tank.
Occ: Low-Berth, 12 Staterooms **Cargo:** 21.5 dtons

Armor	F	RL	B	T	U
Hull:	4/1,200	4/1,200	4/1,200	4/1,200	4/1,200
Turrets:	4/600	4/600	4/600	4/600	4/600

Weaponry

2 Turrets with 6×250mm Missile Racks [3 per Turret].
2 Turrets with 6×405-MJ Turret Lasers [3 per Turret].

Equipment

All: Basic Emission Cloaking; Basic Stealth. *Hull:* Armory; Brig; Emergency Aid Station; Auxiliary Control Station; hardened Basic Bridge; Enhanced Communication Suite; Enhanced Sensor System; 3 Fuel Processors; Utility; 2 5-ston Exo-Skeletons; 2.5-dton Spacedock; Astrin APC; 20-dton Vehicle Bay (for *Jared Al'Kaseel*-class Customs Gig).

Statistics

Size: 115'×30'×20' *Payload:* 241 stons *Lwt.:* 1,654 stons
Volume: 400 dtons *Maint.:* 65.6 mh/day *Price:* MCr187

HT: 12 *HPs:* 75,000 [Hull], 2,400 [each Turret].

sAccel: 3.9 Gs/4.6 Gs empty *Jump:* 3 *aSpeed:* 4,160 mph

Safari Ships

Ships accomplish a great many different missions, and not all of them are designed for military or trade activity. In a class along with the yacht and the personal touring ship is the safari ship – designed for expeditions to strange or far-off worlds in search of adventure or excitement. The general pretext for the ship is the hunt; its passengers are in search of animal or plant life to be found, photographed, captured, or killed. In practice, the ship supports a wide variety of activities aside from hunting: scientific expeditions, treasure hunts, salvage missions, and even simple vacations or retreats.

The vessels described here are variants of the widely available *Animal*-class safari ship (see p. GT137).

Safari ships are typically built and operated by large corporations as yachts for entertainment. When a company's public-relations department makes such a ship available to clients for excursions, billion-credit deals are often sealed during the journey. However, because such ships are not constantly used in the public-relations role, they are also hired out or chartered instead of being allowed to stand idle.

Eventually, safari ships become surplus to the corporation's needs and are sold. They have little commercial use, so they end up as cheap yachts for those who can afford them, or continue as safari ships in the hands of private outfitters.

At large corporations, the cost of operations is often ignored, or concealed in advertising or public-relations budgets. Such corporations generally pay cash for the vessel, and maintain crew salaries and operating expenses as normal costs.

Peculiarities

Because a safari ship is designed to support expeditions into unknown or wild territory, it is fitted with a variety of special features to help it accomplish its purpose. These include streamlining for appearance and efficiency, a special hunting launch for on-planet excursions, an air/raft for hunts or cruises, and luxurious appointments throughout for creature comforts and diversions. The ship also boasts a pair of holding tanks for handling and storage of carcasses or live trophies.

***Leaping Snowcat*-Class 200-ton Safari Ship (TL10)**

The *Leaping Snowcat* is a sleek flying-wing shape with a transparent front screen. Maneuvering fins project from the upper surface, and retractable landing pylons support it while on the ground. The ship comfortably carries a party of seven on expeditions; various double-occupancy arrangements can boost total capacity to 20, including crew. The ship is not economical for commercial passenger service.

The main distinguishing feature of this vessel is the presence of a trophy room/lounge, looking out through a large viewing window (protected by a sliding shutter) onto whatever planetary vista presents itself. Of the seven luxury staterooms, two are merged to form a suite for the owner. Five more luxury staterooms are set aside for guests of the owner. The four standard staterooms are allocated for the crew, which invariably requires most of them to double-bunk.

The hall includes both the internal lounge space and an external retractable porch. The five alien-environment suites installed are grouped into two capture tanks with environmental control to maintain the exotic conditions required for some specimens. The armory represents the arms locker; the other lockers in the design are easily factored into either cargo space or as ship's locker zero-space add-on modules (p. 61).

The usual crew is eight (forcing even the captain to double-bunk) with a captain/pilot, navigator, sensors/comm operator, two engineers, two medics, and a steward.

Subassemblies: VGSL Hull +8, Turret +5.
Powertrain: Engineering, 6 Jump Drive, 10 Maneuver, Combination Gravitics System.
Fuel: 40 Jump Fuel Tank.
Occ: See above. **Cargo:** 7.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

All: Electrified Surface; Liquid Crystal Skin. *Hull:* Armory; Luxury Hall; Basic Bridge; Fuel Processor; 10-dton Vehicle Bay (for *Quatermain*-class Hunting Launch); 2.5-dton Spacedock.

Statistics

Size: 59'×167'×12' *Payload:* 92.2 stons *Lwt.:* 367 stons
Volume: 200 dtons *Maint.:* 28.7 mh/day *Price:* MCr35.8

HT: 12 *HPs:* 22,500 [Hull], 1,200 [Turret].

sAccel: 1.1 Gs/1.5 Gs empty *Jump:* 2 *aSpeed:* 1,380 mph

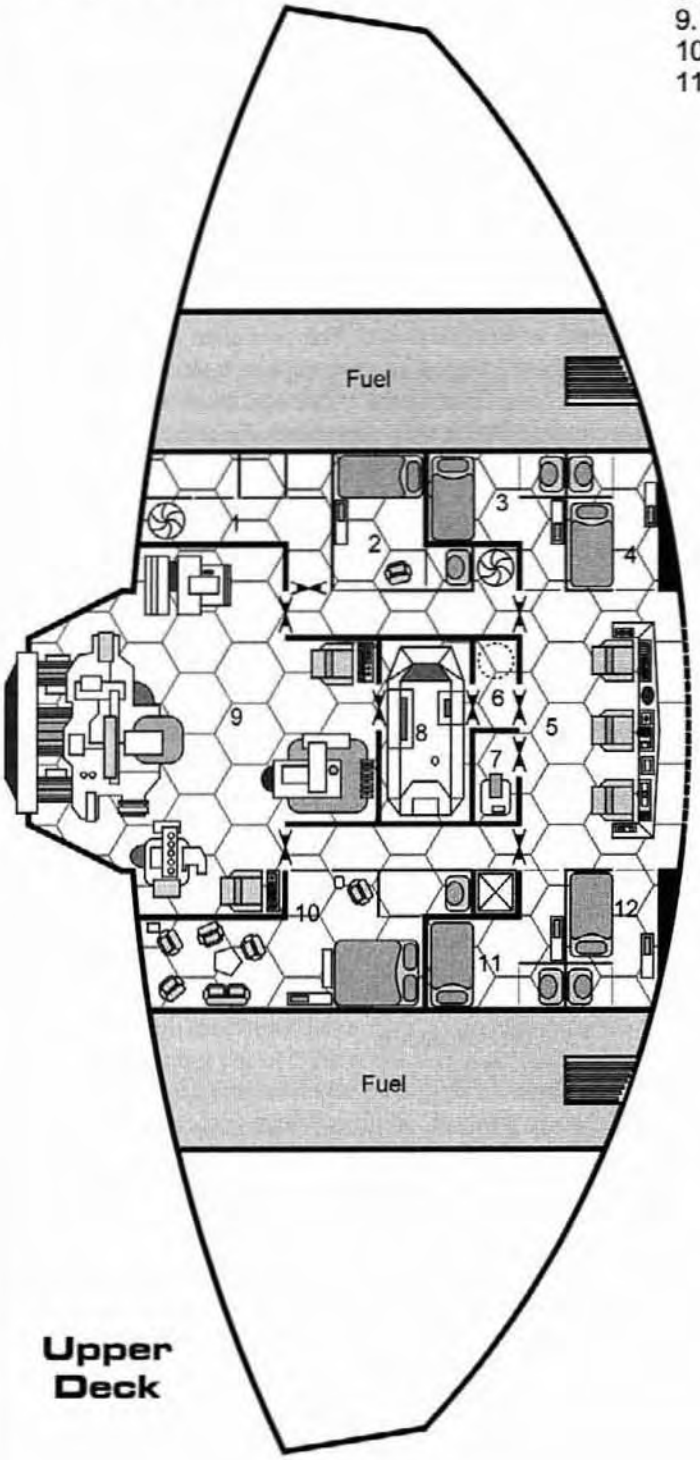
***Prancing Poni*-Class 200-ton Charter Yacht (TL10)**

A few minor variants of the safari ship have been built as luxury passenger ships, sometimes called charter yachts. Typically catering to a high-class clientele, these remove the capture tanks and weapon-storage lockers in favor of four more luxury staterooms, a small emergency aid station, and 4.5 dtons of extra cargo space for more passenger baggage.

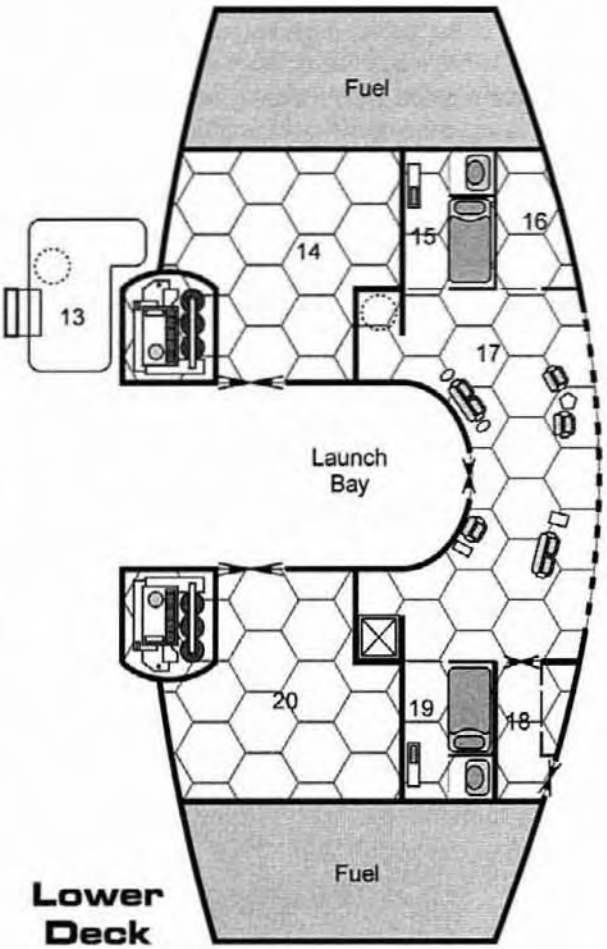
Safari Ship

This particular model of the *Leaping Snowcat*-class safari ship has been outfitted with luxury accommodations. The hunter is given a double-sized suite, while the other guests enjoy comfortable rooms decorated with the finest-quality materials.

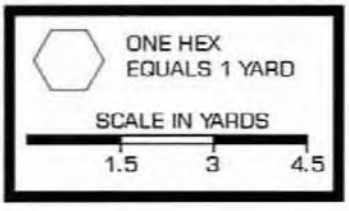
1. Airlock and Ship Stores
2. Guest Stateroom
3-4. Crew Stateroom
5. Bridge
6. Turret Access
7. Computer
8. Vehicle Bay
9. Engineering
10. Hunter's Suite
11-12. Crew Stateroom
13. Retractable Porch
14. Holding Tank/Cage
15. Guest Stateroom
16. Storage
17. Trophy Lounge
18. Primary Lock
19. Guest Stateroom
20. Holding Tank/Cage



Upper Deck



Lower Deck



The usual hunting launch is often replaced by a standard launch in this variant.

This variant is seldom profitable simply going from planet to planet as a pure passenger ship. Instead, it offers some additional services that allows it to demand top credit for passage and to recoup its costs. For example, these ships are sometimes used for sightseeing tours to archaeological digs, famous architectural works, historical locales, etc. (all rife with opportunities for PCs to get into trouble, of course).

The *Prancing Poni* is also found as a private yacht. The usual crew is as for the *Leaping Snowcat*.

Subassemblies: VGSL Hull +8, Turret +5.
Powertrain: Engineering, Combination Gravitics System, 6 Jump Drive, 12 Maneuver.
Fuel: 40 Jump Fuel Tank.
Occ: 4 Staterooms, 11 Luxury Staterooms **Cargo:** 10 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

All: Liquid Crystal Skin; Electrified Surface. *Hull:* Armory; Luxury Hall; Emergency Aid Station; Basic Bridge; Fuel Processor; 10-dton Vehicle Bay (for Launch, see p. T:139); 2-dton Spacedock.

Statistics

Size: 59'×167'×12' *Payload:* 90 stons *Lwt.:* 367 stons
Volume: 200 dtons *Maint.:* 28.9 mh/day *Price:* MCr36.3

HT: 12 *HPs:* 22,500 [Hull], 1,200 [Turret].

sAccel: 1.3 Gs/1.7 Gs empty *Jump:* 2 *aSpeed:* 1,510 mph

***Baso Rita*-Class 200-ton Small Survey Ship (TL10)**

Although the *Donosev*-class survey scout (see p. T:FI36) is the principal survey vessel of the Imperial Interstellar Scout Service, the service is almost always short of vessels. To help fill the gaps, the Scouts have developed a version of the safari ship as a less expensive survey and exploration ship. Used by both the Imperial Grand Survey and the Exploration Office, this model dispenses with the luxury fittings and the large lounge found in the basic safari ship. Instead, it carries a comprehensive array of sensors, two laboratories for basic scientific research in the field, and an enhanced display system for displaying and collating data. A probe launcher is installed in the turret; other armament (if any) varies with the ship's mission and location. An emergency aid station is fitted to treat injuries in the field. The capture tanks are retained, but are often used as general cargo space. Occasionally, this variant is assigned to a detached Scout – or group of Scouts – with an exceptional service record.

A typical crew numbers 15: five bridge crew, a flight tech, three engineers, medic, three service crew, and two mission specialists.

Subassemblies: VGSL Hull +8, Turret +5.
Powertrain: Engineering, Combination Gravitics System, 6 Jump Drive, 11 Maneuver.
Fuel: 40 Jump Fuel Tank.
Occ: 11 Staterooms, 5 Alien Environment Suites **Cargo:** 7.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

All: Electrified Surface; Liquid Crystal Skin. *Hull:* Armory; Emergency Aid Station; Planetary Survey Module; Astronomical Instruments; Small Survey Module; 2 Labs; Enhanced Display; Basic Bridge; Fuel Processor; 10-dton Vehicle Bay (for *Quatermain*-class Hunting Launch); 2.5-dton Spacedock. *Turret:* Probe Control Center (actual control is from the bridge).

Statistics

Size: 59'×167'×12' *Payload:* 96.2 stons *Lwt.:* 400 stons
Volume: 200 dtons *Maint.:* 35.4 mh/day *Price:* MCr54.5

HT: 12 *HPs:* 22,500 [Hull], 1,200 [Turret].

sAccel: 1.1 Gs/1.5 Gs empty *Jump:* 2 *aSpeed:* 1,450 mph

***Sea Animal*-Class 200-ton Aquatic Safari Ship (TL10)**

Most hunters are content to concentrate on land animals, but a few hardy souls prefer to hunt the denizens of the deep. The *Sea Animal*-class is a major modification of the basic *Animal*-class, designed for just such underwater expeditions.

The *Sea Animal* differs from the basic *Animal* in several key ways. It has a reinforced structural frame with integral ballast tanks, it is totally compartmentalized, and has more powerful engines to propel it while submerged. It also has sonar to locate and track aquatic life forms, and an enlarged airlock (sometimes called the lock-out chamber) to give hunters easy access to the ocean while the vessel is submerged. It loses 2.5 dtons of cargo space and two luxury staterooms.

The usual crew is as for the *Leaping Snowcat*.

Subassemblies: VGSL Hull +8, Turret +5.
Powertrain: Engineering, Combination Gravitics System, 6 Jump Drive, 19 Maneuver.
Fuel: 40 Jump Fuel Tank.
Occ: See above. **Cargo:** 5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

All: Liquid Crystal Skin; Electrified Surface. *Hull:* Luxury Hall; Armory; Underwater Electronics Package; Basic Bridge; Fuel Processor; Large Entry Module; 10-dton Vehicle Bay (for *Quatermain*-class Hunting Launch); 2.5-dton Spacedock.

Statistics

Size: 59'×167'×12' *Payload:* 79.3 stons *Lwt.:* 409 stons
Volume: 200 dtons *Maint.:* 33.4 mh/day *Price:* MCr48.5

HT: 12 *HPs:* 90,000 [Hull], 4,800 [Turret].

sAccel: 1.9 Gs/2.3 Gs empty *Jump:* 2 *aSpeed:* 1,900 mph
uSpeed: 20 mph *Crush Depth:* 290 yards

Container Ships

These ships carry standardized cargo containers from one world to another. Many of those seen in the Imperium belong to the *Birdsong* class. The original *Birdsong* was laid down at Terradyne Yard #7 in Earth's L4 Lagrange point on May 29, 2028 (old Terran reckoning). A few starship designs have been in service longer – the genesis of the lifting-body *Siigiizuni*-class free trader (ancestor to the *Beowulf* class) is lost in antiquity – but none can claim an earlier date with such exactitude.

During the Interstellar Wars, hundreds of TL8 *Birdsong* OTVs were retrofitted to TL9 with jump drives and the new reactionless thrusters, and hundreds more were built. They served as cheap "liberty ships" carrying much-needed war supplies. After the fall of the Ziru Sirka, they became ubiquitous, synonymous with and emblematic of the Ramshackle Empire.

The class has endured the centuries, receiving numerous upgrades but retaining its characteristic tapered-dumbbell hull form. (Technically, each variant should have a new class name, but the countless variants over the millennia can't be kept straight, so they are all referred to collectively as *Birdsongs*.)

Birdsongs are tail-landers, laid out with decks perpendicular to the main drive axis. They were originally designed for microgravity. Accessways, particularly the main shaft through the fuel tankage, are inconvenient if not impossible to use under full G. Crew stations on the bridge are recumbent; crewmen lie on their backs, facing forward toward the main view port. Experienced crews often maintain normal gravity only on the quarters (#2) deck, and leave the rest of the ship in zero-G.

These ships can carry six 30-ton standardized cargo containers arranged around the fuel deck (giving the class the nickname "six-pack"). In the initial design, containers and auxiliary fuel tanks attached to hardpoints; modern versions carry LSP cutter modules (see ***GURPS Traveller: Modular Cutter***). This also makes the ship an excellent (if slow) rift-runner. Carrying six fuel tanks, a *Birdsong* can cross a gap of nine parsecs in eight jumps, discarding each tank as it is emptied.

Birdsong-class ships are named after folk or popular songs. Some names have been used so many times that they have become traditional, including *Casey Jones*, *Witchcraft*, *Danny Boy*, *Hound Dog*, *Waltzing Matilda*, *Sakura*, and *Stellar Blue*.

The ships have extra-heavy frames, heavy compartmentalization, and metal armor: expensive at TL8, standard at TL9, or cheap at TL10. The high back (tail) DR originally protected the ship from its own fission rockets and during reentry.

Birdsong-Class 100-ton Container Ship (TL8)

Typical crew is captain/pilot, engineer, and medic/steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, 30 dtons Water, 57 Fission Rocket.
Fuel: 30 Fuel Tanks.
Occ: 3 Staterooms **Cargo:** 4 dtons

Armor	F	RL	B	T	U
All:	4/20	4/20	4/50	4/20	4/20

Equipment

Hull: Basic Bridge; Galley; 100-PF Radiation Shielding on crew areas; Sickbay; 6 100-ston Hardpoints.

Statistics

Size: 81'×45'×45' *Payload:* 1,071 stons *Lwt.:* 1,335 stons
Volume: 100 dtons *Maint.:* 30.9 mh/day *Price:* MCr41.4

HT: 11 *HPs:* 60,000 [Hull].

sAccel: 0.5 Gs 2.8 GRds/1 G 2.8 GRds empty *aSpeed:* 1,990

Birdsong-Class 100-ton Container Ship (TL9)

The introduction of jump drives and reactionless thrusters at this TL turns this class of container ship into a much more wide-ranging vessel.

The usual crew consists of captain/pilot, two engineers, and a medic/steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, 2 Combination Gravitics System, 6 Jump Drive, 13 Late-TL9 Maneuver.
Fuel: 30 Jump Fuel Tank.
Occ: 3 Staterooms **Cargo:** 2.5 dtons

Armor	F	RL	B	T	U
All:	4/20	4/20	4/50	4/20	4/20

Equipment

Hull: Basic Bridge; Galley; 1,000-PF Radiation Shielding on bridge, staterooms, galley, and sickbay; Sickbay; Fuel Processor; 6 100-ston Hardpoints.

Statistics

Size: 81'×45'×45' *Payload:* 613 stons *Lwt.:* 901 stons
Volume: 100 dtons *Maint.:* 38.7 mh/day *Price:* MCr65.1

HT: 12 *HPs:* 60,000 [Hull].

sAccel: 0.4 Gs/1.4 Gs empty *Jump:* 1/2 empty *aSpeed:* 1,710

Birdsong-Class 100-ton Container Ship (TL10)

This is the highest TL at which the vessel class is built.

The typical crew count is three and consists of captain/pilot, engineer, and medic/steward.

Subassemblies: VGSL Hull +8.
Powertrain: Engineering, 2 Combination Gravitics System, 6 Jump Drive, 19 Maneuver.
Fuel: 30 Jump Fuel Tank.
Occ: 3 Staterooms **Cargo:** 5.5 dtons, 0.5-dton Smuggler's Hold

Armor	F	RL	B	T	U
All:	4/20	4/20	4/50	4/20	4/20

Equipment

Hull: Basic Bridge; Galley; 1,000-PF Radiation Shielding on bridge, staterooms, galley, and sickbay; Sickbay; Fuel Processor; 6 100-ston Hardpoints.

Statistics

Size: 81'×45'×45' *Payload:* 631 stons *Lwt.:* 879 stons
Volume: 100 dtons *Maint.:* 29.8 mh/day *Price:* MCr38.5

HT: 12 *HPs:* 60,000 [Hull].

sAccel: 0.9 Gs/3.1 Gs empty *Jump:* 1/2 empty *aSpeed:* 2,385

Jgd-ll-Jagd Vessels

The gas-giant-dwelling Jgd-ll-Jagd do not build jump-capable ships, for reasons that humans find obscure (see ***GURPS Traveller: Alien Races 4***). Their worlds remain fully capable of constructing impressive STL craft, such as the 7,000-dton ore hauler described below.

The Jgd-ll-Jagd do not use ship or class names in any sense that humans can grasp. Officially, Imperial records refer to the ore hauler as a "Large Jgdi Transport." Merchants and scouts often informally refer to this general type as a "Big Blimp." Continuing with this usage, those Jgdi transports known to be operating in a particular system are given numbers, counting in millions (on the grounds that "smaller numbers don't seem right"). For example, a scout might comment that "Big Blimp Nine Million is out in the belt at the moment."

Jgd build robust and versatile craft, which can go almost anywhere. Jgdi "generation ships" used for some interstellar journeys can be *huge*, but humans are unlikely ever to see one. Jgd construction technology is necessarily very different from the Human pattern, using complex non-metallic compounds and very large crystals; terms and concepts used in describing their vessels may not correspond exactly to human equivalents.

Jgdi hull material is a dark, glittering substance with both sharply defined "facets" and some smoothly curved streamlined surfaces. It is "advanced materials" for game purposes (p. 29). All habitable modules have their volumes multiplied by 8, as the Jgd-ll-Jagd are large beings. Many module descriptions represent a Human's best guess at observed functions, based on equipment installed. Communications difficulties between Humans and Jgd make these guesses unreliable; for example, the "sickbay" may actually have as much to do with feeding or recreation. All controls are treated as hardened to represent sturdier electronics that are built to survive in gas giant's magnetic fields and immense pressures.

Costs are hypothetical, reflecting what Humans would need to spend to build anything comparable. Jgd social systems, while obscure, seem to incorporate something analogous to trade and economics. A vessel like this must represent a significant use of even Jgdi resources, but Jgdi populations are large, and they seem content to build relatively few large ships.

All the vessels here use heavy frames, advanced materials, advanced metal armor, and heavy compartmentalization.

150-ton Jgd-ll-Jagd Launch (TL11)

This vessel is attached to the Jgdi Ore Hauler (see below); very similar craft may be seen anywhere that Humans may encounter the Jgd-ll-Jagd. Again, its size reflects the size of its Jgdi crew and passengers, and the Jgdi need to build to survive conditions anywhere from gas-giant atmospheres to deep space; it is actually comparable to a Human 10-ton launch.

This particular vessel has a distorted spherical shape, with the bridge sections projecting from the front, and a pair of stubby nacelles at the back apparently housing thruster systems. Like most Jgdi craft, it has no detectable view ports; Jgd have limited visual senses, which they do not use for piloting. Informally, Human spacers may refer to this sort of vessel as a "Baby Blimp," but rarely try to keep track of individual craft.

The usual crew consists of a single pilot.

Subassemblies: VGSL Hull +8.

Powertrain: 7 Maneuver, Contragravity, Combination Contragravity System.

Occ: 3 Passenger Couches **Cargo:** 24 dtons

Armor	F	RL	B	T	U
All:	4/200	4/200	4/200	4/200	4/200

Equipment

Hull: hardened Cockpit.

Statistics

Size: 147'×37'×18' *Payload:* 124 stons *Lwt.:* 234 stons
Volume: 150 dtons *Maint.:* 2.95 hours *Price:* MCr46

HT: 12 *HPs:* 45,000 [Hull].

sAccel: 3 Gs/6.3 Gs empty *aSpeed:* 1,870 mph

7,000-ton Jgd-ll-Jagd Ore Hauler (TL11)

Despite its size, this particular Big Blimp appears to be the equivalent of a Human 500-ton ore hauler. Ships of this type spend most of their time transporting raw materials between asteroid and planetoid mining operations and inhabited gas giants. The Jgdi can travel quite comfortably in any large pressurized space filled with their natural atmosphere, so this vessel could easily be converted into a short-haul passenger transport. This ship resembles a bulbous teardrop with a truncated tail.

Though the equivalent of a civilian craft, the vessel mounts heavy fusion weapons. The Jgd are obsessed with maintaining symmetrical relationships with the universe in numerous ways, and sometimes this requires application of high levels of energy. PCs encountering a Jgd ship may be able to trade, but they should always proceed carefully.

The usual crew numbers 46: three bridge crew and two other command personnel, a flight technician, four gunners, five engineers, a medic, and 30 service crew.

Subassemblies: VGSL Hull +12, 2×100-ton External Bay +8.

Powertrain: Engineering, 220 Maneuver, 28 Combination Contragravity Systems, 10 Contragravity.

Occ: 23 Staterooms **Cargo:** 2,580 dtons

Armor	F	RL	B	T	U
Hull:	4/2,000	4/2,000	4/2,000	4/2,000	4/2,000
Bays:	4/1,000	4/1,000	4/1,000	4/1,000	4/1,000

Weaponry

2×46.7-GJ Fusion Gun Bay [1 in each External Bay].

Equipment

Hull: Sickbay; compact Basic Bridge; 150-dton Spacedock (for Jgd-ll-Jagd Launch).

Statistics

Size: 546'×137'×68' *Payload:* 13,139 stons *Lwt.:* 23,651 stons
Volume: 7,000 dtons *Maint.:* 170 mh/day *Price:* MCr1,249

HT: 12 *HPs:* 526,324 [Hull], 30,000 [each External Bay].

sAccel: 0.9 Gs/2.1 Gs empty *aSpeed:* 2,910 mph

1,500-ton Jgd-ll-Jagd Seeker (TL11)

The Jgdi Ore Hauler mostly shuttles between established extraction operations and Jgdi worlds. Like anyone else, this species must locate resources before it can exploit them. This vessel represents the relatively uncommon Jgdi craft that perform this task; it could be considered the Jgdi counterpart of the 100-ton *Suleiman II*-class seeker. Once again, its size is dictated by Jgdi physiology and engineering philosophy, and all terms and design concepts used are the nearest Human equivalents to Jgdi systems.

The Jgdi Seeker takes the form of a stubby, bulbous cylinder, with a pair of rectangular "wings" that mostly seem to serve as mounts for instruments and sensors. While it mostly consists of the usual Jgdi dark and glittering hull material, with no identifiable viewports but an especially large number of facets in this case, most craft of this type have one or two large, flat, featureless, oval panels along the "spine," bright red or orange in color. When asked, Jgd refer to these as "identification plates." The fusion gun bay is mounted in the "belly."

The Human nickname for this vessel is a "Seeker Blimp" or "Miner Blimp." If individual crafts can be identified and tracked, they are usually numbered in multiples of ten. ("Go careful out there; Miner Blimps 30 and 70 are in that area.")

The standard crew is 16, consisting of three bridge and two other command personnel, two gunners, three engineers, and six service crew.

Subassemblies: VGSL Hull +10, 50-ton External Bay +7.
Powertrain: Engineering, Contragravity, 64 Maneuver, 6 Combination Contragravity Systems.
Occ: 10 Staterooms **Cargo:** 306 dtons

Armor	F	RL	B	T	U
Hull:	4/1,000	4/1,000	4/1,000	4/1,000	4/1,000
Bay:	4/500	4/500	4/500	4/500	4/500

Weaponry
23.3-GJ Fusion Gun Bay [50-ton External Bay].

Equipment
Hull: compact Basic Bridge.

Statistics
Size: 320'×80'×40' *Payload:* 1,532 stons *Lwt.:* 3,619 stons
Volume: 1,500 dtons *Maint.:* 88.4 mh/day *Price:* MCr339

HT: 12 *HPs:* 180,000 [Hull], 19,500 [External Bay].

sAccel: 1.8 Gs/3.1 Gs empty *aSpeed:* 2,690 mph

Common Starships

The following ship designs represent vessels encountered in many regions of the Imperium. Many are variants of ships presented in the ***GURPS Traveller*** core book.

liken-Class 100-ton Scout Courier (TL9)

This is the predecessor to the *Suleiman*-class Scout, used by the Sylean Federation Scout Service. It has nearly the same performance but requires a much larger crew. It would be common in the First Imperium, during the Long Night, or in current non-Imperial regions (such as the Sword Worlds).

The usual crew of six is pilot, co-pilot, and four engineers. One *highly* skilled person *might* be able to crew the ship.

The vehicle is heavily compartmentalized. Variants are as numerous as for the TL10 version, maybe more so.

Subassemblies: VGSL Hull +8, Turret +5.
Powertrain: Engineering, 3 Jump Drive, 20 Late-TL9 Maneuver, Combination Contragravity System.
Fuel: 20 Jump Fuel Tank.
Occ: 4 Staterooms **Cargo:** 7.5 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
All: Basic Emission Cloaking and Stealth. *Hull:* 2 Fuel Processors; compact Basic Bridge; 0.5-dton Spacedock.

Statistics
Size: 123'×79'×25' *Payload:* 38.3 stons *Lwt.:* 323 stons
Volume: 100 dtons *Maint.:* 34.5 mh/day *Price:* MCr51.7

HT: 12 *HPs:* 15,000 [Hull], 1,200 [Turret].

sAccel: 1.9 Gs/2.1 Gs empty *Jump:* 2 *aSpeed:* 2,040 mph

Siigiizuni-Class 200-ton Free Trader (TL9)

The *Siigiizuni*-class Free Trader is the predecessor to the *Beowulf* class (see p. GT132). Its origins are lost in antiquity; examples essentially identical to the modern model have been dated as far back as -5000 Imperial. The class was used by many Vilani traders during the First Imperium. It is rumored that it was a *Siigiizuni* the Terrans first detected on their sensors when they jumped to Barnard's Star. Terrans later adopted the design for their own use, as the technology was well within their grasp. It may find use in lower-tech sections of the galaxy even today, as it is a well-known and extremely reliable design.

The interior details are nearly identical to those of the *Beowulf* class, with a slightly smaller cargo hold due to the larger and less efficient fusion reactor. The *Siigiizuni* is also equipped with contragravity generators to assist in takeoffs as its acceleration is well below 1 G.

Variants are as numerous as they are for the *Beowulf* class and follow the same patterns.

Typical crew count is six and consists of captain/pilot, navigator, sensor/commo operator, steward, and two engineers. One of the crew doubles as air/raft pilot, if one is carried.

Subassemblies: VGSL Hull +8, 2×Turret +5.
Powertrain: Engineering, 4 Jump Drive, 9 Late-TL9 Maneuver, Combination Contragravity System, Contragravity.
Fuel: 20 Jump Fuel Tank.
Occ: 10 Staterooms, 5 Low Berths **Cargo:** 68 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment
Hull: 2 Fuel Processors; Basic Bridge; 0.5-dton Spacedock.

Statistics

Size: 149'×37'×19' *Payload:* 344 stons *Lwt.:* 665 stons
Volume: 200 dtons *Maint.:* 33.9 mh/day *Price:* MCr49.8

HT: 12 *HPs:* 22,500 [Hull], 1,200 [each Turret].

sAccel: 0.4 Gs/0.8 Gs empty *Jump:*1 *aSpeed:* 1,105 mph

Colresh-Class 400-ton Subsidized Merchant (TL9)

The *Colresh*-class Subsidized Merchant is the predecessor to the *Akkigish* (see p. GT146). The original design is of Terran rather than Vilani origin; the vessel was used by many Terran traders during the latter Interstellar Wars and well into the Rule of Man. It finds use in some low-technology sections of the galaxy to the present day.

Interior details are nearly identical to those of the *Akkigish*, with a slightly smaller cargo hold and maneuver drive, due to the larger and less-efficient fusion reactor. The *Colresh* is also equipped with contragravity generators to assist in takeoffs, as a fully loaded hold reduces the ship's acceleration below 1 G.

Colresh-class vessels make good Q-ships, which can be found working both sides of the law.

Typical crew count is nine and consists of captain, pilot, navigator, sensors operator, communications officer, steward, medic, and two engineers.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 32 Late-TL9 Maneuver, 8 Jump Drive, Contragravity, 2 Combination Contragravity Systems.
Fuel: 40 Jump Fuel Tank.
Occ: 13 Staterooms, 2 Low Berths **Cargo:** 153 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: Sickbay; Basic Bridge; 2 Fuel Processors; 10-dton Vehicle Bay (for *Harper*-class Launch).

Statistics

Size: 153'×105'×49' *Payload:* 815 stons *Lwt.:* 1,394 stons
Volume: 400 dtons *Maint.:* 46.1 mh/day *Price:* MCr92.1

HT: 12 *HPs:* 37,500 [Hull], 1,200 [each Turret].

sAccel: 0.7 Gs/1.7 Gs empty *Jump:*1 *aSpeed:* 1,600 mph

Kugashin-Class 400-ton Lab Ship (TL10)

Research is an unending pursuit within the Imperium. A constant effort to further understand the universe produces more than understanding; it creates products, markets, jobs, and profits. As a result, the research efforts of individuals and corporations are constantly moving forward. Given many continuing research projects, it is only natural that mobile research platforms be designed and made available at reasonable prices. The laboratory ship is one example.

The lab ship is built as a ring structure, which is rotated to provide centrifugal gravity simulation. Although the standard grav plates and inertial compensators are installed, they may be turned off and centrifugal force used, instead, in order to remove grav forces as a variable in experiments. The ship has minor thrusters along the ring to institute spin or stop it.

Two drive pods are mounted on the ring; they contain drives and the power plant. On the forward face of the pods are hardpoints for turret weaponry, if called for.

Upon approach, the most striking feature of the lab ship is the rotation of the ring. The play of light and shadow constantly reveals new facets of the exterior hull. Not rotating, however, is the pinnace and its docking ring. The structure at the end of the single spoke is mounted to counteract the rotation of the ship, making docking easier for pilots of modest skill.

This vessel is used by governments (both Imperial and others) and private-research organizations. The ship is normally delivered with the laboratories empty (except for standard power, environmental, and data ports). The owner fits out the labs with equipment appropriate to its intended research function. Other possible installations are various specialized sensor suites, anti-contamination protocols, shielding, and so on.

Despite its jump capability, a lab ship often spends a lot of time in one locale, working through a regime of experiments.

The ship carries two air/rafts, used for routine errands, and a fuel-skimming pinnace, which also performs heavier transport chores or those requiring greater speed. The two air/rafts are carried in compartments on the ring hull.

A typical crew complement of 21 includes a captain, pilot, navigator, sensors operator, commo operator, two medics, two engineers, 10 scientists/lab techs, a small-craft pilot, and a small-craft engineer.

Subassemblies: USL Hull +9, Turret +5.
Powertrain: Engineering, 28 Maneuver, 12 Jump Drive.
Fuel: 80 Jump Fuel Tank.
Occ: 20 Staterooms, Low Berth **Cargo:** 31 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: Utility; Sickbay; Basic Bridge; 10 Labs; 50-dton Spacedock; 40-dton Vehicle Bay (for pinnace).

Statistics

Size: 186'×47'×23' *Payload:* 263 stons *Lwt.:* 842 stons
Volume: 400 dtons *Maint.:* 41 mh/day *Price:* MCr72.8

HT: 12 *HPs:* 37,500 [Hull], 1,200 [Turret].

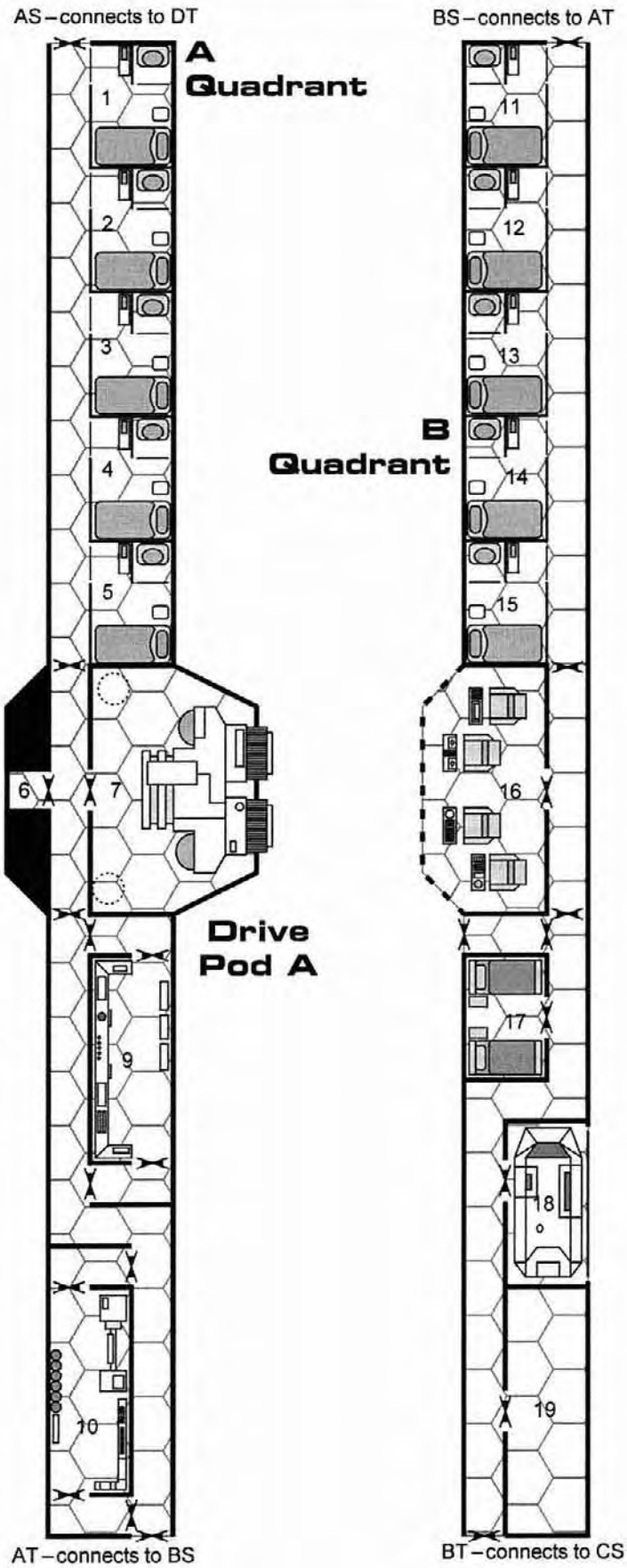
sAccel: 1.3 Gs/1.9 Gs empty *Jump:* 2

KUGASHIN-CLASS LAB SHIP

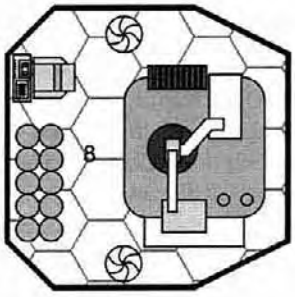
The Laboratory Ship has a unique layout that is designed to allow the ship to operate without grav plates (which may interfere with an experiment).

The ship is constructed in the shape of a giant ring, with the deck flooring against the exterior wall of the ring. This allows the craft to spin to produce gravity.

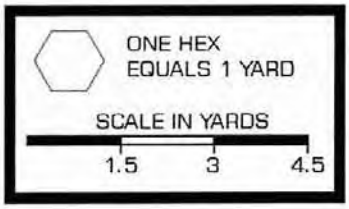
The ship is divided into four quadrants, lettered A through B, with each end of a quadrant labeled either spinward or trailing.



Drive Pod A Upper Deck



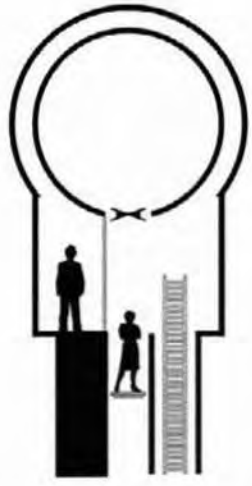
1-5. Staterooms
6. Turret Hardpoint
7. Maneuver Drive 1
8. Power Plant
9-10. Labs
11-15. Staterooms
16. Bridge
17. Sickbay
18. Vehicle Bay
19. Cargo Bay
20-24. Staterooms
25. Turret Hardpoint
26. Maneuver Drive 2
27. Jump Drive
28-29. Labs
30-34. Staterooms
35. Lounge
36. Airlock
37. Low Berths
38. Ship Stores
39. Vehicle Bay
40. Cargo Bay
41. Pinnace Access



In order to ease docking, the pinnace dock is located in the direct center of the ring, mounted on a long "spoke." During docking, the docking sleeve rotates counter to the rotation of the lab ship, causing the dock to be effectively non-rotating.

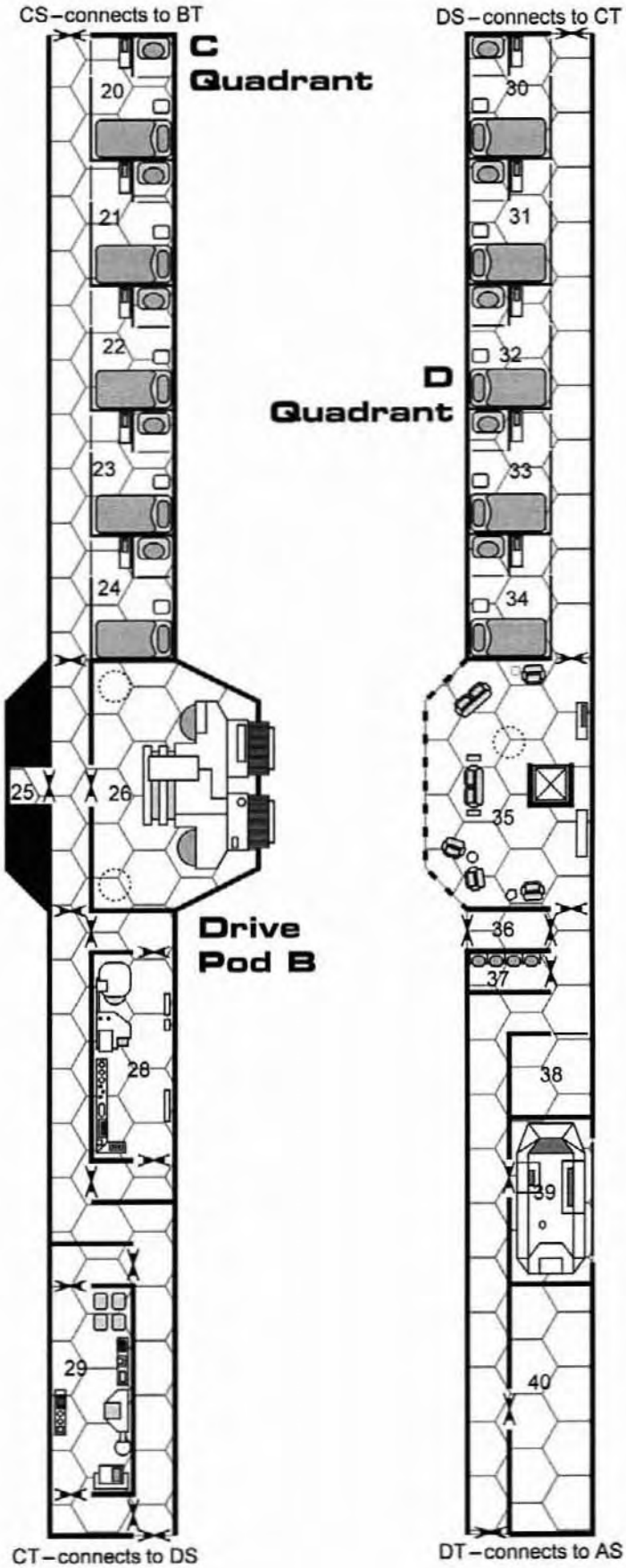
Unfortunately, the vehicle bays are not mounted in such a fashion, and thus docking an air/raft while the lab ship is in rotation can be quite challenging, and even dangerous for the unskilled.

Drive Pod B Upper Deck



Pinnace Dock Cross-Section

Pinnace Spoke



***Fang*-Class 400-ton Corsair (TL11)**

The *Fang*-class Corsair (Type P) is based on a 300-ton VGSL hull. This is not readily apparent, as an extra 160 dtons of cargo hold and other spaces have been added, ruining any streamlining by introducing a bulging underbelly. The *Fang* performs far better than it looks, however.

Most important to this ship are the two pop-turrets and one standard turret. The standard turret holds only one 390-MJ laser to lure wary prey within range of the 1.3-GJ lasers in the pop-turrets. Eight staterooms serve as crew quarters; 16 low berths can hold captives for ransom or provide emergency aid.

The ship features large clamshell doors that can open wide to reveal the entire spacedock, capable of storing a 100-ton ship. (More commonly, up to 200 dtons of cargo can be stuffed inside.) The *Fang* also has several centrally controlled alterable identification features, which can change its shape and configuration at a moment's notice; primitive robotics allow fins to retract or extend, modules appear or disappear, and radio emissions alter frequency and content through an EW system. The ship's transponders can be altered to identify the vessel as having any of several missions and identities. (In the design, the alterable features are handled via a robotic hull, but it is not a true robot as ***GURPS*** usually defines the term. A small, dedicated robotic brain computer is also installed to configure the different hull surfaces, at negligible cost and mass.)

"Book" value for the *Fang* would be hard to obtain on the open market, as it is of a non-commercial type and usually will possess lineage and paperwork of uncertain pedigree.

A typical crew of 14 consists of captain/pilot, navigator, sensors/commo operator, engineer, medic, four gunners, and five "troops." Given the primary occupation of this vessel, extra "troops" often are crammed aboard. This might even result in some crew functions being maintained by quite unqualified personnel.

Subassemblies: USL Hull +9, Turret +5, 2×Pop-Turret +5.
Powertrain: Engineering, 12 Jump Drive, 53 Maneuver, 2 Combination Contragravity Systems.
Fuel: 80 Jump Fuel Tank.
Occ: 8 Staterooms, 4 Low Berths **Cargo:** 0.5 dtons and see above.

Armor	F	RL	B	T	U
Hull:	4/200	4/200	4/200	4/200	4/200
Turrets:	4/100	4/100	4/100	4/100	4/100

Weaponry

390-MJ Turret Laser [Standard Turret].
2×1.3-GJ Heavy Turret Laser [1 per Pop-Turret].

Equipment

All: Modest Stealth; Modest Emission Cloaking. *Hull:* Emergency Aid Station; compact, hardened Basic Bridge; Electronic Warfare System; 4 Fuel Processors.

Statistics

Size: 187'×47'×23' *Payload:* 1,006 stons *Lwt.:* 1,710 stons
Volume: 400 dtons *Maint.:* 52.1 mh/day *Price:* MCr118

HT: 12 *HPs:* 37,500 [Hull], 1,200 [each Turret, either type].

sAccel: 3.1 Gs/7.5 Gs empty *Jump:* 2

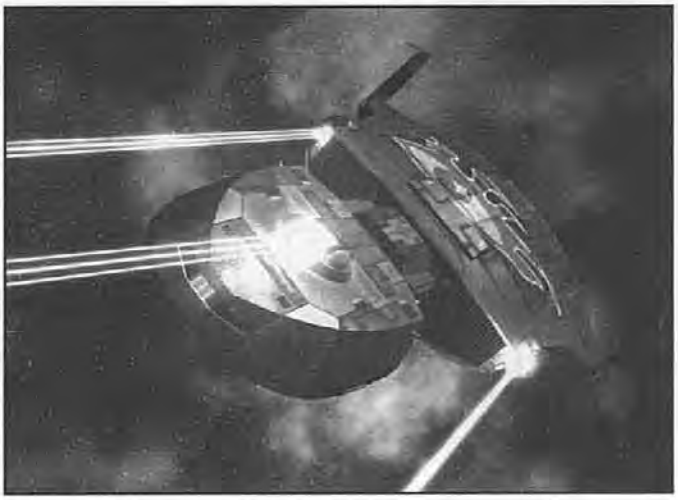
***Ocklosh*-Class 400-ton Salvage Ship (TL11)**

The *Fang*-class Corsair can only go about its business because it's based on a legitimate design: the 400-ton *Ocklosh*-class Salvage Ship, also based on the Type P. *Ocklosh*-class ships are used to bring home smaller ships, or parts of them, too damaged to do it themselves. Their standard turret contains a mining laser to cut through damaged bulkheads.

This ship is not a rescue ship. It is usually brought in afterward, to clean up the mess.

The *Ocklosh* was never common, but enough have found their way into the private sector in their original configuration, or refitted as bulk-transport freighters or mining ships, that possessing one does not automatically brand the owner as a pirate (not quite, anyway). Regardless, given the number of *Ockloshes* in illicit occupations (and the title role given one in the popular *Space Pirate Ship Tsunami* trideo series), officials usually give their papers a particularly thorough going-over.

The usual crew of seven includes captain/pilot, navigator, sensors/commo operator, engineer, medic, and two small-craft crew (one of whom usually handles the gunner role, too).



Subassemblies: Hull +9, Turret +5.
Powertrain: Engineering, 12 Jump Drive, 53 Maneuver, 2 Combination Contragravity Systems.
Fuel: 80 Jump Fuel Tank.
Occ: 5 Staterooms, 4 Low Berths **Cargo:** In Spacedock only.

Armor	F	RL	B	T	U
Hull:	4/200	4/200	4/200	4/200	4/200
Turret:	4/100	4/100	4/100	4/100	4/100

Weaponry

46.5-MJ Mining Laser [Turret].

Equipment

Hull: Emergency Aid Station; compact Basic Bridge; 4 Fuel Processors; 112-dton Spacedock (holds 10-ton Launch).

Statistics

Size: 186'×47'×23' *Payload:* 1,157 stons *Lwt.:* 1,752 stons
Volume: 400 dtons *Maint.:* 47 mh/day *Price:* MCr95.9

HT: 12 *HPs:* 37,500 [Hull], 1,200 [Turret].

sAccel: 3 Gs/8.9 Gs empty *Jump:* 2

***Liverpool*-Class 20,000-ton Dispersed Hull Bulk Freighter (TL11)**

While tramp traders may delude themselves that they are carrying the Imperium's lifeblood, bulk carriers really do. The *Liverpool* can slowly carry nearly 15,000 tons of cargo along a jump-2 main far cheaper than the scruffiest free trader.

Bulk freighters are too large to profit from incidental trade; their routes are carefully planned, sometimes years in advance. Coupled with the lack of troublesome "live freight" (passengers), this makes them favorite berths for married spacers. It also makes them choice targets for pirates, even hijackers. In 947, a gang placed cutter modules as cargo on the *Kommeran Star*, including a quarters module in which they hid. During the voyage, they looted valuables from the forward cargo hold, stowing them in their cargo modules. When the *Kommeran Star* reached Deneb, it was met by a *Naakil*-class Jump Cutter. The thieves attached two cargo containers loaded with valuables and jumped for an unknown destination.

The main hull is a long open-frame slab, divided into holds by support girders. Cargo is floated into these holds and secured, but is otherwise exposed to space. For this reason, *Liverpool*-class ships usually carry containerized cargo. At the rear of the overall ship sits the single pressure hull. It contains all systems except fuel and cargo (though it does contain 0.5 dtons of cargo space primarily for crew and ship needs). On a fully loaded ship, the only visible parts of the pressure hull are the thruster plates and flying bridge. The fuel tanks are situated aft, beside the engineering decks of the subhull, but not in it.

The flying bridge, perched on a support pylon that protrudes from the main hull, gives the crew an almost complete view of the ship's dorsal reaches. Also on the pylon is a small lounge where off-duty crewmen can relax and enjoy the view.

The ship's armor is open frame. The subhull has a superlight frame and total compartmentalization. The freighters are usually unarmed. Armed escorts usually provide any security, though some operators install weapons in self-contained subhulls within the cargo area. Several Vargr corsairs have had a nasty surprise when their easy target suddenly grew teeth!

Typical crew count is 37 and consists of five bridge personnel with five additional command slots, 21 engineers, a medic, and five service crew.

Subassemblies: Dispersed Hull +12, Subhull +10.
Powertrain: Engineering [Subhull], 600 Jump Drive [Subhull], 390 Maneuver [Subhull].
Fuel: 4,000 Jump Fuel Tank.
Occ: 21 Staterooms [Subhull] **Cargo:** 14,881 dtons and see above.

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Equipment

Hull: 40 Utility; Basic Bridge; Sickbay.

Statistics

Size: 697'×174'×87' *Payload:* 74,412 stons *Lwt.:* 84,616 stons
Volume: 20,000 dtons *Maint.:* 252 mh/day *Price:* MCr2,756

HT: 12 *HPs:* 420,000 [Hull], 7,500 [Subhull].

sAccel: 0.5 Gs/3.8 Gs empty *Jump:* 2

***Gazelle*-Class 300-ton Close Escort (TL11)**

The *Gazelle* is an inexpensive ship for anti-piracy and revenue patrols. Its particle accelerators can disable civilian or other lightly armored ships at close range. Against real combat vessels with hardened systems, the *Gazelle* fares poorly.

The ship is widespread because it's easy to build. The hull and many systems could be built at TL10 (using a standard frame and expensive armor) or TL9 (expensive frame and advanced armor). Drives and other systems usually would be imported, but could be made locally with a performance loss. TL10 thrusters would provide about 1.6 Gs with tanks, 2 Gs without. TL9 thrusters give 1.2 Gs with tanks, 1.5 Gs without.

The ship's internal fuel tankage provides jump-2. It often carries drop tanks giving jump-4, or jump-5 if the tanks are jettisoned (see below). Dropping the tanks adds about 1 G to sAccel, making this common practice during pursuits.

The *Gazelle* has a heavy frame built from cheap materials with standard metal armor. It is heavily compartmentalized.

The usual crew of 13 includes four command personnel, four engineers, four gunners, and a medic/cook.

Subassemblies: USL Hull +9, 2×Turret +5.
Powertrain: Engineering, 143 Maneuver, 20 Jump Drive.
Fuel: 60 Jump Fuel Tank.
Occ: 8 Staterooms **Cargo:** 8.5 dtons

Armor	F	RL	B	T	U
Hull:	4/1,700	4/1,700	4/1,700	4/1,700	4/1,700
Turrets:	4/850	4/850	4/850	4/850	4/850

Weaponry

6×390-MJ Turret Lasers [3 per Turret].
2×700-MJ Turret P-Beams [Hull:F].

Equipment

All: Basic Emission Cloaking and Stealth. *Hull:* Emergency Aid Station; compact Basic Bridge; Enhanced Sensor System; Utility; 2 Fuel Processors; 20-dton partially recessed Vehicle Bay (for *Faun*-class Gig); 2 300-ston Hardpoints.

Statistics

Size: 158'×75'×28' *Payload:* 152 stons *Lwt.:* 3,484 stons
Volume: 300 dtons *Maint.:* 70.9 mh/day *Price:* MCr218

HT: 11 *HPs:* 60,000 [Hull], 2,400 [each Turret].

sAccel: 4.1 Gs with tanks/5 without/5.2 empty *Jump:* See above.

50-ton ***Gazelle*** Drop Tank (TL11)

The tank is built with heavy frame, cheap materials, and standard metal armor. It is heavily compartmentalized.

Subassemblies: Hull +7.
Fuel: 50 Jump Fuel Tank.

Armor	F	RL	B	T	U
All:	4/600	4/600	4/600	4/600	4/600

Statistics

Size: 50'×25'×25' *Payload:* 0 stons *Lwt.:* 272 stons
Volume: 50 dtons *Maint.:* 6.6 hours *Price:* MCr9.18

HT: 12 *HPs:* 19,500 [Hull].

Fiery-Class 500-ton Gunned Escort (TL11)

This is a more refined, streamlined version of the *Gazelle*. The external drop tanks are replaced by internal fuel tanks, limiting the ship to jump-4 without the possibility of the extended-range jump-5. Few navies regard this as a major shortcoming, but many don't like the fact that the *Fiery* is slower than a tankless *Gazelle*.

The *Fiery* is much less common than the *Gazelle* because it cannot be built at less sophisticated shipyards like its ancestor can (p. 97).

It has a heavy frame and heavy compartmentalization.

The typical crew of 13 includes four command personnel, two engineers, four gunners, and three maintenance crew.

Subassemblies: VGSL Hull +9, 4×Turret +5.
Powertrain: Engineering, 25 Jump Drive, 104 Maneuver.
Fuel: 200 Jump Fuel Tank.
Occ: 8 Staterooms **Cargo:** 3.5 dtons

Armor	F	RL	B	T	U
Hull:	4/1,700	4/1,700	4/1,700	4/1,700	4/1,700
Turrets:	4/850	4/850	4/850	4/850	4/850

Weaponry

2 Turrets with 2×1.4-GJ Turret P-Beam [1 per Turret].
2 Turrets with 6×390-MJ Turret Lasers [3 per Turret].

Equipment

All: Basic Emission Cloaking and Stealth. *Hull:* Emergency Aid Station; compact Basic Bridge; Enhanced Sensor System; 2 Fuel Processors; Utility; 20-dton Vehicle Bay (for *Faun*-class Gunned Gig).

Statistics

Size: 138'×90'×28' *Payload:* 127 stons *Lwt.:* 2,754 stons
Volume: 500 dtons *Maint.:* 76.6 mh/day *Price:* MCr255

HT: 12 *HPs:* 90,000 [Hull], 2,400 [each Turret].

sAccel: 3.8 Gs/4 Gs empty *Jump:* 4 *aSpeed:* 4,850 mph

Condor-Class 2,000-ton Belt Surveyor (TL7)

The *Condor*-class belt surveyor represents what a lower-tech society committed to exploring its solar system can achieve. It is designed with long-term comfort in mind for the crew, with single-occupancy staterooms, an oversized recreation facility, and two gymnasiums. Its acceleration is nothing to be proud of, but it can make the Earth-Mars run in around five months (coasting most of the way). It would require refueling at the end of its journey, and thus would not normally travel to a destination without a guaranteed supply of water.

It carries five triple-missile racks. They are for point defense against rogue asteroids and for making smaller asteroids out of larger ones, enabling easier study.

A standard crew would be 33: 13 command personnel, a medic, 14 lab technicians, and five gunners/maintenance crew.

Subassemblies: Hull +10, 5×Turret +5.
Powertrain: Engineering, Power Core, 476 Fission Rocket.
Fuel: 1,290 dtons Water, 1,290 Fuel Tanks.
Occ: 33 Staterooms **Cargo:** 172 dtons

Armor	F	RL	B	T	U
All:	4/100	4/100	4/100	4/100	4/100

Weaponry

5 Turrets with 15×250mm Missile Racks [3 per Turret].

Equipment

Hull: Sickbay, 2 Gymnasiums, 6 Isolation Labs, Hall, Command Bridge, Advanced Sensor System, Planetary Survey Module, Enhanced Communication System, 2 Large Entry Modules, Complete Workshop.

Statistics

Size: 318'×80'×40' *Payload:* 20,217 stons *Lwt.:* 25,636 stons
Volume: 2,000 dtons *Maint.:* 113 mh/day *Price:* MCr554

HT: 11 *HPs:* 90,000 [Hull], 1,200 [each Turret].

sAccel: 0.13 Gs 0.81 GRds

Warships and Dreadnoughts

Large starfaring services such as the Imperial Navy usually organize themselves around "capital ships," massive warships whose primary armament is a spinal-mount beam weapon. During wartime, these ships serve as the primary arm of battle. In peacetime, they provide command-and-control services for routine patrols and other non-combat missions.

Azhanti High Lightning-Class 60,000-ton Frontier Cruiser (TL11)

Conceived as a fleet intruder, the *Azhanti High Lightning* was designed with unusual mobility and defenses; at the time, jump-5 capability and meson screens were very unusual for warships below the capital class. The first members of the class were built in the years just before the Solomani Rim War, and many of them saw valiant service during that conflict.

The original *Azhanti High Lightning* class presented here has long since been declared obsolete by the Imperial Navy. Examples can still be encountered in IISS service, or (with most or all weapons removed) in commercial service. A number of the original model have also been transferred to local or allied service (notably to the Darrian Confederation and Vegan Autonomous Region).

In the 1080s, 28 *Azhanti High Lightnings* were taken out of mothballs and refurbished to reenter frontier service. A spinal meson gun replaced the particle accelerator, with particle accelerators replacing most of the missile batteries, and a black-globe generator and meson screen were installed. The refurbished cruisers were deployed to the Imperium's most dangerous "trouble spots," the Spinward Marches, the Solomani Rim sector, and the turbulent client states along the Gateway frontier to trailing. Although several of the refurbished ships have been lost, most remain in active Imperial service.

The ship has an extra-heavy frame.

A standard crew of 662 includes 30 bridge, 10 countermeasures, 196 flight, 106 gunnery, 136 engineering, four medical, and 180 service personnel, with 150 troops and up to 52 non-crew personnel often carried, as well.

Subassemblies: USL Hull +13, 360×Turret +5.
Powertrain: 3 Engineering, 3,600 Jump Drive, 11,241 Maneuver.
Fuel: 30,000 Jump Fuel Tank.
Occ: 416 Staterooms, 50 Bunkrooms, 155 Low Berths
Cargo: 400 dtons

Armor	F	RL	B	T	U
Hull:	4/24,000	4/24,000	4/24,000	4/24,000	4/24,000
All Else:	4/8,000	4/8,000	4/8,000	4/8,000	4/8,000

Weaponry

1.6-TJ Spinal P-Beam [Hull: F].
21×250mm Missile Bay [Hull: 4F, 3L, 3R, 4T, 4B, 3U].
10 Batteries w/ 100×700-MJ T. Fusion Gun [10 Turrets/Guns each].
26 Batteries w/ 780×390-MJ T. Laser [10 Turrets/30 Lasers each].

Equipment

All: Radical Emission Cloaking and Stealth. *Hull:* 10 Armory; Brig; 2 Conference Rooms; 5 Halls; 2 Safes; 4 Military Sickbays; 8 Gymnasiums; 86 Escape Capsules; Advanced Communication Module; Advanced Sensor Suite; 6 Extra-Heavy AESA Arrays; 6 Extra-Heavy PESA Arrays; 6 Ultra-Heavy Radscanners; 2 hardened Command Bridges (one used as backup); 2 Computer Systems; Electronic Warfare System; 2 Enhanced Displays; Information Center; 10 Complete Workshops; 750 Fuel Processors; 120 Utility; 2,000 Meson Screens (meson DR 47,926); 16 Nuclear Dampers; 5 Military Holoventure Suites; 10 Drop Capsule Racks; Drop Capsule Launcher; 8 Morgues; 80 10-dton Vehicle Bays (for *Iramda*-class Fighters); 2 10-dton Launch Tube Staging Areas; 2 75-ston Launch Tubes; 2,202-dton Spacedock (for 4 550-ton Fuel Skimmers).

Statistics

Size: 992'×248'×124' *Payload:* 9,181 stons *Lwt.:* 662,347 stons
Volume: 60,000 dtons *Maint.:* 1,067 mh/day *Price:* MCr49,404

HT: 12 *HPs:* 3,480,000 [Hull], 4,800 [each Turret].

sAccel: 1.7 Gs *Jump:* 5

Kokirrak-Class 200,000-ton Dreadnought (TL12)

The *Kokirrak*-class dreadnought is one of the oldest TL12 designs in Imperial service; the first examples were built just after the Solomani Rim War. While the class is slowly being phased out, many examples still remain on active duty in the Navy. In the past few decades, a number of *Kokirraks* have been transferred to the IISS, or to sector or client-state navies.

The design remains popular with Imperial flag officers because it makes an excellent flagship, with extensive admiral's quarters including communications and entertainment facilities. A *Kokirrak* is capable of controlling a large fleet engagement even while participating in front-line combat.

Each border sector still has 3-5 BatRons of *Kokirraks* – the Spinward Marches has four (posted at Rhylanor, Regina, Jewell, and Mora) and the Solomani Rim has five (Shululsish, Muan Gwi, Dingir, Terra, and Huy Braseal). In peacetime, *Kokirrak* BatRons are normally dispersed as independent ships with escorts. Such task forces combine training operations with routine patrols and quick-reaction missions.

The *Kokirrak* does not normally carry troops. The cargo hold can carry modular quarters for up to 2,000 troops; usually only 1,000 are carried to avoid crowding. A BatRon of eight *Kokirraks* with troop quarters installed can carry 8,000-16,000 soldiers, or a reinforced division. The statistics below assume the ship is carrying 200 troop modules (see ***GURPS Traveller: Modular Cutter***) rated at 30 dtons and 300 stons each.

The design includes a black-globe generator and capacitors. When built, the *Kokirrak* was intended to carry black globes. Over the years, the technology has proven unreliable; many ships have suffered black-globe failures and the devices have not been replaced. There is a 50% chance that a given *Kokirrak* will possess a functioning black globe.

A standard crew complement of 1,848 includes 30 bridge and 46 additional command, 24 countermeasure, 409 gunnery, 724 engineering, 15 medical, and 600 service personnel.

Subassemblies: USL Hull +15, 720×Turret +5, 20×100-ton External Bay +8.
Powertrain: 5 Engineering, 10,000 Jump Drive, 62,382 Maneuver, 35 Black Globe Capacitor.
Fuel: 80,000 Jump Fuel Tank.
Occ: 1,016 Staterooms, 10 Luxury Staterooms, 100 Low Berths
Cargo: 4,000 dtons and see above.

Armor	F	RL	B	T	U
Hull:	4/75,000	4/75,000	4/75,000	4/75,000	4/75,000
All Else:	4/8,000	4/8,000	4/8,000	4/8,000	4/8,000

Weaponry

2.9-TJ Spinal Meson Gun [Hull:F].
50×250mm Missile Bay [Hull:10F, 8L, 8R, 8T, 8B, 8U].
50×23.3-GJ Fusion Gun Bay [Hull:10F, 8L, 8R, 8T, 8B, 8U].
32 Batteries w/ 320×860-MJ T. P-Beam [10 Turrets/P-Beams each].
100 Batteries w/ 1,200×405-MJ T. Laser [4 Turrets/12 Lasers each].
Heavy Repulsor Bay [20×Large External Bay, see p. 49].

Equipment

All: Radical Emission Cloaking and Stealth. *Hull:* 6 Armory; 2 Brigs; 2 Conference Rooms; 15 Halls; 2 Safes; 10 Stages; 10 Theaters; 15 Military Sickbays; 24 Gymnasiums; 234 Escape Capsules; 6 Advanced Communication Modules; 6 Advanced Sensor Systems; 6 Extra-Heavy AESA Arrays; 6 Extra-Heavy PESA Arrays; 6 Ultra-Heavy Radscanners; 2 genius, hardened Command Bridges (one serves as backup); 6 Computer Systems; 6 Electronic Warfare Systems; 10 Enhanced Displays; 2 Info Centers; 34 Complete Workshops; 2,000 Fuel Processors; 400 Utility; 253 Black Globe-4; 14,000 Meson Screen (meson DR 140,949); 256 Nuclear Damper; 800-dton Spacedock (various crafts by ship).

Statistics

Size: 1,484'×371'×185' *Payload:* 80,245 stons *Lwt.:* 2,829,497
Volume: 200,000 dtons *Maint.:* 2,509 mh/day *Price:* MCr273,126

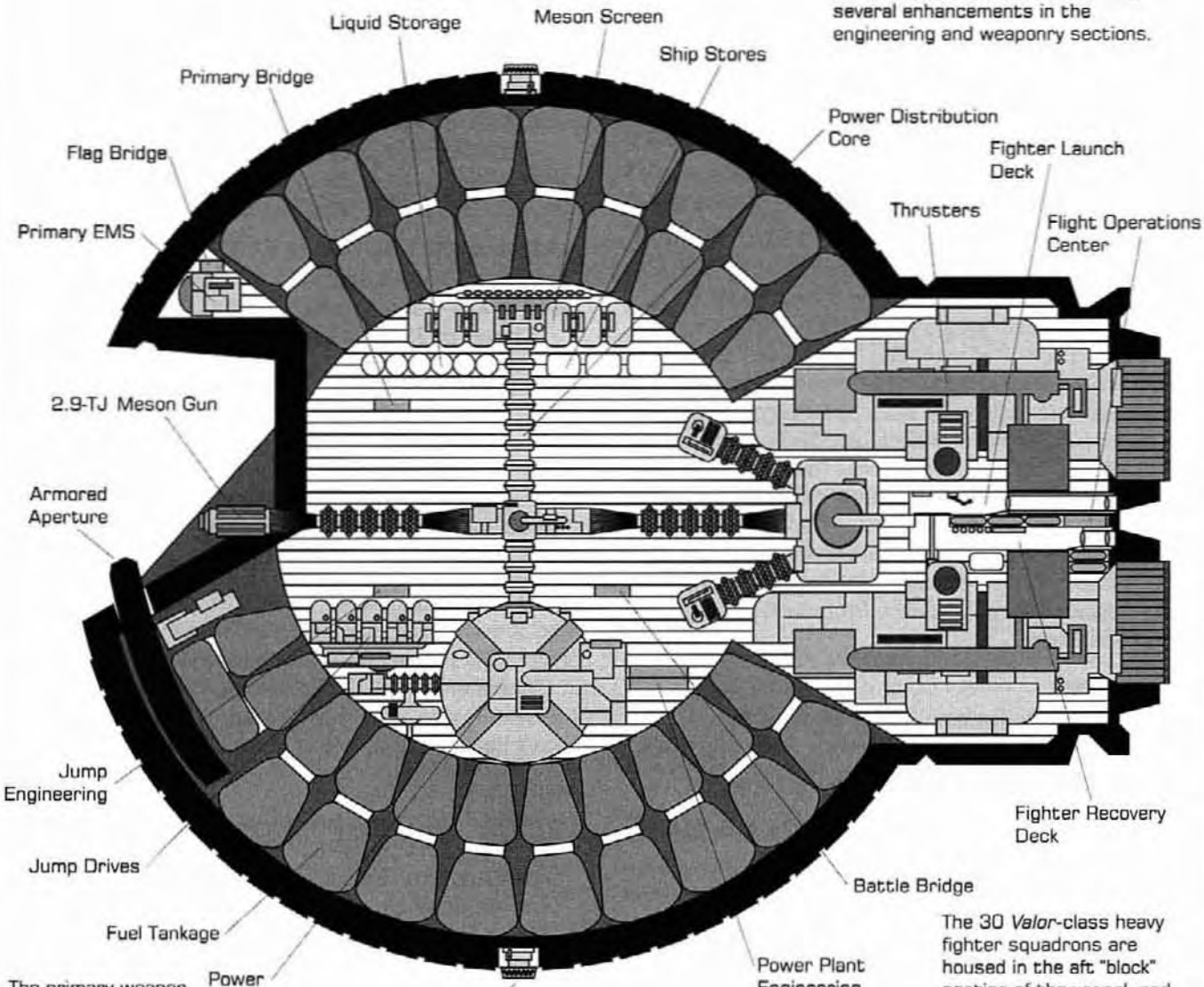
HT: 10 *HPs:* 7,740,000 [Hull], 4,800 [each Turret], 60,000 [each Bay].

sAccel: 2.2 Gs/2.3 Gs empty *Jump:* 4

Block IV Configuration

Scale in Meters
12 24 36 48

The *Tigress*-class dreadnought is one of the most powerful vessels in known space. The Block IV configuration is the current version, incorporating several enhancements in the engineering and weaponry sections.

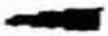


The primary weapon of the *Tigress* class is a 2.9-TJ spinal meson projector. Numerous turrets and weapon bays cover the hull to supplement the meson gun and provide close support.

The 30 *Valor*-class heavy fighter squadrons are housed in the aft "block" section of the vessel, and are launched and recovered to the rear of the parent vessel.

Comparison Profiles

Dragon-class
System Defense Boat



Vayu-class
Patrol Cruiser

P.F. Sloan-class
Fleet Escort

Tigress-Class 500,000-ton Dreadnought (TL12)

Although some older warships of greater displacement remain in service, the *Tigress*-class dreadnought is the largest vessel currently in service with the Imperial Navy in the Spinward Marches. Each eight-ship BatRon of *Tigress*-class vessels is virtually a fleet unto itself, particularly given that each ship carries thirty squadrons of *Valor*-class heavy fighters (p. 79). At 10 fighters per squadron, a *Tigress* BatRon carries 2,400 fighters.

Tigress-class BatRons are usually assigned one per sector. In the Spinward Marches, one BatRon is assigned to the 212th Fleet, at Rhylanor. Another is assigned to the 294th Fleet, based at Muan Gwi in the Solomani Rim sector.

In peacetime, individual *Tigress*-class ships are often scattered throughout a region on peacekeeping missions. For example, several individual *Tigresses* have been deployed among the worlds in the Five Sisters subsector to enforce the Amber Zone blockade of Candory and Andor.

Tigress-class dreadnoughts are particularly useful in "show the flag" exercises, peaceful but intimidating demonstrations of Imperial power. A single *Tigress* outclasses many entire planetary or client-state navies in terms of sheer tonnage. Imperial Navy news releases are often designed to improve the propaganda value of the class, stressing its mass, crew size, and firepower. These releases have made the *Tigress* instantly recognizable (and feared) throughout Imperial space and beyond.

A prominent recent example involved *Pantheress*, which was dispatched (to the chagrin of the Zhodani government) to receive the body of the Imperial Ambassador to Chronor upon her death by assassination in 1104. Given the circumstances of her death, it was difficult for the Consulate to object. The ship's weaponry was ceremonially sealed, but that would have meant little in an actual fight. Imperial newsreels treated it as a propaganda coup for months.

Construction

The *Tigress* class is produced using a totally compartmentalized, armored, extra-heavy spherical hull, with the 2.9-TJ spinal meson gun mounted centrally. A large armored port protects the gun during non-combat operations; the port itself contains focusing equipment for the weapon beam.

Within the sphere, layered decks hold the various onship functions such as quarters, computers and electronic equipment, fuel treatment, and maintenance areas. Appended to the back of the sphere is a large heavy-fighter launch and recovery installation, consisting of three launch tubes and a large spacedock for recovery. Fighters are launched to the rear, to starboard, and recovered from the rear, to port; this arrangement prevents them from entering the meson beam when it is in use, as well as providing some armored bulk between the fighters and the enemy during vulnerable stages of their flight operations.

The ship has a standard complement of 5,603, including 60 bridge and 172 additional command, 18 countermeasure, 930 flight, 1,017 gunnery, 1,859 engineering, 47 medical, and 1,500 service personnel.

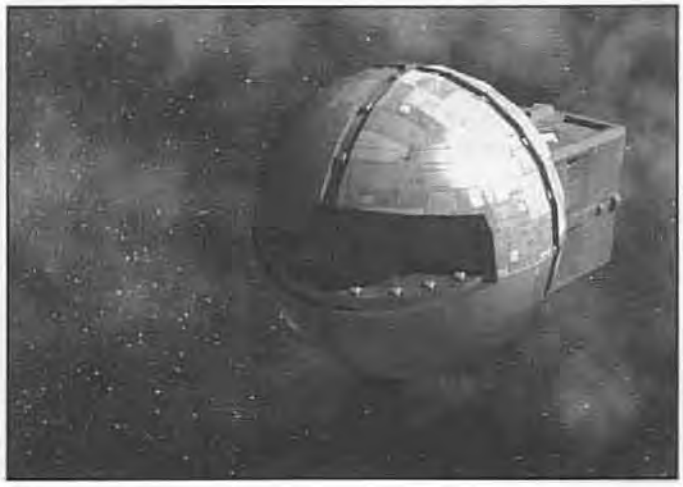
Subassemblies: USL Hull +15, 400×Turret +5, 22×100-ton External Bay +8.

Powertrain: 8 Engineering, 25,000 Jump Drive, 160,814 Maneuver.

Fuel: 200,000 Jump Fuel Tank.

Occ: 3,082 Staterooms, 100 Low Berths **Cargo:** 3,150 dtons

Armor	F	RL	B	T	U
Hull:	4/130,000	4/130,000	4/130,000	4/130,000	4/130,000
All Else:	4/8,000	4/8,000	4/8,000	4/8,000	4/8,000



Weaponry

2.9-TJ Spinal Meson Gun [Hull:F].
430×250mm Missile Bay [Hull:80F, 70L, 70R, 70T, 70B, 70U].
10 Batteries w/ 100×860-MJ T. P-Beam [10 Turrets/P-Beams each].
10 Batteries w/ 300×405-MJ T. Laser [10 Turrets/30 Lasers each].
10 Batteries w/ 300×Sandcasters [10 Turrets/30 Casters each].
50 Batteries w/ 100×700-MJ T. Fusion Gun [2 Turrets/Guns each].
Heavy Repulsor Bay [22×Large External Bay, see p. 49-50].

Equipment

All: Radical Emission Cloaking and Stealth. *Hull:* 15 Armory; 5 Brigs; 5 Conference Rooms; 30 Halls; 5 Safes; 15 Stages; 15 Theaters; 47 Military Sickbays; 60 Gymnasiums; 773 Escape Capsules; 5 Advanced Communication Modules; 5 Advanced Sensor Systems; 6 Super-Heavy AESA Arrays; 2 genius, hardened Command Bridges (one serves as backup); 5 Computer Systems; 5 Electronic Warfare Systems; 3 Enhanced Displays; 6 Super-Heavy PESA Arrays; 6 Ultra-Heavy Radscanners; Flight Control Bridge (built as hardened Command Bridge); Information Center; 115 Complete Workshops; 5,000 Fuel Processors; 1,000 Utility; 43,000 Meson Screen (meson DR 306,186); 25 Nuclear Dampers; 3 600-ston Launch Tubes; 3 50-dton Launch Tube Staging Areas; 300 50-dton Vehicle Bays (for *Valor*-class Heavy Fighters); 665-dton Spacedock.

Statistics

Size: 750'×500'×500' *Payload:* 187,706 stons *Lwt.:* 8,131,673
Volume: 500,000 dtons *Maint.:* 3,297 mh/day *Price:* MCr471,843

HT: 10 *HPs:* 14,280,000 [Hull], 4,800 [each Turret], 60,000 [each Bay].

sAccel: 2 Gs *Jump:* 4

Chapter Eleven

Starship Operations

The following rules extend (but are compatible with) the rules for starship operation given in ***GURPS Traveller*** and other supplements, notably ***Far Trader***. They may be used or ignored at the GM's discretion, although the expanded starship-design sequence in Chapters 2 through 10 of this book assumes the use of some sections.

Movement

One of the most significant considerations in interstellar travel is the time it takes to complete a voyage. This is the result of two factors: time in jumpspace and time spent traveling to and from the jump and breakout points. Time in jumpspace is fixed by the nature of jump travel: 168 hours (+/-10%), regardless of the distance jumped (see p. GT44). Time to and from the jump and breakout points depends on the time to reach the 100-diameter (100D) limit. This would be a straightforward calculation based on the size of the main world and the g-rating of the ship's maneuver drives were it not for one problem: jump-point masking. The following discussion of masking appeared originally in ***Far Trader***, and is repeated here for convenience.

Jump Points and Jump-Point Masking

Jump-point masking occurs when the 100D limit of another astronomical body blocks (*masks*) the jump point of the main world. Since a ship trying to jump in through the 100D limit would be precipitated out of jumpspace well short of its destination (see p. GT120), and since jumping out from within that radius runs the risk of misjump, astrogators must plot a course that just skims the 100D limit and begins or ends as close to the main world as possible (see illustration). Masking occurs about 78% of the time at either origin or destination, making completely *free* (unmasked) jumps less than 5% of the total. This adds 30 hours to the average voyage length.

Determining Masked Jump Points

Before jumping into a system, the GM should roll to determine whether the main world jump point is free; otherwise, the characters will have to jump to an unmasked breakout point and travel in. Use the following table to determine masking and travel time:

Jump-Point Masking Table (Main Sequence Stars)

Spectral Class	Diameter (Solar Diam.)	100D (AU)	Free (Roll 3d)	Time to Jump Point (Max)* At 0.5 G	At 1 G	At 2 Gs
O5	18.00	16.84	auto	2 w	10 d	7 d
B0	7.40	6.92	auto	9 d	6.3 d	4.5 d
B5	3.80	3.56	auto	6.4 d	4.5 d	3.2 d
A0	2.50	2.34	17	5.2 d	3.7 d	2.6 d
A5	1.70	1.59	16	4.3 d	3 d	2.1 d
F0	1.30	1.22	15	3.8 d	2.7 d	45 h
F5	1.20	1.12	14	3.6 d	2.6 d	43 h
G0	1.05	0.98	12	3.4 d	2.4 d	40 h
G5	0.93	0.87	no	3.2 d	2.2 d	38 h
K0	0.85	0.80	no	3 d	2.1 d	36 h
K5	0.74	0.69	no	2.8 d	2 d	34 h
M0	0.63	0.59	no	2.6 d	44 h	31 h
M5	0.32	0.30	no	45 h	32 h	22 h
M9	0.13	0.12	no	29 h	20 h	14 h
Unknown	n/a	n/a	8	2.6 d	44 h	31 h

* In weeks (w), days (d) or hours (h).

Free is the chance (on 3d) that any point on the main-world 100D limit will be unmasked by the jump limit of the stellar primary, based on its spectral class (see pp. S98-105). If spectral class is unknown (or the GM doesn't want to keep track of it), use the "Unknown" value. "Auto" means the main world jump point is automatically free; "no" means the jump point will always be masked (too close to the primary). Roll separately for origin and destination, and add +1 to the target number for a main world that is the satellite of a gas giant.

The travel times on the table are the *maximum* values for each type of star. To find the actual time required, the GM can simply multiply the maximum time by 0.7; this method should also be used when spectral class is unknown. Alternatively, the following more detailed method can be used.

First, determine whether the main world is sometimes free (spectral class G4 and higher) or always masked (G5 and lower). For planets that are sometimes free, roll on the following table and multiply travel time by the listed factor. The adjusted travel time will not be less than the time to reach a free jump/breakout point (see *Free Jump Point*, p. 103):

Travel Time Factor Table I

Roll (1d):	1	2	3	4	5	6
Factor:	0.2	0.4	0.6	0.8	0.9	1.0

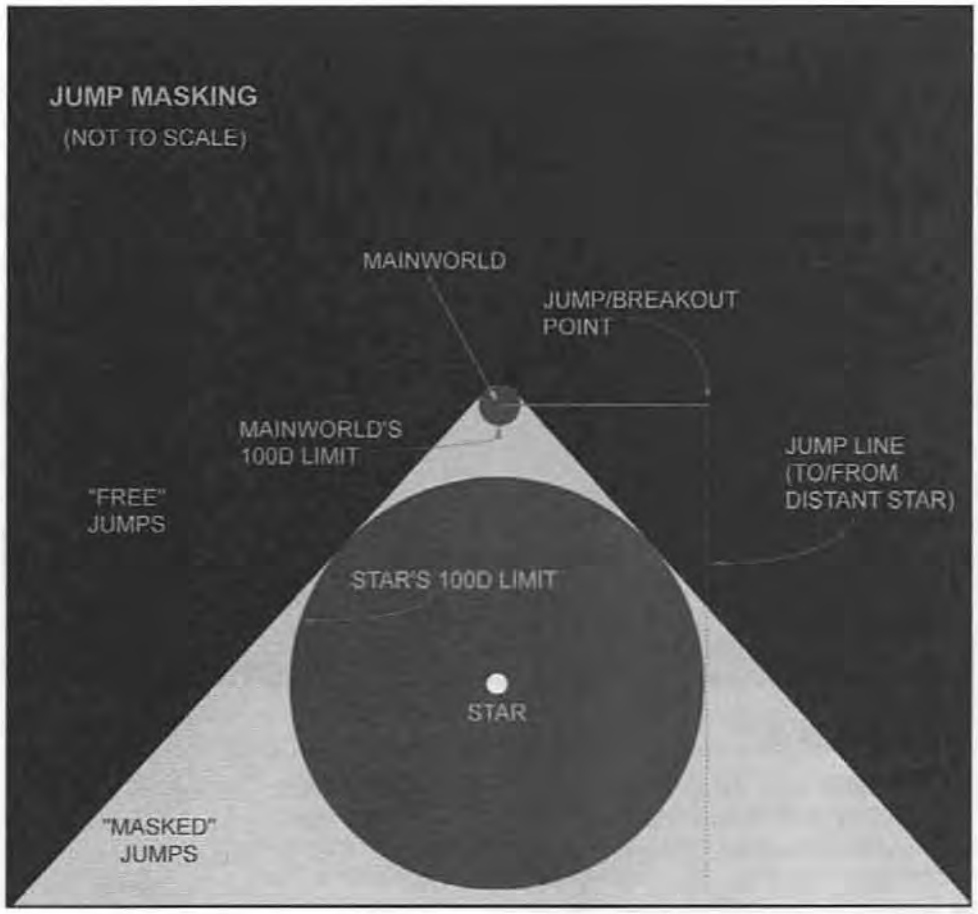
For planets or other destinations that are always masked, roll 1d. On a 1-3, the jump/breakout point is on the near side of the star system, and the actual travel time depends on the spectral class of the system's primary star:

Travel Time Factor Table II

Star:	G5	K0	K5	M0	M5	M9
Factor:	0.4	0.5	0.8	0.8	0.8	0.9

On a 4-6, the jump/breakout point is on the far side of the system. Roll on *Travel Time Factor Table I* and compare the factor generated with that from *Travel Time Factor Table II*; the result will be the higher of the two.

Information about jump-point masking for known systems is readily available from common navigational databases as far in advance as the spacefarers might require. This information changes with time, however. Specific travel times are good for about a week. Ships retracing their voyage should use their previous results, unless they have been on planet longer than a week. For stays between jumps longer than a week but shorter than a month, reroll the actual travel time (if required). If more than a month has passed since the previous jump, a new roll should be made for jump-point masking.



Free Jump Point

If the main world jump/breakout point is free, travel time depends on the main world's diameter (or that of the gas giant it orbits, if a satellite). Use the following table:

Free Jump Point Table

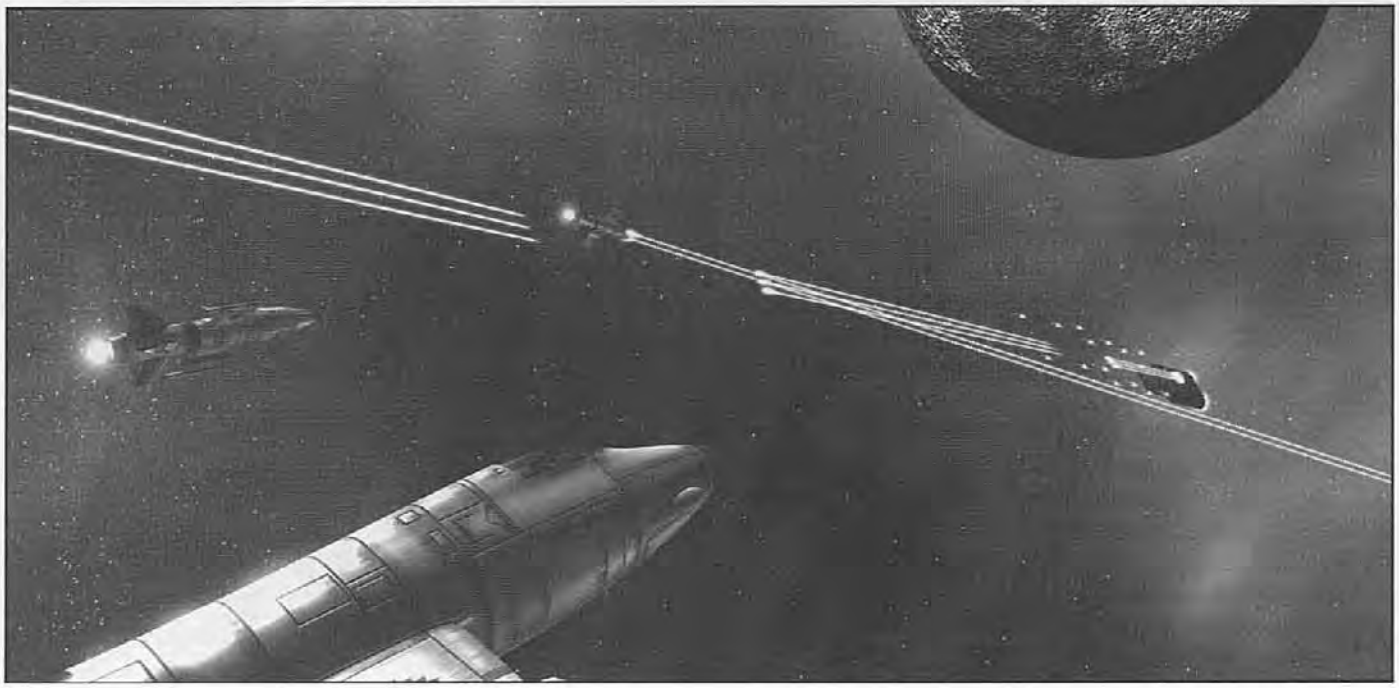
Main World Diameter	Time to Jump Point (hours) At 0.5 G	At 1 G	At 2 Gs
Asteroid	0.9	0.7	0.5
1,000 miles	2.7	1.9	1.3
2,000 miles	3.8	2.7	1.9
3,000 miles	4.6	3.3	2.3
4,000 miles	5.4	3.8	2.7
5,000 miles	6.0	4.2	3.0
6,000 miles	6.6	4.6	3.3
7,000 miles	7.1	5.0	3.5
8,000 miles	7.6	5.4	3.8
9,000 miles	8.0	5.7	4.0
10,000 miles	8.5	6.0	4.2
Small Gas Giant	14.7	10.4	7.3
Medium Gas Giant	19.0	13.4	9.5
Large Gas Giant	24.0	17.0	12.0

Deep Navigation

For long-range interstellar navigation across a considerable portion of the galaxy, such as the Zhodani Core Expeditions, pulsars are the best reference points. Stars for the most part are not readily distinguishable, so identifying a star uniquely when you're not sure where you are is difficult.

Quasars are extremely faint objects visually, so even finding one when you are not sure of your location or orientation is difficult. Some have significant radio emission, but you still need very sensitive optical-detection gear to pinpoint them. Even if you can find quasars, they are so far away that from all places in the galaxy they appear in essentially fixed positions, so you can't use your position relative to quasars to locate your position much more accurately than "yes, we're still inside our own galaxy." Quasars might be useful for intergalactic travel, but not within a single galaxy.

Pulsars are spread throughout the galaxy, but are considerably less common than stars. They are very easy to detect by their radio emission, and their position can be located precisely. The pulse rates are known with great accuracy, and slow down at a predictable rate, so it is possible both to identify a pulsar uniquely across a distance of most of the galaxy, and also to know how long it has been since the last recorded observation of that pulsar (which solves the time-keeping problem). Given a fix on four known pulsars – which is relatively easy with standard radio detectors – it is possible to determine your location within the galaxy and the time relative to when you left on your journey.



Combat

The basic rules for space combat are on pp. GT163-174. This section details some additional rules that work with the new combat-oriented equipment in this book.

Missiles

The following rules affect how missiles are operated and deal out damage. See pp. 52-53 for information on the different warhead types and their damage capabilities.

Auto-Miss

A missile which must travel a long distance to the target, or which does not have a maneuvering advantage over its target, has a much lower chance of striking for damage. The space combat system in ***GURPS Traveller*** reflects this (p. GT169) but GMs may wish to apply the following rule to cut down on dice-rolling in complex situations.

If a tracking missile's sAccel is *equal to or lower than* the sAccel of the target ship, then the target automatically dodges the missile. For this purpose, the sAccel of the missile is considered to be 1 G lower for every five hexes of range from the missile's controlling gunner to the target ship.

For example, Ship A fires a missile at Ship B. The missile has sAccel of 8 Gs. Ship B is 10 hexes away from Ship A. If Ship B's sAccel is at least 6 Gs, the missile will automatically miss (the ship can dodge faster than the missile can be told to correct its trajectory). Additionally, if Ship B was 15 hexes away, then it would only need an sAccel of 5 Gs to dodge.

Ordnance Frangibility

A kinetic-kill missile ramming its target at high relative velocity loses some of its effectiveness in doing damage. To reflect this, GMs may choose to rule that missile damage resulting from ramming attacks is limited to no more than three hexes of relative velocity.

Without this optional rule, large salvoes of missiles are the most potent attack in ***GURPS Traveller*** space combat; this means that most vessels translated from other ***Traveller*** resources will not be "optimized" for combat performance in this environment. With the rule in effect, a more classic balance of power emerges; heavily armored warships generally can ignore the worst damage that a non-nuclear missile can inflict (although their turrets can't), making spinal weapons the one sure means of destroying these dreadnoughts.

Repulsors

Repulsors add a bonus to the ship's Piloting skill in the Quick Contest during the *Collision and Point Defense Phase* to check whether ramming succeeds (see p. GT169). This bonus is variable and depends on the size and TL of the bay (see pp. 49-50). Regardless of the size, however, a single bay can deflect no more than 50 missiles. Each time the number of bays is doubled, add +1 to this bonus or double the number of missiles that can be deflected.

For ease of play, vessels may not mix repulsor bays of different sizes or TLs, unless one is designed solely as a backup for use when the main bay is disabled or destroyed.

Black Globes

Missile defense does not normally allow the use of the ship's PD. A black globe allows a ship to use its modified PD against missile attacks. When resolving missile attacks against a globe-protected ship, resolve the attack during the *Direct Fire Phase* as a standard beam-weapon hit, comparing against the ship's PD. If the attack was successful, the missile will get through the black globe and impact the ship (unless the *Point Defense and Collision Phase* indicates otherwise). The missile damage should be resolved normally.

For a large number of missiles (20 or more), simply assume that the globe absorbs a percentage of missiles equal to its flicker rate. Resolve damage normally for those

missiles; this is the number of hit points absorbed by the globe. The rest got through and should be resolved normally in the *Point Defense and Collision Phase*.

Instead of flickering, any black globe may be turned completely on. No enemy fire will affect it, but the ship may not fire or maneuver (although it may still jump). While the black globe is on, the ship counts as a stationary target (Size Mod +17); all enemy fire automatically hits the globe.

Sandcasters

Sand may be used to deflect the controlling lasers for missiles. Each round that a sand cloud is between a missile and its launcher, that missile may not maneuver (it continues on its previous trajectory).

Nuclear Explosions

DR is squared against nuclear explosions (impact or proximity). Damage is applied to all externally mounted stores, turrets, and sensor systems individually as well as the main hull. The sensor system is assumed to have the same DR as the hull but will only have hit points equal to a vessel of its size (for bridge sensors, assume 20% of bridge size). GMs may optionally assume that stores on the opposite side of the ship from the explosion are unaffected (unless, of course, the entire vessel is destroyed).

Orbital Bombardment

See *Deadfall Ordnance*, pp. 53-54.

ECM

See p. 45 and pp. VE168-174 for information on sensors and jammers.

Blip Enhancers add +1 to +4 (owner's choice) to the ship's Size Mod for detection purposes, so a small ship can appear to be bigger to distract or bluff an enemy. TL10+ blip enhancers also affect ladar.

Space Combat Made Easy

Space combat requires many modifiers. Rather than stop the game while everyone adds up numbers for every shot, GMs and players should pre-compute the adjusted skill for each character involved in the combat.

Important skills are: *Gunnery* for each weapon, including weapon accuracy and targeting software; *Electronics Operation* for all sensors, communicators, and screens; *Piloting* for all dodge attempts, including size modifiers and cloaking; and *Engineering* for all damage control.

The range and damage of all weapons, sensors, and communicators should be listed as well, to save time looking them up. The effects of ship size and cloaking can be combined into a single defensive DM against detection (and another against weapons fire).

TAS Form 3A (p. FT141) provides a convenient place to record these adjusted skills and DMs.

Boarding Operations

Boarding operations range from a simple courtesy visit from a lonely customs agent to a full-scale assault by Imperial Marines. While two friendly ships will simply use a docking tube (p. 67) to link airlocks, contact between neutral, enemy, or unknown vessels will use some type of boarding procedure.

Inspections

The most common type of boarding procedure is the customs inspection. A small craft is used for boarding, to protect the inspecting vessel. If that is not possible (as for SDBs that have no small craft) the inspecting team will either transfer in vacc suits (see p. GT118) or escort the target vessel to a place where it can be inspected by another vessel. If transferring in vacc suits, they would expect a member of the ship's crew to meet them outside the airlock (in a vacc suit).

Standard procedure is for all members of the ship's crew (except for the bridge crew) to assemble in a lounge or empty hold, somewhere that they can be accounted for by the inspecting team. Passengers are assembled in the lounge on small ships, or requested to stay in their cabins until the cabins have been searched.

Most inspections follow a standard procedure. A team proceeds to secure the bridge, and possibly engineering. This team demands access to cargo and passenger manifests as well as crew listings. This also includes legal "papers" the ship should be carrying in the way of certifications, inspection records, and so on. Producing these documents is usually the purser's responsibility.

Once the papers have been examined, inspection teams commence whatever level of inspection is deemed appropriate. Most often, the inspectors will be satisfied with a remote download of transmissions from the ship's transponder; this takes only a few minutes and will not even require a boarding party. A cursory "papers only" inspection will take no more than 40 minutes even for a very large vessel. If the boarding party wishes to perform an actual inspection of ship's spaces, this will usually take 5 minutes per dton divided by the number of inspectors. If contraband or a wanted individual is believed to be aboard, a thorough inspection can be performed, taking three times as long.

Combat Assaults

Sometimes boarding parties must enter a ship against opposition. The essential rules for running a boarding mission can be found on pp. T:GF45-47.

Every missed shot eventually hits something; on a starship, that something is often breakable. A firefight on board a vessel can have devastating consequences, ranging from major breakdowns to catastrophic failure of the fusion core. While GMs can plot the trajectory of every missed shot, and resolve it as an attack on the equipment it eventually hits, this is tedious. An easier method is to total up the average damage inflicted by each shot and apply that to the ship as a whole.

For example, suppose a hijacker is firing an ACR on board the players' *Empress Marava*-class far trader. An ACR does 7d-1 damage per shot, averaging 7 × 3.5 - 1 = 23.5 damage. Interior walls are DR 8 (see p. GT151), so the average damage per shot is 15.5, or 155 for a burst of 10 rounds. A far trader has HP 22,500, so 15 bursts from an ACR will pass the 2,250 HP threshold for a major damage result. A FGMP-12, doing 8d×20, takes a mere four shots to trigger major damage!

If the GM desires, he could choose the result from the Major Damage Table that is most appropriate to the location of the firefight. Shooting up engineering will knock out drives and the power plant, while gunfights on the bridge are likely to affect sensors or communications.

GMs who don't wish to keep track of the damage from every shot can simply estimate it and impose major damage results at appropriate intervals.

Maintenance and Supplies

The Imperium requires at least 50% of all maintenance (including annual maintenance) on Imperial registry shipping be performed by shipyards on member planets. Not only does this provide a check on illegal modifications, but it also supports Imperial shipyard capacity. Any ship performing maintenance outside the Imperium must report its nature and amount to the Imperial Legate at the port of entry when arriving from foreign territories. Foreign maintenance (other than bona fide emergency repairs) over 50% annually is subject to a fine equal to the amount in excess.

Routine Maintenance

Ships require routine maintenance to keep them at peak performance. See p. 22 for information on calculating a ship's maintenance requirements. Used ships (those bought at a discount) will have higher maintenance requirements, reflecting greater age and wear.

The required maintenance is divided among all engineering personnel (at 8-12 hours per person per day); additional man-hours can be provided by equipment operators (communications, sensors, weapons, etc.), or other crew members if qualified. As a rule of thumb, assume 2/3 of the crew (as determined by the *Crew* requirements for each module) can contribute to routine maintenance.

Maintenance is cumulative over a voyage (port call to port call); maintenance shortfalls may be deferred until the ship is in port. This deferred maintenance can be performed by hired mechanics as in *Refitting and Repairs*, see below, if the crew is unable (or unwilling) to do it. The use of robots can reduce the number of mechanics needed, though at least one sophont is typically needed to supervise.

For every four man-hours of maintenance not made up before the ship lifts, roll randomly against the average Mechanic skill of the engineering department (-4 for every missed check after the first). If that roll fails, roll against the ship's Health (HT). Failure indicates a minor breakdown; critical failure indicates loss of 1 point of HT and a major system breakdown. (The GM may pick one, or use the Major Damage Table on p. GT174.) Repairs are conducted using the Damage Control rules on p. GT170; regaining a point of HT lost in this way is equivalent to repairing major system damage.

Make one roll against HT after any combat in which the ship Dodged, exceeded its rated load capacity (don't forget to recalculate HT for the new loaded mass), or was otherwise stressed in ways for which it was not designed. Apply damage as described above.

Routine maintenance is *not* the same as operating the equipment. It is the boring task of performing preventative maintenance on equipment like greasing bearings and hatch seals, changing the oil, scanning for microfractures, checking the jump grid for continuity, and so on. Crew requirements for operating the ship are covered in *Crew and Passengers*, pp. 25-26.

Annual Maintenance

A ship should be given a complete overhaul once a year to ensure that it is kept in good working order. Annual maintenance restores HT lost due to poor maintenance and removes any remaining faults (other than battle damage, permanent "bugs," etc.). Such maintenance costs 0.1% (1/1,000) of the original purchase price of the ship and requires two weeks at a Class IV or Class V starport. The owner must make provisions for the payment of the maintenance fee when it comes due. Crew members generally take their vacations at this time. The ship owners must make provisions for the expected loss of revenue while the ship is laid up (including paying the vacationing crew's salary).

Annual maintenance can be conducted by the crew themselves at a Class III or better starport in twice the normal time (four weeks), provided the required parts have already been purchased at a Class IV or Class V starport at a cost of 0.05% (1/2000) of the ship's original purchase price. They take up 1/200 the ship's hull class in dtons. There is no additional cost above crew salaries and berthing fees, but the crew obviously gets no vacation. At Class I or Class II starports, this do-it-yourself maintenance takes eight weeks.

For 50% of the difference between the ship's original and actual purchase price and time laid up in dock equal to hull surface area/4,000 in days (minimum two weeks), a ship can receive a complete rebuild from the hull up. This restores its HT to its maximum value. Recalculate maintenance requirements as if for a new ship (actual price equal to original price). Permanent "bugs" may also be "bought off" with character points at this time.

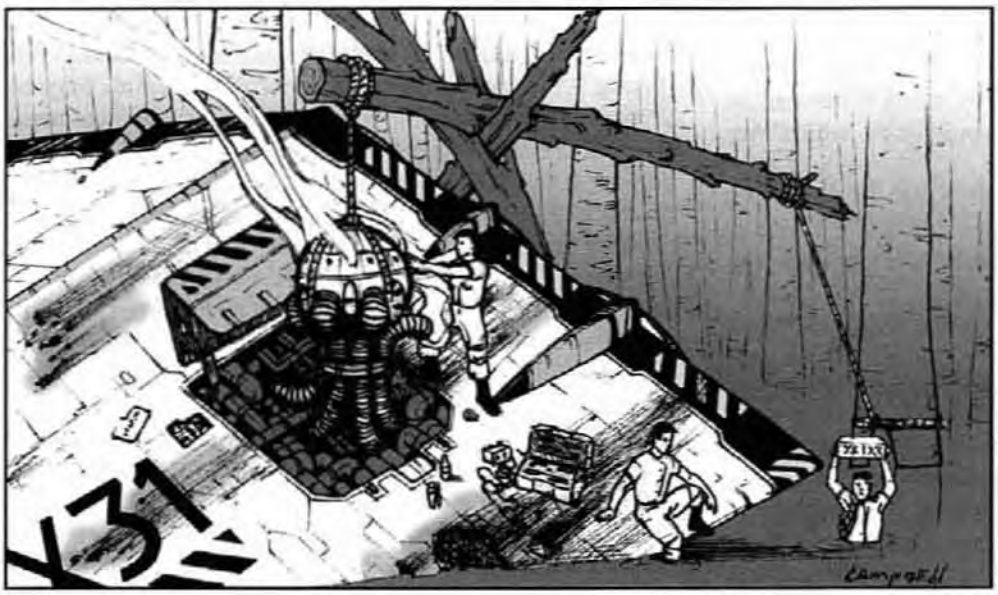
Refitting and Starport Repairs

A secondhand ship may not suit the buyer's exact needs, and will require refitting. A ship that takes damage will require repair. Either situation requires a shipyard (see pp. 13-14). Within the guidelines given there, the GM judges whether the yard can do the required work.

Cost of refitting is the cost of all new equipment added. Add 30% to this cost if the repairs include removing the existing equipment. Old equipment may have some salvage

value, especially if the negotiators ensure that extra time and care are taken with their project.

A damaged system is one that has lost more than 10% of its HPs. A disabled system is one that has lost more than its HPs. A destroyed system is one that has lost more than six times its HPs. Damaged systems may be repaired for 1/20 their original cost per 10% of HPs lost. Disabled systems may be repaired for half their original cost regardless of how severely disabled they are. Destroyed systems must be replaced for their full original cost plus 10%.



It takes 50 man-hours of work and a roll against Mechanic skill to repair 100 HPs of damage; all normal modifiers apply (see p. B54). Damaged systems are treated as a "minor" repair. A disabled system is treated as "major" (an extra -2 penalty). Hiring a mechanic costs at least Cr20 per person per hour. Repairs can be rushed – see *Damage Control Phase*, p. GT170.

Time for extensive repairs or refitting is generally equal to half the time it would take that shipyard to build a ship of mass equal to the mass of gear being replaced or installed. This may be modified by extra payments, as described under *Standard Designs*, p. 14 – and, of course, by the GM's judgment.

If the GM allows, a ship with a workshop or mini-workshop and the necessary spare parts can make its own repairs to disabled (not destroyed) systems until the parts run out. These are *not* considered field repairs.

Field Repairs

Field repairs (those done without the aid of specialized repair facilities) can always restore disabled (not destroyed) systems to operational status. When repairing a system knocked out by Major Damage rolls, assume it is "disabled." Getting it to work requires accumulating hit points' worth of repair equal to 10% of the hull's original HPs (or the system's HPs if using the component HP rules). Damage Control Lockers (p. 68) give a +1 bonus to field repairs only. See pp. 116-117 and p. GT170 for more information on damage control and emergency repairs.

Field repairs tend to break down. Roll against HT each week per repaired system for breakdown. The roll is made when the system is used for the first time; if it is not used, roll at the end of the week, anyway. Consequences of breakdown (aside from the system not working) are up to the GM. Apply a +1 bonus for each previous week in which the system did not break down (maximum +3). The GM may impose additional modifiers for heavy (or careful) use of the system. If a system breaks down it must be repaired again, but there are no further penalties. Field repairs are temporary; more permanent work usually requires specialized facilities and more spare parts than are typically carried aboard a ship. Further repairs are only possible as described in *Refitting and Starport Repairs*, p. 106.

Wilderness Refueling Operations

Starships use hydrogen for fuel. Military starships in particular can be very large, and often perform long-range jumps during naval maneuvers. As a result, they use tremendous quantities of fuel. All large-scale operations are conditioned by the ready supply of fuel in the theater. In particular, any task force arriving in-system is likely to have empty tanks, which puts it at a severe operational disadvantage until it is refueled. As a result, most naval tactics are centered on the necessity for refueling; the first priority for any task force entering a star system is often to secure and use the most convenient fuel source.

Warships can't count on being able to refuel at a friendly starport. Instead, they must gather and refine hydrogen gas from a natural source. The most likely source is the hydrogen-rich atmosphere of a gas giant planet. Ships skim the atmosphere of a chosen gas giant, scooping up the atmosphere. On-board refining plants can then separate hydrogen gas from its natural contaminants, storing purified hydrogen in fuel tanks for use during jump.

If a gas giant world is not available, then ships must land on a world with water oceans or ice caps. Fuel refining plants can break water down into oxygen and hydrogen gas, discarding the oxygen and storing the hydrogen.

Naturally, not all starships are capable of refueling from all sources. A ship must be fully streamlined to refuel from a world's oceans or ice caps, since it must be able to land and take off. A partially streamlined ship (what ***GURPS Traveller*** calls "unstreamlined") cannot land on a world, but most such ships are capable of skimming gas-giant atmospheres. A completely unstreamlined ship, such as one with a dispersed hull (p. 30) or planetoid hull (p. 30), cannot even skim a gas giant and is unable to refuel "in the wilderness" at all.

Some starships which have difficulty with wilderness refueling carry small craft specifically designed to expedite refueling operations – these "fueling shuttles" collect the raw fuel and bring it back to the starship for refining.

Refueling Classifications

Naval vessels generally operate in squadrons and task forces, rather than alone, allowing the merits of each ship to supplement and complement the others in company with it. Refueling is an all-ships evolution, involving the concerted efforts of the entire task force. Task forces are classified for refueling by how much of their fuel tankage is carried in vessels (including carried craft) which are capable of planetary or gas-giant refueling. Of course, a task force can be reorganized, adding or leaving out some ships, which may change its classification.

Unrestricted Refueling: A task force has *unrestricted* refueling capability if it includes ships capable of ocean or ice-cap refueling, with fuel tankage equal to more than 50% of the total fuel tankage of the task force.

Restricted Refueling: A task force has *restricted* refueling capability if it includes ships only capable of gas-giant refueling, with fuel tankage equal to 50% or more of the total fuel tankage of the task force.

Tanker-Dependent: All other task forces are considered *tanker-dependent*. As long as at least 10% of total fuel tankage is carried in ships capable at least of gas giant refueling, the task force can still perform wilderness refueling (although very slowly). If this requirement cannot be met, operationally useful wilderness refueling cannot take place, and the task force will have to be refueled from local refined-fuel sources – starports, bases, or tanker squadrons.

Refueling Options

The refueling operation is a point of danger for a task force, as forces are vulnerable when low on fuel and maneuvering in a gravity well. Fueling procedures are well thought out, and include several options.

Administrative Refueling: This procedure is used to replenish fuel supplies in a normal system with a gas giant easily accessible and with no enemy threat present.

Many ships and most squadrons carry a number of small craft; these are normally streamlined for refueling dips in a gas giant. One pass through the gas giant's atmosphere is sufficient to fill all tanks and takes about 2 hours and 20 minutes (7 turns). Transferring fuel to ship's tanks takes an additional 40 minutes (2 turns). Small craft continue to sortie once every three hours until all tanks are full. Small streamlined escort vessels (generally less than 1,000 dtons) take turns refueling themselves.

Squadrons are normally arranged so that at least 10% of their fuel tankage is carried in streamlined vessels. These are not always the right vessels for the task, however; complete refueling may require 20 sorties or more by all refueling craft (taking 2.5 or more days). Some of these vessels may be diverted to administrative or other duties, reducing the number available still further and increasing refueling time in proportion. If the fuel source is an ocean, the refueling vessels must penetrate the atmosphere, land in or near the ocean, and fill their tanks. The procedure takes roughly twice as long (six hours per sortie). Finally, the fuel source may be an ice cap. Vessels take three times as long (nine hours per sortie) to refuel, as sufficient water (or other) ice must be mined and melted to fill the tanks.

Tactical Refueling: Technically, naval regulations advise always jumping into a system with a large enough fuel reserve in the tanks for a safe jump out-system if discretion calls. This is not always possible, however, and refueling under tactical conditions may be required. Much as in administrative refueling, the squadron's small craft and streamlined escorts skim gas from the gas giant, but do so under cover of the squadron's many fighters, and protected by the big ships' guns. A specific formation or position called "high guard" (so called because the ship is higher with respect to the gravity well than its companions) is used to mount protective operations during such maneuvers. If the enemy is far enough away and can be held at bay, this procedure has little risk. The refueling takes many sorties, however, and many times the commodore will be content with grabbing just enough fuel to jump out-system.

Self-Refueling: Virtually all capital ships are unstreamlined. Utter dependence on small craft can make any ship, even a battleship or cruiser, very vulnerable. Loss of a significant fraction of refueling craft can substantially increase the time necessary for refueling, reducing the squadron's operational mobility. Their total loss could make the squadron impossible to refuel. Instead, big ships (other than dispersed structure tenders) can use their limited streamlining and fuel scoops to make a direct fuel skim of a gas giant; how much of an emergency measure this represents depends on the structural integrity and state of repair of the ships themselves. This procedure will not work with an ocean or ice cap (unless the ships are equipped with extensive contragravity, and even then this is quite dicey), but it does give the squadron the ability to refuel in most star systems. Each ship in turn dives into the gas giant's atmosphere and opens its fuel scoops, loading up with raw gas directly from the atmosphere. The remainder of the squadron maintains high guard above their backs. Self-refueling may also be ordered when time is of the essence and the threat of enemy intervention is slight.

How Far Is That Gas Giant?

Computing travel time between planets is simple, once you know the distance between them (see p. GT119). The only problem is that in a planetary system everything is constantly moving; the distance to the gas giant will be different next month.

One way to determine relative planetary position is to assume that on 001-0000 all the planets in every star system were lined up. To determine the distance between planets, follow these steps:

1. Divide the day number by 365, add the year number, and then divide the sum by the planet's period (in years). Keep *only* the decimal part of the answer. Multiply this by 360° to find the planet's orbital location. This is value X.

2. Repeat step one for the other planet. This is value Y.

3. Subtract X from Y to find the angle between the planets. This is value Z.

4. Compute the distance between the planets using this formula: square root ($A \times A + B \times B - 2 \times A \times B \times \cos(Z)$) where "A" is the orbital radius of the first planet and "B" is the orbital radius of the second planet.

Gas Giant Skimming

A vessel in low orbit around a gas giant completes one orbit in 3-4 hours, at an altitude just above the sensible atmosphere (about 200 miles above the cloud tops; there is no other "surface" from which to judge). A refueling run begins by decelerating from orbital velocity to maximum skimming airspeed (see below). The ship spends about an hour filling its tanks at about 40 miles above cloud tops, where the atmospheric density and pressure are still 0.1 atmospheres or less. During this phase of the operation the ship is actually flying, using thrusters to counteract its weight and pointing its nose up to obtain every possible amount of lift (even from unstreamlined shapes). Once the tanks are full, the ship accelerates back up to circular orbit speed and altitude. This process requires about 2 hours and 20 minutes (7 turns) from beginning to end, or somewhat less than one complete orbit. The ship is now halfway around the world from where it would have been if it remained in orbit, however, and thus half an orbit behind any mother ship or other vessel it left behind in orbit while it made its run. Wilderness refueling is thus a complicated ballet, orchestrated with the utmost care.

To calculate maximum skimming airspeed: First calculate high altitude drag, which is equal to total surface area/40. For unstreamlined ships, subtract loaded mass from thrust to get adjusted thrust; for streamlined ships just use total thrust. Then calculate airspeed per p. GT159, using these values of drag and thrust. For streamlined ships, skimming airspeed equals regular airspeed × 2.83. Skimming airspeed is only useful for vacuum or trace atmospheres (0.1 atmospheres or less).

Each refueling run requires a roll against Piloting skill to avoid mishap. For streamlined ships, the pilot must roll a critical failure to encounter a dangerous situation, and can avoid it on a second roll. (Any fatigue penalties apply to these rolls.) A failure on the second roll results in minor damage, and only critical failure on the second roll results in disaster. By comparison, skimming in an unstreamlined ship is extremely chancy: simple failure results in a mishap, and critical failure results in disaster.

Minor damage during skimming usually results from severe buffeting. Roll the ship's HT to avoid one or more fuel tanks springing a leak. One tank springs a leak for each point by which the roll is missed, for a loss of 1d% of the ship's fuel capacity each. Repairing a leaky fuel tank is a minor repair. Each craft carried in an external cradle also does a number of dice of collision damage equal to 5% of its hull HPs (armor protects normally); this damage is done to both the ship and the small craft.

Disaster can take one of three forms (GM's choice, or determine randomly).

Loss of carried craft: Any craft carried in external cradles are ripped from their mooring and lost. Each craft collides with the parent vessel as it goes, doing a number of dice of damage equal to twice its hull HPs. The pilot must make an additional Piloting skill roll to maintain control.

Loss of fuel-tank integrity: One or more fuel tanks has ruptured. Roll the ship's HT-5; for each point by which the roll is missed, 5% of the ship's fuel tankage is damaged and unable to retain fuel, reducing total capacity. Repairing a ruptured tank is a major repair.

Loss of maneuver control: Damage to the vessel's maneuver thrusters or control surfaces results in an unusual attitude or condition. The pilot must continue to make Piloting skill rolls to maintain control, while the Engineer and his crew roll vs. their Mechanic (M-Drive) skill to fix the drive. Critical failure on either roll results in catastrophic loss of control: the ship crashes into the gas giant's lower atmosphere (and is crushed, in all probability). Simple failure by the pilot results in additional damage; roll on the *Major Damage Table,* p. GT174.

High Guard

A ship conducting gas-giant skimming is particularly vulnerable to attack. The ship must maintain very narrow parameters of speed and orientation or risk losing control. Because they are traveling in the clear air above the clouds, skimming ships are visible to system-defense boats lurking in the cloud tops up to 1,400-2,700 miles away. Even though the smallest gas giant is huge by terrestrial standards, the swath from which a skimming ship is visible during its run covers 3-5% of the surface of a Jovian-class gas giant. Given that choices of refuel track are constrained by atmospheric conditions, it usually takes fewer than 20-30 SDBs to fully cover a single gas giant. Even if that many aren't available, it still takes (for one example) 40-50 separate passes to completely refuel an *Azhanti High Lightning*-class cruiser using its organic fuel shuttles. The loss of two or three shuttles to random SDB attacks will very quickly make refueling operations extremely difficult.

In order to maintain high guard over a refueling track, the guarding ships must be moving more slowly than ships in low orbit. This causes them to move outward to between 0.2 and 1.2 diameters above the surface; the average is 0.7 diameters. This still provides only a limited useful time on station, usually timed to coincide with the start of the run.

Chapter Twelve

Life Aboard

"I was so excited on my first interstellar flight. I sat glued to the viewport all the way out to the jump point, watching my home world slowly shrinking. It felt as if I was leaving behind all the baggage of my previous life, making a clean break with the past. Then came the magical moment when they dimmed the lights – I held my breath, trying to feel the difference as we made the transition. I felt nothing, but when the lights came back up they'd shut off all the viewports. For the next week, the interior of the ship was to be our entire universe."

– Alison Berghaus, ***Memoirs of a Traveler***

Every year, the romance of starships draws hundreds of millions of young sophonts, eager to try the wandering life. Most of them who succeed in finding starship employment soon discover that life aboard is anything but romantic. Of course, most of the hopeful applicants each year *fail*, doomed to spend the rest of their lives planetbound unless they can one day gather the fare for an interstellar business trip or vacation.

Of course, life on a starship is not for everyone. Simple things that dirtsiders take for granted – walking in the park, visiting a museum, making a spontaneous trip – are impossible on a starship, where life is bound within the hull and governed by duty. Yet the discipline and camaraderie can be very comforting, and the spartan lifestyle allows the crew to focus on education and entertainment. And at each journey's end, every port liberty brings new sights, new contacts with different cultures and races, and new adventures.

Finding a Berth

The quickest way to find a berth aboard a starship is to go to the local starport. Even starports that lack Navy or Scout bases will have recruiting posts for those services. Meanwhile, every starport of Class II or better is likely to host one or more employment services, which work with the merchant lines and other private organizations that might hire crew. Register with such a service, even if that just means putting a notice up on a bulletin board somewhere in a Class II starport's administration building; sooner or later a ship will come by. If there is no such employment service, it will be necessary to haunt the starport in person and apply directly to visiting captains.

Finding a berth aboard a starship requires surprisingly little technical skill. It *helps* to have a good education, including scientific, technical, or business experience that can be applied directly to ship operations. This can be especially true on worlds where many people are interested in taking up the life aboard, forcing each hopeful spacehand to try to stand out in a crowd. Still, most of the organizations that hire starship crew will accept young sophonts who have just completed basic education. Such "apprentices" or "recruits" provide the basic material from which every starfaring organization is built.

Recruiting Organizations

In the Third Imperium, starships are operated by thousands of different organizations. Only a few of them are prominent Imperium-wide, willing to accept applicants at almost any starport.

Imperial Navy

The Imperial Navy is a military organization, which normally accepts applicants looking for a first (or only) career. The Navy accepts many inexperienced recruits, although (unlike most starfaring organizations) it stresses education even for its enlisted personnel. Even college graduates who enter the service are likely to begin their careers in the enlisted ranks.

The Navy's officer corps has a strong bias toward recruits with high social status. The quickest way for a commoner to earn a Navy commission is to complete a Naval Officer Training Corps (NOTC) program in college. Otherwise, competent service earning an appointment to Officer Candidate School (OCS) is the best approach.

Aside from the Imperial Navy, there exists a variety of local naval organizations at the system or subsector level. A career in one of these local navies is likely to be similar to one in the Imperial Navy – but spent closer to home.

Imperial Interstellar Scout Service

The IISS usually accepts applicants looking for a first career, but is much less formal than the Navy and will accept more experienced applicants (especially in the rare cases that there are not enough *former* Scouts available to reactivate and assign to current tasks).

Inexperienced IISS recruits need to be intelligent and quick to learn. Even more importantly, they must be in good physical condition. Most inexperienced recruits will be assigned to the Field branch, and may be stationed at a dirtside facility somewhere in Imperial. Such facilities are often on wilderness planets where toughness and stamina are required. Field scouts advance their careers by developing useful technical skills and acquiring seniority, not by acquiring rank.

College graduates joining the IISS are normally assigned to the (more formally structured) Bureaucracy. The Bureaucracy has a formal rank structure, and Scouts in the Bureaucracy will usually organize their careers around the process of earning promotion.

Merchant Lines

The many merchant lines that operate in Imperial space will accept both inexperienced recruits and those who have already spent time aboard. Indeed, former Navy or Scout personnel are often sought after for berths on merchant ships. The largest merchant lines tend to recruit on high-population, high-technology worlds. Smaller lines (which spend more of their time off the main trade routes, anyway) will often recruit from backwater planets. Unlike military starfarers, merchant crewmen are very self-directed in managing their careers – it is common for them to leave their current ship and seek out a new berth elsewhere.

New merchant crewmen must be physically capable, since cargo-handling is among the first duties any merchant apprentice will be assigned. A college education makes little difference in recruitment, although the megacorporate lines often prefer college-educated apprentices. Many of the largest lines operate "merchant academies" as a substitute for college education, giving inexperienced apprentices a chance to advance their careers and pick up useful shipboard skills early on. Smaller merchant lines rely on simple on-the-job training (or subscribe to correspondence courses) for their apprentices.

Most merchant lines award promotions on a merit basis; any crewman can take examinations to prove that he has mastered the skills necessary for the next grade. Passing one's examinations doesn't mean that promotion is automatic, however. If no position is available at the next higher grade, then the crew member must remain where he is.

Many merchant crewmen join spacers' guilds or brotherhoods, which can provide a number of benefits in exchange for a modest monthly fee (Cr100 is normal). These guilds can offer insurance and a pension to crewmen who normally move from one ship to another on a regular basis. They can help crewmen who are "looking for a ship" to find employment – although they often *regulate* the job hunt as well. Crewmen looking for a berth may have to give way to others with more seniority, or there may be a "first come, first placed" policy.

Free Traders

Free-trader starships are much like the smallest merchant lines. They recruit anywhere that they need more crew members, even on the most out-of-the-way worlds in the Imperium. They are often willing to hire very inexperienced crew, and indeed are even less likely than most merchants to value university education. Former space experience, on the other hand, is especially valuable. Free traders offer little formal training, relying on work experience to teach the skills required for a position aboard.

Many free-trader ships are a bit clannish, with captain and crew working together for years at a time. A few free traders even operate with marriage or family ties among the crew, a situation which is quite uncommon in other starfaring organizations. Promotion is slow, occurring only when positions come open. "Examination" for a new position can be quite informal; when the captain says you're ready, you're ready.

Free traders and their crewmen often make use of the same spacers' guilds that are commonly associated with organized merchant lines.

Private Owners

Aside from the merchant services, many private organizations and individuals operate their own starships. Such ships – scientific vessels, safari ships, nobles' yachts, racing vessels, and so on – are similar to merchant lines in their recruitment. The main difference is that such organizations rarely accept inexperienced crew or offer basic training in shipboard skills. If a private entity can afford to operate a starship *without* engaging in continual trade, it can probably afford the best possible crew. Such private vessels hire crewmen with plenty of prior space experience, and pay them well for their expertise.

Starship Superstitions

Even after 10,000 years of Human space travel, the whole enterprise of flying between stars seems to tempt fate. The process of using the jump drive is particularly unnerving, since no one really understands jump physics and even the best-run ships sometimes misjump. Hence, many crewmen try to stack the deck in their own favor, observing minor superstitious rituals that supposedly help protect ship and crew. Ask any starship crewman whether the superstitions actually *work*, and he'll probably deny it – but he'll continue with his small rituals, anyway.

The most famous such superstition is the Vilani custom of *jump dimming*. Starships with largely Vilani crews still follow this practice. Just before a ship enters jump, the lighting aboard ship is reduced to near-darkness in all areas but the bridge and engineering. Tradition has it that this is a holdover from the days when ship power plants operated on a lower safety margin, and all extra power had to be diverted to the jump drives to ensure proper function. This explanation is not very credible – even ancient Vilani power plants had ample reserve capacity. The tradition remains, nevertheless. Non-Human crews do not practice jump dimming, and many Solomani crews pointedly ignore the practice.

Other superstitions involve boarding before departure. Many Human crew members practice a small boarding ritual when their ship is about to depart for jump, spitting in the entry corridor, dusting off coveralls and boots, or buying a small souvenir only to discard it once on board. Some Human crews also engage in the practice of a "last meal," taking the time to have at least one meal together after departing from the starport but before going into jump.

Non-Human crews engage in similar superstitions. Aslan crews will often light a candle in the ship's shrine as part of the pre-jump preparations. Some Vargr crews inflict a harmless ritual beating on the first member to come on board after the crew is recalled; it is considered an honor to be the "victim" of this beating. Droyne crews use a special set of gold coyns to "ward" the jump-drive equipment, placing each coyn under one of the bolts that holds the jump drive to the floor of the engineering compartment.

Crewing a Ship

A minimum number of jobs must be covered to operate any given ship. The crew must operate all of the ship's systems as needed, keep the vessel spaceworthy by following maintenance requirements, and keep it legal by meeting all safety requirements for the area of space where the ship is operating.

General Requirements

Actual crew requirements vary, depending on the function and ownership of the vessel.

Private starships which do not carry passengers or freight for pay have fairly loose legal requirements, but still must have sufficient crew to operate the ship and perform routine maintenance.

Commercial starships must meet more stringent legal standards for crew size. Ships operating in the Third Imperium must comply with standards set by a certification authority such as the Travellers' Aid Society; see pp. T:FT70-71 for the pertinent rules. Ships operating in the Solomani Confederation must meet similar requirements in order to qualify for certification, testing, and inspection services provided by Lloyd's. Ships in the Hierate and Vargr Extents must have sufficient crew aboard to operate the ship and keep it running, although specific crew requirements and positions might be different. Zhodani and Hiver ships use a markedly higher level of automation, but even on their ships, a sophont will be in charge of both the ship and its equipment.

On ships smaller than 200 dtons, one person may fill all the crew positions, provided he possesses all of the skills necessary to operate and maintain the ship, or has automated support in the form of robots, routine vehicle operation (RVO) programs (see p. 70, or a robotic-hulled ship. Commercial ships in the Imperium are not authorized to carry passengers unless there are enough sophonts aboard to supervise any robots performing maintenance or operational duties.

Most insurance companies also limit coverage on cargoes carried by ships with a less than full complement of licensed and certified crew members. Private vessels do not actually *require* certified crew, but many starports prohibit vessels crewed by unqualified persons from entering their control areas. Maintenance requirements must still be met, or eventually the ship will not run.

Military requirements vary, but commercial guidelines are a good place to start, with extra engineering and maintenance crew for damage-control duties.

Crew Size

During normal operations, the crew is busy with the boring task of monitoring the ship's systems – scanning the sensors for debris (or pirates), verifying position, ensuring the drives are operating correctly, keeping the reactor output high enough to supply the ship's systems, and so on. The *Crew* statistic (see *Module Tables*, pp. 124-139) for each module gives the number of *equipment operators* required for such conditions.

Preventive maintenance (or PM), means running equipment not currently in use through a series of tests to ensure compliance with some set of guidelines. Preventive maintenance also includes the little stuff – cleaning switches, torquing nuts and bolts, scrubbing power-cell connections, cleaning the fuel-processor filters, and so on. The *Maintenance Requirement* (see p. 22) gives the number of *mechanics* required. Personnel not currently on watch may assist in preventive maintenance if qualified.

Neither of these tasks requires any special skills. Mechanic (Jump Drives), for instance, would permit a crewman to perform anything from simple preventive maintenance to a complete rebuild on any jump drive. The GM should not worry about making skill checks for routine operations or preventive maintenance, but he should feel free to make skill checks if something is amiss onboard (saboteurs, battle damage, ship quirks or flaws, and so on).

Incident-Free Voyage

Most voyages are routine. Requiring every crew member to make a skill roll for every task would fill the universe with exploding starships. Instead, for routine voyages the captain rolls against Shipmaster+3 (see p. 121 for the Shipmaster skill). The GM should reduce the bonus for less favorable conditions, such as a new crew or an old ship. Success gives a trouble-free trip (that is, one with no unresolved problems requiring a roleplayed solution). On a failure, the GM should think of a particular problem and have the appropriate crew member make a skill roll to avoid it. Problems can range from an officious flight controller delaying clearance because of a spelling mistake in the cargo manifest, to the possibility of a minor breakdown in the fusion core. A critical failure will result in a more serious problem, such as a dangerous breakdown of the ship's drives.

Of course, the GM is always free to *impose* a skill roll for a crew member or to roleplay the details of a particular voyage.

Basic Duties

As soon as a new crewman reports aboard, he will be inserted into the starship's daily routine. Very quickly, he will be told when he is to be on duty, what his normal duties will entail, and what his responsibilities are when the ship is performing unusual evolutions. Nothing is left to chance; even if a crewman can't speak to his immediate supervisor in a stressful moment, it should always be clear what's expected of him.

Inexperienced crewmen will find their first duty shifts to be quite simple, even boring. Their first important job is to adjust to starship life and absorb the necessary protocols. More experienced crew will be able to take up highly technical duties at once, but even they will have to learn the specific details of how things work on their new ship.

Duty Shifts

Life and work aboard a starship is carefully structured. The captain has certain resources of manpower, trained and untrained; ship operations require that certain tasks be performed. A large part of his job is to match men with jobs, so that everything is done as efficiently as possible.

Departments

Most starships divide their crew into *departments*, each of which is responsible for one major aspect of ship operations. The number of departments on any given ship varies. A small free trader will usually have no more than two departments (*deck* and *engineering*). Ships with hundreds or thousands of crewmen will probably have many distinct departments, as well.

Each department is always led by an officer, the *department head*. On a small ship, the department head will be a low-ranking officer (who may actually be the only person in his department). On a large ship, a department is often divided into *divisions*, *sections*, or *work centers*, each of which is led by a junior commissioned officer or a senior petty officer.

Every new crewman will be assigned to some department as soon as he reports for duty. His immediate supervisor will be the section, division, or department head – from there, the chain of command will reach upward to the captain.

Watchbills

Even the smallest interstellar vessel will post one or more *watchbills*. A watchbill is a document recording the watch rotation for the crew; it ensures that all crewmen know where they are to be and when. The captain of a small free trader, with an experienced, stable crew, might record his watchbill in the log just for form's sake. On a large vessel each department is responsible for its own watchbill, although traditionally the first mate or executive officer is responsible for ensuring that all watches are filled with qualified people.

Most vessels have a variety of watchbills for different occasions. Some of the most common watchbills are:

Standard watchbill: This watchbill is used while the ship can afford to maintain minimum bridge and engineering watches, such as when it is in jump space, or when it is at a starport with all the drives shut down. Someone must be on duty should an unexpected problem arise, but many bridge systems don't need to be manned. Military vessels often use this time to run watch teams through simulations or other training. Civilian ships often use this time for maintenance, sending crewmen who would normally be on watch elsewhere to supplement the maintenance gang's efforts.

System watchbill: This watchbill is used while in transit to or from a jump point (on SDBs and other non-starships this is the standard watchbill). All critical workstations are manned. The pilot maintains the ship on its proper course. The navigator sets the course and monitors the ship's progress. The sensor officer tracks and identifies all visible objects. The communications officer handles all incoming and outgoing message traffic. If there is a watch officer or officer of the deck, it is his responsibility to monitor the other watch-standers and make decisions in the absence of the captain. Engineering monitors the drive systems. Jump-system technicians either prepare the jump drive for use or perform post-jump maintenance.

Orbital and docking watchbill: This watchbill is used during planetfall and highport docking. All critical workstations are manned. The captain is on the bridge and the chief engineer is at the main engineering control station. The mate (or XO) will often be at the main airlock to greet any inspection, customs, or other officials who may attempt to board the vessel as soon as it is docked. The navigator is available on the bridge. On armed ships, gunnery stations are manned and gunners work to lock down their weapons. Engineering stations are heavily manned, with extra watch-standers and maintenance personnel available to respond to emergencies.

Ship's Articles

Every ship has a set of ship's articles. These serve as its charter or constitution, spelling out the responsibilities of the ship's captain, officers, and crew. On a military ship, the ship's articles include general regulations imposed by the Imperium and the relevant military service, as well as specific items covering only that ship. Private organizations that operate more than one starship (merchant lines, scientific foundations, and so on) often publish general articles for their whole fleet, but still permit the captain of each ship to make specific additions. Even small free traders publish ship's articles, often borrowing heavily from those published by larger merchant lines.

Ship's articles generally establish the chain of command, designate officers in charge of various departments, establish the watchbills and shift structure (see below), detail salaries and shares, establish rules of professional conduct, and so on. In particular, ship's articles invariably establish the captain's authority to maintain discipline, but also require him to log disciplinary actions and crew complaints.

For a (very basic) example of ship's articles, see p. G:FT141.

Turnover

"It's 2245, sir," whispered Able Spacehand Rose above the sounds of snoring as he shook Lt. Dravos Shugalii.

Lt. Shugalii could only dimly make out the Messenger of the Watch in the dim red lighting. "Thank you, Spaceman Rose, and give my compliments to the OOD."

Lt. Shugalii rolled out of his narrow bunk and groped his way over to his desk. Banging against a chair, he muttered about the CruRon staff that had bumped him from his two-man stateroom to this four-man CPO bunkroom. Well, at least he wasn't eating in the enlisted mess. Dravos tapped in an order on his data pad for midrats down at the wardroom and pulled on his uniform by feel and habit. After three years aboard the ***Gionetti****-class cruiser INS* ***Uluumi****, he could and often did dress while still asleep.*

The clock above the CDC watch officer's desk flipped to 2305 as Lt. Shugalii stepped into the CDC and looked up at the tactical display. The ***Uluumi*** *was still in company with two* ***Gazelle****-class close escorts, headed inbound to the gas giant in the Walston system. No threats were showing on the screen and the task force was still at condition III alert.*

Dravos greeted PO3 Hanson, the boatswain of the watch, as he came onto the spacious but dimly lit bridge at 2320. The pilot's station was manned by Ensign Yoshihara, while the OOD was conducting a training session for two midshipmen and a rating at the astrogator's station.

Lt. Shugalii walked over to the navigational display and checked the planned course and any warnings or notes left by the astrogator or the captain in his night orders. Again, it looked like he was to position the ship so morning watch could perform the frontier refueling. They had all the fun.

Lt. Reval looked up from the console as Dravos stepped over and tapped him on the shoulder. "Dravos, you're early as usual. We are in tactical control of the ***Antelope*** *and* ***Kudu*** *heading at 1 G to the system gas giant. High guard orbital insertion is scheduled for 0300 hours."*

Lt. Reval turned back from the tactical display and brought up the captain's night orders in the air in front of the command chair. "The CO wants to be called if we pick up any traffic, and in any event at 0245 before we start maneuvering. Engineering is performing maintenance on the jump drive, but all other systems are at nominal." The display changed under his prompting to show system readouts and the chief engineer's instructions.

Dravos looked around and saw the watch quietly changing around him as the midwatch came on duty. He straightened up, saluted his friend and said, "I relieve you, sir."

"I stand relieved," answered Lt. Reval, handing over the OOD data pack. "Attention on the bridge, this is Lt. Reval. Lt. Shugalii has the deck," he stated loudly to the bridge crew.

Dravos completed the ritual with, "This is Lt. Shugalii, I have the deck." The various watchstanders acknowledged the changeover and the bridge settled into quiet routine.

Lt. Shugalii set his Junior OOD, Ensign Blackmoore, to plotting various alternate courses for the refueling exercise, sat back in the command chair, and took a deep breath . . .

Loading operations watchbill: This watchbill resembles the standard watchbill, but all hands with cargo-handling experience will be in the cargo hold or near the airlocks to assist with loading or unloading. Command of the ship may be shifted to a quarterdeck in the cargo hold, most likely in the cargo office if there is one.

Jump transition watchbill: Typically, this watchbill resembles the orbital and docking watchbill, with extra engineering personnel at posts to monitor fuel, condenser, and jump-governor stations. If there are passengers, medical and steward personnel will be on duty to help deal with any difficulties with the transition, such as jump sickness.

Action stations watchbill: Called when combat is expected, or after an attack. On small ships such as free traders, this is essentially the same as the orbital and docking watchbill. On large ships, damage-control teams are manned and fighters scrambled. Heavy weapons systems such as spinal mounts are brought online and extra sensor operators are set. Stewards and administrators man damage-control stations and see to the safety of any passengers. On military ships, this watchbill is also called *General Quarters*.

Some ships have other watchbills. Ships that can engage in frontier refueling have a refueling watchbill. Carriers have a flight-quarters watchbill. Xboat and other tenders have special-craft launch and recovery watchbills.

Shift Structures

Most Imperial starfaring institutions divide the 24-hour standard day into six four-hour watches. The 1600-to-2000 watch is further divided into two two-hour "dog watches," giving each day an odd number of watches and helping with watch rotation (the dog watches also give watch standers a chance to break for the evening meal). Four hours is generally regarded as the optimum length for a watch, permitting Human crewmen to carry out the duties necessary to operate a starship without risking errors due to fatigue.

Military vessels, and large private starships, usually have enough crew on hand so that when the ship is maneuvering, but is not expected to run into any difficulty, the watchbill can be filled with about one-third of the crew. The system watchbill (p. 113) is the normal standard for this measurement. When the standard watchbill applies, only critical stations are left manned around the clock, and crewmen need only stand watch for four hours at a time.

Indeed, on a large ship many members of the crew do not stand watch at all. They spend their duty time repairing ship's systems, seeing to the needs of passengers, or engaged in administrative duties. Some of these tasks are limited to the ship's "day," which is typically from 0800 to 1600 hours. Passenger services on liners and other craft often extend to 2400 hours, requiring two watches of service crew. Most ships maintain a minimum watch during the 2400 to 0800

time period. Only a few watch-standers are needed for duties in the engineering and weapons areas of the ship.

Small ships often operate with much smaller crews – which can mean much longer hours and greater fatigue for their crew members. On most such ships, bridge and engineering watch-standers spend eight hours on watch, eight hours on various other personal and shipboard duties, and eight hours sleeping. When the ship is undergoing unusual maneuvers (such as docking or cargo transfer) crewmen can find themselves on duty for 16 or 24 hours at a time.

Weapons are only crewed during General Quarters or a similar alert. Dedicated gunners spend the majority of their time maintaining their weapons. Military ships sometimes have a centralized fire-control watch and a few turrets manned at all times, allowing for rapid response while the ship is going to action stations.

Crew members spend some of their off-watch time performing various assigned tasks that typically require just a few hours. They spend the rest of their day in personal activities. Many spacers spend this time meeting educational goals, increasing their shipboard proficiencies and qualifications, or pursuing hobbies.

Duty Types

No matter what class of starship one serves on, no matter what its function, certain kinds of on-board duty are universal.

Maintenance

On almost all starships, maintenance takes up the largest portion of the crew's budget of man-hours. Every mechanical and electronic part on board has a maintenance schedule, and must be inspected, cleaned, serviced, or replaced in accordance with that schedule. Even the most slovenly ships don't neglect this maintenance for long – ships that do tend not to return to port.

The engineering crew does most of the maintenance work, but every crewman is likely to be assigned a portion. In particular, officers responsible for watch stations are usually at least partially responsible for maintenance on the associated ship's systems.

On small ships, the engineering department has only a few people; on larger vessels, engineers number in the hundreds. Not all of them run the drives. Most are specialists in a particular field: electricians, drive mechanics, toolmakers, hull-repair specialists, reactor technicians, small-craft technicians, gravitics technicians, plumbers, and so on.

On commercial ships, engineers of a given specialty are assigned to *gangs* that are led by a licensed assistant engineer. In the military, gangs are called *divisions* and are usually run by a junior officer or very senior petty officer. They all report directly to the chief engineer. While organizations vary, the following allocations are typical.

Power: This gang is responsible for operation and maintenance of the ship's power plant and the electrical distribution system. Engineers from this gang usually work closely with those from the others, as nearly everything runs off electricity. The requisite skill is Mechanic (Power Plant).

Maneuver Drive: This gang is responsible for the operation and maintenance of the ship's normal space drive. The necessary skill is Mechanic (Maneuver Drive).

Jump Drive: Responsible for the operation and maintenance of the ship's jump drive, this gang has the required skill Mechanic (Jump Drive).

Life Support: This gang is responsible for the operation and maintenance of the ship's life support. It may have a few medics assigned to it, and may even be part of the purser department on smaller vessels. This gang is also responsible for ensuring hull integrity under normal conditions. Life Support gang members have a variety of skills, including Electronics (Medical), Mechanic (Starship), and Shipbuilding (Starship).

Gravitics: This gang is responsible for the operation and maintenance of the ship's gravitic systems and any small-craft gravitics. The necessary skill is Electronics (Contragravity); Mechanic (Spaceship) will also be useful when working on small craft.

Fuel: This gang is responsible for the operation and maintenance of the ship's fuel tanks, collection, processing, and delivery plant. On smaller vessels, this gang may be part of the jump-drive division. Mechanic (Fuel Systems) is the required skill.

Not all gang members stand watch (operating the equipment). Some are tasked with general and routine maintenance only. All of them should know how to fix their gang's equipment.

See p. T:FT84 for more detailed rules regarding engineers and their specializations.

Cleaning

One essential aspect of maintenance is often overlooked in descriptions of starship life: *cleaning*. Cleaning is the most basic form of preventative maintenance, for both the ship and the crew. If a ship's internal environment is dirty, the dirt will tend to get into critical components and cause malfunctions. More importantly, a dirty or poorly organized ship is bad for crew morale, impairs efficiency, can provide a breeding ground for disease and vermin, and is unattractive to potential trading partners or passengers. Military starships are always kept immaculate, and even privately owned ships almost always maintain high standards of cleanliness.

On Imperial ships, cleaning duty traditionally falls on all hands alike – even officers take part, in a supervisory role. Crewmen are responsible for keeping their own staterooms clean, and will be subject to periodic inspections. Daily cleaning is handled by "sweepers," who methodically go through every working compartment sweeping up dirt and picking up trash. Many ships occasionally observe the ancient tradition of a "field day," during which all other nonessential duties are dropped. During a field day, everyone on board works to give the ship a thorough cleaning, including careful scrubbing of every hard surface and deep-cleaning of carpets; this is followed by a meticulous inspection.

Damage Control

Every starship risks being damaged, whether due to accident or hostile action. When damage occurs, it becomes the job of every crewman to limit its extent, keeping the ship both habitable and functional. The crew must focus on three things: stopping fire, controlling decompression, and remaining operational. Damage control involves repairing damage in the quickest way possible, stabilizing the situation until more permanent repairs become feasible; for example, putting a hull patch over a hole instead of removing the hull plate and replacing it.

Military starship crewmen are taught damage-control procedures from the beginning of their careers. Private vessels are more lax (especially if they never expect to be shot at) but insurance firms usually insist that everyone on board receive at least basic damage-control training.

During damage-control operations, the chain of command may change completely at the lower levels. Damage-control parties may consist of personnel from every department, depending on their experience and the needs of the vessel.

One member of the crew is directly responsible for all damage-control operations onboard ship – usually a very senior crew member and sometimes the chief engineer himself. This damage-control officer (DCO) has the power to pull personnel from whatever departments necessary to ensure the vessel remains operational. The DCO usually has a damage control assistant (DCA) who handles day-to-day operations.

Up to half of the crew may be assigned to a damage-control (DC) party during

Staying Alive

Space is deadly. Onboard a ship, there is only a thin skin of metal holding in air, food, water, warmth, and light, and holding out the cold, dark vacuum. The margin for error is slim – even a second of inattention has an enormous potential for destruction and death. Most starships conduct safety drills for the crew on a regular basis, practicing how to deal with various life-threatening situations. Passengers are also expected to learn a few simple things to do in an emergency – keep out of the way of the crew, do what you are told, and climb into a rescue ball when the alarm goes off.

Decompression

Almost all starships have several internal compartments separated by pressure-tight bulkheads and doors, to prevent all of the air in a ship from escaping through a single hull breach.

Despite the popular media, explosive decompression is not immediately fatal (see p. S105). Even in an explosive decompression, there will be time to get into a rescue ball, provided you act without hesitation.

Dramatic as it is, explosive decompression is fairly easy for trained personnel to deal with, especially because it is easy to figure out what is happening. Gradual decompression is harder for people to react to – a pinhole leak in your compartment doesn't cause a bang and suck the air from your lungs. Slow leaks cause hypoxia, which degrades brain function and reaction time, and can send victims into unconsciousness before they realize what is going on. For this reason, all starships (unless the crew is suicidal) are equipped with alarms that go off when air pressure drops below certain levels (the alarms feature sound, light, and vibration, and are hard to ignore). Every stateroom has one, and they are located in every compartment in the ship. All alarms are linked to the life-support subsystem of the computer, and are constantly monitored.

Trained personnel can usually climb into a vacc suit with plenty of time to spare. In fact, the "tailored" vacc suit available at TL12 is so comfortable that some starfaring organizations use it (without the helmet) as the standard undress uniform. For decompression emergencies, starships carry rescue balls (see p. GT112), which are the equivalent of life preservers on an ocean-going vessel, and can be donned in seconds even by untrained personnel.

Military vessels about to enter combat will put the entire crew into vacc suits and reduce air pressure to zero to prevent explosive decompression from battle damage. This is usually not practical for civilian ships.

Fire

The main danger from fire on a starship is asphyxiation and smoke inhalation. Fire may also cause oxygen or fuel stores to explode, or damage computer systems. Passengers on a starship are instructed to get out of the affected compartment as quickly as possible. If they cannot do so, they may use a rescue ball for fire emergencies as well as decompression emergencies. The balls provide 15 minutes of air, and are reasonably resistant to heat.

Firefighting on a starship consists of localizing the problem by sealing off the burning compartments, cutting off artificial gravity and ventilation, and then evacuating the air. If a compartment contains living beings or cargo that could be damaged by exposure to vacuum, the situation becomes more complicated; the crew must then use more conventional means of firefighting.

emergencies. Each party is responsible for a particular section of the vessel. They get their orders from damage-control central (DCC), a watch center typically buried deep in the ship, and they report progress on current tasks and other relevant status back so the DCO can track the ship's current status. There will usually be one damage-control locker (p. 68) per damage-control party, spread throughout the vessel. Assume one DC party per 150-300 people onboard, with a minimum of two on vessels over 1,000 dtons.

Damage-control parties are usually headed by people with training in Shipbuilding (Starship). On larger vessels, these people spend their entire careers doing nothing but studying about shipboard integrity, firefighting, and other emergency procedures. They are experts in managing a team of people making emergency repairs or fighting onboard catastrophes, while at the same time ensuring the vessel remains operational during these crises.

When using the rules on p. GT170, treat the DCO, DCA, or DC party leader as a chief engineer for bonus purposes *during a crisis only*. If GMs prefer a more detailed repair scenario (airlocks, jammed turrets, etc.), refer to *Surface Features*, pp. 31-32, to determine the HPs for individual components.

Gunnery

Armed starships require a gunnery crew. On a small ship, there may be no formal weapons department; instead, crewmen who normally have other duties will become qualified to operate the ship's guns, and will go there during combat situations. Large commercial ships and military vessels will have dedicated weapons crews.

Logistics

Starships use a lot of supplies: fuel, clean air and water, food and other consumables, spare parts, expendable ordnance, small items of equipment, souvenirs for passengers, and so on. Managing this inventory is usually delegated to the executive officer, the chief purser, or some other officer. On large ships, there may actually be a supply department with its own senior officer.

Naturally, all crewmen will have to draw and use supplies, and may be charged with buying more to replenish low stocks.

Administration

Every starship runs on paperwork. The ship's log must be kept, crewmen must be paid, changes in crew status must be documented, supplies accounted for, cargo accepted and delivered, inspections passed, annual maintenance arranged for, and so on *ad infinitum*. For further information (at least as regards privately owned ships), see ***Far Trader***.

Most of this paperwork falls on the captain's shoulders, although he often delegates as much of it as possible to others. Ordinary crewmen will often be required to read, understand, or sign official documents covering aspects of starship operation. In most cases, these documents have only virtual existence, residing within the ship's main computer and on backup storage devices. Few starships print out any but the most critical documents (or the flood of paper would quickly overwhelm the crew's efforts to keep a clean ship).

Passenger Relations

Starships that carry passengers are a special case. The occasional passenger on board a military ship will be treated courteously, but will be expected to conform to military protocol. Commercial ships are *much* more solicitous toward their passengers' needs. The stewards will spend as much time as possible making sure passengers are well-fed, entertained, and content. On small ships, even the captain and first mate will make time to meet all the passengers and ask whether they're enjoying the trip.

In general, even crewmen whose jobs don't involve working directly with passengers will be expected to help present the ship in a good light. It particularly helps if they maintain a good *personal* appearance. Engineering crewmen on small passenger starships are among the cleanest in the Imperium.

The most important element of passenger relations is *courtesy*. "The passenger is always right" is an often-quoted saying in commercial service. Most passenger ships have a policy to ensure that even the most unreasonable, abusive passengers are treated with courtesy at all times. There are exceptions, of course – a passenger who puts the ship in danger or who makes the trip unpleasant for other passengers will be handled very firmly. Being chronically rude (or worse, physically threatening) to another passenger is a good way to get locked into one's stateroom for the duration of the journey, or put off at the nearest port.

Another element of passenger relations is *distance*. Some passengers are lonely, some are bored, and some are taken with the "romance" of interstellar travel. If they can't seek out friendship or a romantic interlude among the other passengers, they may approach the crew. Most starships forbid crewmen to respond with anything other than discreet professionalism. Fortunately, only very inexperienced (or very stupid) crewmen are likely to be tempted. Once one has dealt with hundreds or thousands of passengers, few of them will present enough surprises to be interesting.

Career Planning

Starship crewmen are motivated by many things, but one of the most powerful forces is ambition. Anyone who serves aboard a working starship for long knows that the captain's job is one of the most difficult in the Imperium . . . but many of them would still love to try his uniform on for size.

Some organizations set up well-defined "career paths" for their members. These define a sequence of positions to be held and training courses to be taken, which ensures that at each step the crewman will pick up the training and experience he needs for the later steps. A good career path provides a wide variety of experience, while the crewman holds positions of increasing authority and responsibility. The Imperial and local navies, the IISS, and the larger merchant lines are all notable for this kind of career planning. Crewmen aboard these starships will be encouraged to define their career goals. Supervisors will spend time advising their subordinates on career planning, and will be expected to help arrange for the proper opportunities.

Smaller or more informal services (small merchant lines, free traders, privately owned ships) are less likely to publish formal career plans. In such organizations, it's difficult to plan for when the next necessary position will be *available*. They usually respond by making it easier for crewmen to leave and find employment elsewhere if necessary. A good small-fleet employer will be generous in writing letters of recommendation and sharing his contacts. This is good business practice even when it helps one's best crewmen to find work elsewhere – because it builds a good reputation among potential new hires.

Training

Training is a constant duty for all starship crewmen. They must master a variety of highly technical skills. Military crew need to learn military protocol, tactics, strategy, military law, and basic interstellar politics. Commercial spacehands must learn some business economics, accounting, and law. Anyone with ambitions for a senior officer's berth must master not only all the skills in his own department, but also a smattering of all the skills relevant to others. As a result, much of any crewman's "off-duty" time is taken up with training – personal study on the ship's computer net, small-team instruction from senior crew, arranging to take examinations, and so on.

Free Time

After all duties have been taken care of and training has been attended to, the starship crewman returns to crew quarters for a well-earned rest. He may seek out his own entertainment on the Shipboard Information Service, curl up with a good book, or use the crew lounge.

Starship crewmen naturally socialize with each other when off duty. Shipboard protocols permit this, although certain kinds of relationships are discouraged if they threaten to impair effectiveness, harm morale, or raise questions of favoritism. In the military, these relationships are generally called "fraternization," and can involve romantic ties, private business partnerships, gambling, or loans of money (among other things). Such relationships are sometimes permissible if both parties are of about the same rank and don't have duty together, but even in such cases they are discouraged. Violation of the fraternization rules will usually harm both parties' careers, and may lead to involuntary transfer or a discharge.

Large merchant lines usually follow the military in the nature and strictness of rules about fraternization. Small merchant lines, free traders, and private starships are much more lax; indeed, it is not uncommon for such crews to include married couples or even larger family units. Even there, however, disputes between crewmen must be kept limited in scope. A starship is a small community, utterly dependent on close cooperation for its survival; an intractable dispute can be as dangerous as a breach in the hull.

Officer's Duties

An ordinary crewman has well-defined, but limited, responsibilities. The weight on an officer's shoulders is far greater. He must operate the ship's most critical systems, and make decisions affecting the lives of everyone aboard.

On most starships, officers can be found in two areas of crew organization.

Crewmen who serve at critical stations on the bridge or in other control spaces are usually officers, even on the smallest ships. On small ships, these officers usually all serve in a single department, called the *operations* department on military ships, or the *deck* department on merchant and privately owned ships. The ship's executive officer is normally the head of this department, reporting directly to the captain. On larger ships, each bridge officer is likely to be a department head in his own right.

Elsewhere in the ship, each department will be led by at least one officer of its own, the department head.

Pilot

Knowing how to direct a starship to its destination is critical – it doesn't matter how well-tuned your drives are if you don't know where to aim them! The pilot ("helmsman" on larger vessels) is responsible for maneuvering the starship. While flight in space is very mathematical, atmospheric flight and orbital maneuvering are less predictable and call for a finely developed sixth sense for trouble *before* it starts.

Rules for piloting in normal space are on p. GT119.

Astrogator

The astrogator is responsible for directing the pilot. In normal space, this means plotting orbits, notifying the pilot of navigational hazards, and so forth. His most important task is generating the jump plot – without a valid jump plot, a starship might misjump horribly or even be lost forever.

Rules for astrogation and jump are on pp. GT120-121.

Flight Controller

Vessels with many auxiliaries, such as naval carriers, require central coordination to avoid collisions – particularly during launch and recovery operations. Like the traffic controllers of a starport (see p. T:ST26), flight controllers require nerves of steel and the self-confidence of an ace fighter pilot. They frequently suffer from stomach disorders, nervous conditions, and outright mental breakdowns.

The flight controller plans flight paths and communicates them to pilots, coordinates arrivals and departures with hangar and launch-tube crew, anticipates and resolves possible collisions – and does it all over again when the starship maneuvers.

The basic roll to avoid trouble is Professional Skill: Flight Controller (M/A)+3, rolled once per space combat round. Apply a penalty to skill of 1 per G of evasion or 2 Gs of straight acceleration applied by the main starship. If the controller fails, all auxiliary pilots must roll against their Piloting with a penalty equal to the amount the controller failed by, with failure indicating an accident.

Sensor Officer

A ship's sensors are its eyes and ears. Under routine circumstances, a small vessel doesn't need a full-time electronics operator. Larger vessels – and smaller vessels anticipating trouble, like scouts and warships – employ electronic-operations specialists.

The sensor officer is essentially a smart monitor of the ship's passive and active sensor systems. Although ***GURPS Traveller*** sensor systems function with a high degree of automation, they still require a crew member to deal with unusual sensor returns. Large ships, especially military vessels, will have a whole "sensor department" to man a large number of sensor systems.

The sensor officer spends his duty shift watching for any unusual sensor contacts. When a contact appears, he deliberately uses the sensors and ship's computers to develop more information about it. In particular, if the contact turns out to be another vessel, he must determine its course, heading, and probable identity. Every contact of significance must be brought to the attention of the officer of the watch, although in crowded space the sensor officer must use his own judgment to determine which contacts are "significant." Finally, every contact must be tracked as long as it remains relevant to the ship.

Basic rules for sensor use in ***GURPS Traveller*** are given on pp. GT165-166 and p. GT173.

Communications Officer

A ship's communications officer is critically important, despite often being overlooked by unsophisticated observers. His duties are quite varied, and require constant intelligent judgment. All but the smallest ships have a communications officer; on larger ships, a "communications department" is often one of the first to be given independent status.

Message Traffic

The communications officer's primary duty is the handling of message traffic. Incoming messages must be forwarded to the appropriate officers, while outgoing messages are formatted and allocated to the correct channels. Message clarity must be monitored and backup channels or systems must be used, if necessary. All messages must be logged; this process is mostly automatic, but a responsible officer must still check and "sign" the log on a regular basis.

Under normal conditions, successfully sending and receiving messages is automatic for any qualified officer. Under adverse conditions, roll against Electronics Operations (Communications), with a skill penalty set by the GM depending on local conditions. Failed rolls indicate either slower transmission or missing data, at the GM's discretion. GMs may also require a skill roll when a communications officer is dealing with particularly intense traffic. Failure on this roll indicates that some messages are delayed, not that they are lost.

Distress Channels

Although an RVO program (p. 70) can monitor distress channels, when a signal is detected the communications officer must resolve it and, if it is real, notify the watch officer. A mayday is *never* responded to without higher authorization; by convention, once a ship has responded to a distress signal, it is obligated to render assistance, and deciding to do so is the captain's responsibility.

Recognition Signals

The Imperium maintains standards for recognition signals, but ships traveling outside Imperial borders must be aware of, and comply with, the wishes of their destination systems. The communications officer is responsible for broadcasting all required signals.

Communications Security

In military vessels, the communications officer can also be a cryptography specialist, encoding and decoding messages. On smaller vessels he will also handle "signals intelligence" and traffic analysis. In the event of disaster, a military communications officer is responsible for destroying all communications equipment, codes, and other sensitive information to prevent their capture by the enemy.

Weapons Officer

Most commercial ships will not have a weapons officer as such; weapons are manned by crewmen from other departments on an *ad hoc* basis, and they will report directly to the bridge during combat. Only warships are likely have a formal weapons department, reporting to a weapons officer.

On a ship that does have a dedicated gunnery crew, the weapons officer is the tactical liaison between them and the captain. He allocates weapons fire among available targets, coordinates the handling of physical ordnance, and often gives the actual orders to fire. When the ship is not in combat, he supervises maintenance of the ship's weapons systems.

Chief Engineer

The engineering department is the core of any vessel – just ask the men and women who work there. Without their dedication, the ship doesn't move, the freshers overflow, and the hull itself loses structural integrity. When things break down, either through old age or combat damage, engineering is right there to make sure it gets fixed. The men and women of engineering are called engineers – some may be true engineers as ***GURPS*** uses the term, but the majority of them are actually mechanics and technicians.

Contrary to popular belief, engineering (or main engineering or main control) is not where the chief engineer spends his every waking moment. He usually has an office located nearby; he may even work directly out of his stateroom. The big machinery that provides the power, life support, and propulsion for the vessel is located in engineering, and that's where the majority of the engineering department stands watches, but there are many other locations on the ship that require manning, too.

Purser

Every commercial ship, even the smallest, will have a purser. His primary duty is ensuring that the ship remains a profitable enterprise. He is in charge of all the ship's commercial payload, both cargo and passengers. He supervises all cargo-handling operations, verifies passenger bookings, oversees the activities of ship's stewards, tracks the ship's accounts, and helps the captain with administrative details. ***Far Trader*** exhaustively covers the details of operating a commercial starship, including all of the matters that will normally fall under the purser's care.

Private non-commercial vessels may include a purser, just to handle the ship's accounts and provide luxury passenger accommodations. Military ships may not employ pursers; if there is no such officer, the analogous duties will fall to the captain, executive officer, logistics officer, or other personnel.

Medical Officer

All but the smallest starships employ medical personnel, especially if they carry passengers (and *especially* if they carry low berths). On a small commercial ship, the medical officer reports to the purser.

On large ships and military vessels, sickbay is run by its own department, commanded by the chief medical officer (sometimes called the *chief surgeon*). Since warships do not always employ a purser department, crew morale is sometimes considered a matter for the medical department. Very large ships may employ a few psychologists with training in shipboard social dynamics, and the morale officer may report to the medical department.

Captain's Duties

The captain is the most important person on board. On large starships, command is his only job; on smaller vessels he will also fill another role, usually that of pilot. Everything that happens on board ship is the captain's responsibility. He may delegate, but the final responsibility is his, and he will be held accountable for the actions of his crew.

Popular television series to the contrary, the captain does *not* abandon the bridge to personally investigate every strange occurrence. His responsibility is to the entire ship; his duty ties him to the bridge, where he has immediate access to sensors and communications.

While the captain is always on call, he has to sleep sometime. Law and custom provide for watch officers who assume temporary command when the captain is off duty. While they have the authority of a captain, they are expected to know their limits and to wake the captain for major decisions. If the captain is unavailable, however, they must act in his stead for the safety of the ship and all aboard her.

Meanwhile, many military and large commercial vessels designate an *executive officer* or *first officer*. This officer serves as the captain's senior assistant and second-in-command. He is usually a senior officer with plenty of experience, putting the final polish on his command skills before moving into a captaincy of his own.

Management

Much of a captain's job is simple administration.

The captain (and executive officer, if there is one) must oversee crew performance, issuing awards and reprimands, making promotions, arranging for transfers, and so forth. On many commercial ships, the captain *hires* the crew himself.

The captain must also see to all the other paperwork that every starship generates – cargo manifests, supply purchases or

requisitions, customs documents, financial documents – everything must be completed or at least signed by the captain. This paperwork load is particularly heavy on merchant ships, but even military ships carry a lot of administrative overhead.

In particular, every starship maintains a "logbook." The captain or first officer maintains a *rough log*, taking notes on ship's activities as they occur, possibly adding reports from other officers or crewmen. At some point, the rough log is edited into a *smooth* or *official log*, which is stored on an unalterable medium and can be referred to via the ship's main computer. The captain must approve all entries in the official log, and will usually sign each block of entries. The log serves to document the ship's activities, and can serve as evidence if the ship and its crew ever face legal action.

Another common administrative duty which the captain never designates is the filing of *flight plans*. A flight plan is a public declaration of intent to pilot a vessel from one location to another, and is required by traffic-control authorities in every civilized star system. See p. T:FT73 for more information on flight plans.

Command

Aside from the routine of management, the captain must command. He is ultimately responsible for all decisions affecting ship's operations. By tradition, even if he works for a larger institution, he is sole master of his ship when it is underway.

In the game, a captain's actions in command are best addressed through interactions between the GM and the player. Critical situations can be handled using rolls against Leadership (to motivate crewmen under stress), Shiphandling (to competently oversee the ship's maneuvers), or Shipmaster (to oversee other operations or correctly handle ship procedures; see below).

Starship Skills

The following skill listings first appeared in ***Far Trader*** and are repeated here for convenience.

Shiphandling/TL — see p. CI161

This is the skill of *commanding* a large (1,000 dtons or more) starship. The person at the helm still needs Piloting skill. Officers on large vessels should add Shiphandling (and its prerequisites) to the templates in Chapter 3 of ***GURPS Traveller***.

Shipmaster/TL — Defaults to IQ-5, Astrogation-3, or Aviation-4

This is the professional knowledge of spaceship operations and procedures, port protocols and ship's business. Shipmaster is an ultra-tech version of Sailor skill (see p. CI154), and covers the information in Chapter 4 of ***Far Trader***. It is to spacecraft what Aviation skill (p. CI153) is to aircraft; these skills default either way at -4.

Leadership

The most difficult of a captain's responsibilities is possibly the most imponderable as well: *leading* the ship's crew.

Starship crewmen are, when it comes down to it, people. Their profession often involves long hours of strenuous or painstaking labor, under conditions of great stress (in the middle of battle, after a 16-hour shift of cargo handling, and so on). If they are to perform well, they must be motivated to give their best every day.

The nature of good leadership is hard to define, and can be noticeably different on different ships. An Imperial Navy vessel will have a completely different "leadership culture" than a merchant ship, a ship crewed by Vilani will be led differently than one crewed by Vargr, and so on.

One common principle is that of *respect* – a good leader is respected by his subordinates. Among Humans, this usually means that the leader works hard, knows his job, is trustworthy, makes good and timely decisions, and is tough of body and mind. Another important item is *compassion* for one's subordinates. A leader must insist on loyalty and good performance from his crew, but must also remember that each crewman is motivated by different things, and must take due care for his subordinates' feelings.

If a PC captain needs to interact with NPC crewmen, see *Loyalty of Hirelings*, p. B195. This mechanism can be used even if the captain didn't actually hire his own crewmen, as on a military starship, or on a commercial ship where hiring is taken care of by a corporate office. A secret reaction roll for each crewman can help indicate which man is going to be a hard worker and which will be a "problem file."

The GM should fill in the details of *why* each crewman has the attitude he does. That engineering technician who seems hard-working and dependable may be counting on rapid promotion, and might slack off if he thinks he is stuck in a dead-end position. On the other hand, the steward who snaps at passengers and spends most of his off-duty time hiding in his cabin may simply be worried about family members on his homeworld – and the captain, using his contacts, may be able to help out. Naturally, each crewman's situation should be designed to give the GM some adventure hooks . . .

Three Twists

The most common starship-centered campaign form in ***Traveller*** is probably the "small tramp freighter" campaign, in which the PC party makes up the entire crew of a small starship. Players who are tired of this premise might try one of the following twists to make their game more interesting.

Captain's Table

The PCs are all command officers on a medium-sized starship. For a trading campaign, use a subsidized merchant vessel; see p. GT146 or p. T:FT138 for examples. A military campaign can use a *Gazelle*-class close escort (p. 97), a 400-ton patrol cruiser (p. 86), or (for extra dirtside action) a *Broadsword*-class mercenary cruiser (p. GT139). All of the ordinary crewmen and junior officers are NPCs, drawn up and handled by the GM.

This campaign concept is oriented around the details of command, without the need for some players to take on subordinate roles. Military starships will take on patrol and escort missions, with the occasional combat situation even in peacetime. Merchant starships will be concerned with making a profit; if the GM and players like the minutiae of management, they can use the full rules from ***Far Trader*** and track every shipment, every passenger, and every purchase of repairs or supplies (while undertaking other adventures as opportunities arise).

In either case, the campaign can also be very character-driven, as the rest of the ship's crew presents a series of roleplaying challenges. Every crewman will have personal connections to events outside the ship, providing plot hooks. Some crewmen will be competent and ambitious, while others will be "problem employees." Some crewmen will get along with each other, with the senior officers, and with the passengers – while others will be sources of conflict.

Lower Decks

This concept inverts the "Captain's Table" setup. The starship is again a medium-sized military or commercial vessel, but now the PCs are all ordinary crewmen and junior officers – cargo handlers, mechanics, ship's troops, stewards, and so on. The GM draws up all the senior officers and commanders.

This concept is more oriented toward a traditional adventure format. The PCs aren't in management positions, so their adventures (missions) will be assigned to them by their supervisors. Many adventures will happen while the PCs are off the ship, taking care of ship's business or enjoying liberty time. Character-driven roleplaying will also be important, as the PCs interact with their shipmates.

Note that the "Lower Decks" campaign can easily turn into a more traditional merchant's game, or even a "Captain's Table" game, as the crew members gain experience and are promoted.

Looking for a Ship

This concept involves roleplaying the "prior history" of a group of ***Traveller*** characters. It works best for mercantile adventures. The GM should choose a base world, preferably with a Class V starport and in the midst of an extensive web of trade routes. In the Spinward Marches, worlds such as Efate, Glisten, Regina, or Rhylanor are all good choices. In the Solomani Rim, the density of trade yields literally dozens of candidates.

Each player should generate a "core" character, presumably an inexperienced crewman. All of the core characters begin on the base world, will know each other personally, and should be able to get along if they find work on the same ship. They will not necessarily end up on the same ship, however – they may well find work on different ships, heading in different directions and working for different merchant lines.

Each adventure will focus on the activities of one ship on one trading voyage. Players whose core characters are not present can take the roles of NPC crewmen, or can play Adversary roles (see pp. B180-181). The adventures will often be set many parsecs apart, and may be independent (or the GM can develop a long-range plot to link them, slowly revealing it to the players across many adventures).

After an adventure or two, each ship will return to the base world. Core characters will meet once again; they may change jobs, moving from one ship or situation to another. With adventures, the core characters will gain skills and experience, and will qualify for more advanced positions.

Eventually the core characters may be powerful enough to set their own courses, possibly assembling as an experienced merchant crew and transforming the campaign into a more traditional mercantile game. In the meantime, the players have gotten a chance to sample a wide variety of worlds in the ***Traveller*** setting. They will also have encountered dozens of interesting NPCs, and will have a history of interactions with them.

"Looking for a Ship" can also work with characters on active duty in the Navy or Scouts. In this case, the core characters will work their way up the promotion ladder in their chosen service. The adventures are more likely to be military, exploratory, or political rather than mercantile in nature.

Passengers

Being a passenger on a starship is not much different from being locked in a small hotel room, with no business to attend to and nowhere to go, for a week. Much of the way passengers are handled is intended to make this experience as pleasant as possible.

Entertainment

Passengers are normally provided with a wide variety of reading material, holographic movies, games, and other amusements. Much of this is accessible through the Shipboard Information Service (p. 8). On large passenger liners, one or more live entertainers may be booked, and there are usually scheduled activities to divert the passengers from their cabin fever. Repeat business is an important consideration, so most starship crew members who interact with passengers are trained on how to deal with passenger boredom before it becomes displeasure.

Security

Stateroom doors can be locked by the occupant – keyed by voice, handprint, face recognition, or a physical keycard in any combination (set when the passenger boards). Staterooms contain a small safe, and many ships have secure spaces in the ship's locker for passengers' valuables. Only the command staff has override keys for staterooms and other locks on their ship, for use in emergencies.

On most vessels, passengers are restricted to certain areas of the ship except when boarding or debarking. This is primarily for the passengers' safety and the proper operation of the ship. (Engineers hate curious passengers nosing around the machinery.) It is also an anti-hijacking precaution. All but the smallest of ships require passengers to check their weapons with the purser, and those who bring weapons aboard may be monitored for antisocial or violent tendencies. Other anti-hijacking protocols, such as video monitoring of the passenger lounge, may be implemented at the discretion (and paranoia) of the captain.

Your Attention, Please . . .

"Good afternoon, ladies and gentlemen. Welcome aboard the ***Cote d'Azure****. I am your steward and ship's safety officer, Negasanin Ukanegashir. Imperial regulations require that all passengers be made familiar with emergency procedures before liftoff. During liftoff, passengers are requested to seat themselves here in the ship's lounge. In the event of an emergency before orbit is achieved, passengers should remain in their seats until the ship lands, when they should proceed to the egress ports, there, there, and there.*

"In the event of a decompression incident, this alarm will sound. [Klaxon wails.] Passengers in a depressurizing area should immediately locate the nearest emergency-rescue ball. These orange packs containing an emergency-rescue ball are situated around the ship, mounted on the walls of all compartments. Passengers are requested ***not*** *to open the packs unless instructed to do so by an officer of the ship or if the decompression alarm is activated. My colleague, Hiroshi, will now demonstrate the method of donning the emergency rescue ball. This demonstration ball is completely transparent to enable you to see the operation; the real ball is opaque on one side and semi-transparent on the other.*

"To open the ball, grasp the two handles and pull apart. The main structural frame of the ball will automatically unfold into a circle. Retaining hold of the handles, push your head into the ring and draw it down over your body. When the frame is approximately at waist-height, kneel, roll onto your back, bring your knees up and pull the handles together to meet under your feet. As you bring the handles together, the ball will seal automatically and then inflate. In the event that the ball does not seal automatically, pull this fastener all the way along the frame. Please ensure that no loose items block the opening, or a proper seal will not be maintained, leading to loss of pressure.

"The rescue ball will independently supply air for at least 15 minutes. If rescue is not expected before that time, a ship's officer will connect you to an external oxygen supply. Also attached inside the ball is a puncture-sealing kit and first-aid kit. Instructions on their use are included with each kit and are duplicated in your passenger orientation packet – we encourage you to review these instructions in advance of any emergency, as there may not be time later. External to the rescue ball are a location transponder, radar reflector, and flashing beacon, which all deploy automatically when the pack is opened.

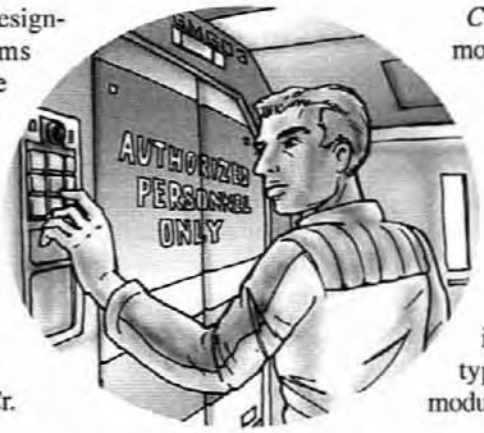
"Thank you, Hiroshi. In the event of an emergency not covered by this demonstration, passengers should follow directions given by the ship's officers. This concludes the safety demonstration. After leaving orbit, at approximately 1700 ship-time, there will be a lifeboat drill on this deck; passengers are strongly urged to attend. If you will now take your seats, liftoff will be commencing shortly."

– 4th Officer Negasanin Ukanegashir, IMS ***Cote d'Azure***

Appendix A

Module Tables

The following tables provide the design-system data for the spaceship systems described in this book. Each general type of module begins with a paragraph giving page references elsewhere in this book for more detailed descriptions of the listed modules and their functions.



Key

Spaces is the number of spaces (dtons) taken up in the hull.

Mass is the mass in stons.

Cost is the cost in megacredits, or MCr.

Crew is the number of personnel that the module requires.

Power is the rating of the power slice in the module in MW. This is used to determine the final size of the reactor when designing deck plans. If deck plans are not being drawn for your vessel, you may ignore this column.

Special circumstances for other table values will be explained in the introductory paragraph for any general type, or in a special endnote for specific module types.

Engineering and Power Plants

See pp. 36-37 for descriptions of these systems that form the core of a vessel's ability to function.

Name	Spaces	Mass	Cost	Crew	Power
Engineering/7	3.5	16.6	4.42	0-1	0
Engineering/8	1.5	6.6	0.624	0-1	0
Engineering/9	3.5	13.4	5.02	0-1	0
Engineering/10	1	4	0.32	0-1	0
Engineering/11-12	1	3.6	0.16	0-1	0
Engineering/13	1	2.85	0.17	0-1	0
Small Mod./7-12	-0.5	-1.25			
Small Mod./13	-0.5	-0.625			

Name	Spaces	Mass	Cost	Crew	Power
Small-Cr. Bridge Add-On/7	3.5	15.2	4.49	0	0.05
Small-Cr. Bridge Add-On/8	1	4.85	0.629	0	0.05
Small-Cr. Bridge Add-On/9	2.5	11.4	5.02	0	0.05
Small-Cr. Bridge Add-On/10	0.5	1.96	0.32	0	0.05
Small-Cr. Bridge Add-On/11	0.5	1.65	0.155	0	0.001
Small-Cr. Bridge Add-On/12	0.5	1.40	0.16	0	0.001

Name	Spaces	Mass	Cost	Crew	Power
Power Core/7	2.5	10	4.4	0-1	0
Power Core/8	0.5	2	0.6	0-1	0
Power Core/9	2.5	10	5	0-1	0
Power Core/10	0.5	1	0.3	0-1	0
Power Core/11	0.5	1	0.15	0-1	0

Name	Spaces	Mass	Cost	Crew	Power
Power Plant Slice/7	0.5	2	0.8	0	0.5
Power Plant Slice/8	0.5	2	0.4	0	1
Power Plant Slice/9	0.5	2	0.8	0	4
Power Plant Slice/10	0.5	2	0.2	0	20
Power Plant Slice/11	0.5	2	0.1	0	20

Fuel Tanks

See pp. 40-41 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Collapsible Tank/7	1	20	0.4	0	0
Collapsible Tank/8	1	10	0.4	0	0
Demountable Tanks/7	1	0.33	0.64	0	0
Demountable Tanks/8	1	0.15	0.64	0	0
Jump Fuel/7	1	1.3	0.16	0	0

Gravitic Systems

See pp. 39-40 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Utility/8	8	101	5	0	10
Utility/9	2	15.5	2.2	0	10
Utility/10	1	11.5	0.30	0	10
Utility/11-12	1	11.5	0.25	0	10
Utility/13	1	11.3	0.254	0	10

Name	Spaces	Mass	Cost	Crew	Power
ST Utility/8	1.5	22.5	1.11	0	2.22
ST Utility/9	0.5	4.69	0.653	0	2.96
ST Utility/10	0.5	6.36	0.168	0	5.56
ST Utility/11-12	0.5	6.36	0.14	0	5.56
ST Utility/13	0.5	6.24	0.141	0	5.56

Name	Spaces	Mass	Cost	Crew	Power
Contragravity/8	0.5	2.26	0.385	1/6	0.9
Contragravity/9	0.5	2.56	0.616	1/17	3
Contragravity/10	0.5	3.51	0.15	1/25	10
Contragravity/11	0.5	3.51	0.101	1/50	10
Contragravity/12	0.5	3.51	0.101	1/100	10

Gravitic Systems (Cont.)

Name	Spaces	Mass	Cost	Crew	Power
Comb. Gravitics Sys./8	4	48.6	2.66	1/6	5.43
Comb. Gravitics Sys./9	1	7.65	1.14	1/80	5.23
Comb. Gravitics Sys./10	0.5	5.66	0.154	1/500	5.53
Comb. Gravitics Sys./11	0.5	5.66	0.126	1/1,000	5.53
Comb. Gravitics Sys./12	0.5	5.66	0.126	1/2,000	5.53
Comb. Gravitics Sys./13	0.5	5.54	0.127	1/2,000	5.53

Name	Spaces	Mass	Cost	Crew	Power
Repulsor Beam/10	1	10.4	0.107	0	8.5
Repulsor Beam/11	1	10.4	0.065	0	8.5
Tractor Beam/13	1	10.4	0.065	0	8.5
Comb. Beam/13	1	10.4	0.068	0	8.5

Energy Banks

See p. 37 for descriptions of these systems. Early TL7 is lead-acid battery, late TL7 and early TL8 are advanced battery, and all others are rechargeable power cells.

Name	Spaces	Mass	Cost	Crew	Power (MWs)
Energy Bank/Early 7	1	50	0.125	0	50,00
Energy Bank/Late 7	1	25	0.5	0	10,000
Energy Bank/Early 8	1	12.5	0.75	0	25,000
Energy Bank/Late 8	1	25	5	0	450,000
Energy Bank/9	1	25	5	0	675,000
Energy Bank/10	1	25	5	0	900,000
Energy Bank/11	1	25	5	0	1,125,000
Energy Bank/12	1	25	5	0	1,350,000
Energy Bank/13	1	25	5	0	1,565,000

Hydrogen-Fueling Units

See p. 41 for descriptions of these portable systems.

Name	Spaces	Mass	Cost	Crew	Power	Notes
Hyd. Fueling Unit/7	4	47.2	17	0	7.7	550 gph
Hyd. Fueling Unit/8	4	47.2	8.8	0	19.6	1,400 gph
Hyd. Fueling Unit/9	2	35.8	12.9	0	31.5	2,250 gph
Hyd.Fueling Unit/10	2	13.1	1.36	0	56	4,000 gph
Hyd. Fueling Unit/11	2	18.8	1.13	0	70	5,000 gph

Misc. Engineering Systems

See p. 41, p. 65 for descriptions of these systems.

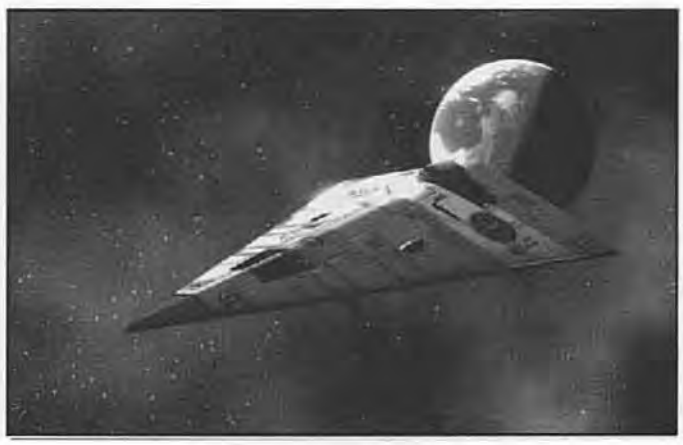
Name	Spaces	Mass	Cost	Crew	Power
Mini-Workshop/8	1	5.26	0.02	0	0
Complete Workshop/7	2.5	15	0.06	0	0

Name	Spaces	Mass	Cost	Crew	Power
Starship Shipyard/9	600	600	30	100	0
Non-starship Shipyard/7	500	500	20	100	0

Name	Spaces	Mass	Cost	Crew	Power
Fuel Processor/8	1	3.67	0.733	0	1
Fuel Processor/9	1	4.67	1.28	0	3.5
Fuel Processor/10	1	1.1	0.85	0	8

Name	Spaces	Mass	Cost	Crew	Power
Fuel Electrolysis/7	30.5	129	48.3	0	29.5
Fuel Electrolysis/8	15.5	64.4	12.3	0	29.5
Fuel Electrolysis/9	4.5	17.4	6.17	0	29.5
Fuel Electrolysis/10	1.5	5.59	0.559	0	29.5
Fuel Electrolysis/11	1.5	5.59	0.411	0	29.5

Name	Spaces	Mass	Cost	Crew	Power
Comb. Fuel Electro./Proc./8	8.5	35.8	6.91	0	15.8
Comb. Fuel Electro./Proc./9	3	12.7	4.19	0	17.8
Comb. Fuel Electro./Proc./10	1	4.35	0.56	0	17.8
Comb. Fuel Electro./Proc./11	1	4.35	0.471	0	17.8



Security

See p. 69 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Brig/7	4	34.1	0.177	0	0.02
Brig/8	4	27	0.122	0	0.02
Brig/9	4	17.4	0.081	0	0.02
Brig/10	4	11.4	0.052	0	0.02
Brig/11	4	8.04	0.04	0	Neg.
Brig/12	4	5.60	0.030	0	Neg.
Brig/13	4	4.44	0.026	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Double Cell/7	2	33.1	0.17	0	Neg.
Double Cell/8	2	26	0.115	0	Neg.
Double Cell/9	2	16.4	0.074	0	Neg.
Double Cell/10	2	10.4	0.045	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Double Cell/11	2	7.04	0.033	0	Neg.
Double Cell/12	2	4.64	0.023	0	Neg.
Double Cell/13	2	3.44	0.019	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Cell/Armory/Safe/7	1	21	0.096	0	Neg.
Cell/Armory/Safe/8	1	17	0.073	0	Neg.
Cell/Armory/Safe/9	1	11	0.048	0	Neg.
Cell/Armory/Safe/10	1	7	0.031	0	Neg.
Cell/Armory/Safe/11	1	5	0.023	0	Neg.
Cell/Armory/Safe/12	1	3.4	0.017	0	Neg.
Cell/Armory/Safe/13	1	2.6	0.013	0	Neg.

Security Station: See *Auxiliary Control Station/Duplicate Controls*, p. 43, p. 133.

Quarters and Life Support

See pp. 56-59 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Life Support/7	1	4.86	0.088	0	0.05
Life Support/8	0.5	2.51	0.028	0	0.05
Life Support/9	0.5	1.14	0.018	0	0.05
Life Support/10	0.5	1	0.008	0	0.05
Life Support/11	0.5	0.345	0.003	0	0.001

Name	Spaces	Mass	Cost	Crew	Power
Bunkroom/7	4	6.84	0.103	0	0.06
Bunkroom/8	4	5.58	0.046	0	0.09
Bunkroom/9	4	4.27	0.043	0	0.14
Bunkroom/10	4	4.80	0.018	0	0.16
Bunkroom/11	4	1.92	0.018	0	0.002

Name	Spaces	Mass	Cost	Crew	Power
Stateroom/7	4	4.08	0.044	0	0.02
Stateroom/8	4	3.04	0.02	0	0.02
Stateroom/9	4	2.41	0.016	0	0.02
Stateroom/10	4	2.4	0.012	0	0.02
Stateroom/11	4	2	0.012	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Small-Craft Cabin/7	2	3.08	0.037	0	0.02
Small-Craft Cabin/8	2	2.04	0.013	0	0.02
Small-Craft Cabin/9	2	1.41	0.009	0	0.02
Small-Craft Cabin/10	2	1.4	0.005	0	0.02
Small-Craft Cabin/11	2	1.04	0.005	0	Neg.

Medical

See pp. 65-66 for descriptions of these systems. *Beds* is the number of patients that a medical module can handle at once. Some of these "beds," such as operating tables, might not strictly be proper facilities for long-term care. Also, actual staffing of medical modules can vary considerably from the listed norm.

Name	Spaces	Mass	Cost	Crew	Power	Beds
Low Berth/9	0.5	2	0.22	0	Neg.	4

Name	Spaces	Mass	Cost	Crew	Power	Beds
Emerg. Aid Station/7	0.5	0.245	0.001	1/2	Neg.	2
Emerg. Aid Station/8	0.5	0.345	0.061	1/2	Neg.	2
Emerg. Aid Station/9	0.5	0.51	0.078	1/2	Neg.	2
Emerg. Aid Station/10	0.5	0.455	0.07	1/2	Neg.	2
Emerg. Aid Station/11-12	0.5	0.405	0.07	1/2	Neg.	2
Emerg. Aid Station/13	0.5	0.755	0.17	1/2	Neg.	2

Name	Spaces	Mass	Cost	Crew	Power	Beds
Sickbay/7	1	0.372	0.052	1	0.001	2
Sickbay/8	1	0.471	0.112	1	0.001	2
Sickbay/9	1	0.86	0.163	1	0.001	2
Sickbay/10	1	0.75	0.16	1	0.001	2
Sickbay/11-12	1	0.85	0.21	1	0.001	3
Sickbay/13	1.5	1.91	0.512	1	0.001	3

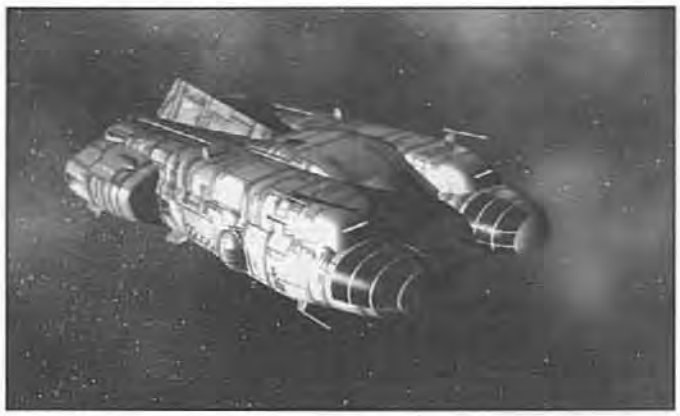
Name	Spaces	Mass	Cost	Crew	Power	Beds
Operating Theater/7	1	0.319	0.109	0	0.001	2
Operating Theater/8	1	0.417	0.167	0	0.001	2
Operating Theater/9	1	0.396	0.136	0	0.001	2
Operating Theater/10	1	0.385	0.121	0	0.001	2

Name	Spaces	Mass	Cost	Crew	Power
Alien Environ. Suite/7	4	10.3	0.184	0	0.021
Alien Environ. Suite/8	4	4.29	0.067	0	0.021
Alien Environ. Suite/9	4	3.28	0.047	0	0.021
Alien Environ. Suite/10	4	3	0.039	0	0.021
Alien Environ. Suite/11-12	4	2.54	0.024	0	Neg.
Alien Environ. Suite/13	4	2.29	0.026	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Passenger Couch/7	1	1.34	0.201	0	0.006
Passenger Couch/8	1	1.06	0.088	0	0.006
Passenger Couch/9	1	0.773	0.077	0	0.006
Passenger Couch/10	1	0.54	0.075	0	0.006
Passenger Couch/11	1	0.54	0.073	0	0.001

Name	Spaces	Mass	Cost	Crew	Power
Office/7	4	10.6	0.274	0	0.16
Office/8	4	6.32	0.082	0	0.16
Office/9	4	3.68	0.050	0	0.16
Office/10	4	3.54	0.018	0	0.16
Office/11	4	2.16	0.009	0	0.002
Office/12	4	1.92	0.009	0	0.002

Name	Spaces	Mass	Cost	Crew	Power
Luxury Modifications			×5		



Name	Spaces	Mass	Cost	Crew	Power	Beds
Evacuation Bay, Basic/7	2	1.52	0.023	1	0.006	12
Evacuation Bay, Basic/8	2	1.81	0.37	1	0.007	12
Evacuation Bay, Basic/9	2	1.5	0.189	1	0.007	12
Evacuation Bay, Basic/10	2	1.2	0.097	1	0.007	12
Evacuation Bay, Basic/11	2	1.02	0.097	1	0.002	12

Name	Spaces	Mass	Cost	Crew	Power	Beds
Evacuation Bay, Adv./9	4	4.2	0.61	1	0.007	12
Evacuation Bay, Adv./10	4	3.3	0.61	1	0.007	12
Evac. Bay, Adv./11-12	4	2.52	0.607	1	0.002	12
Evacuation Bay, Adv./13	4	6.72	1.81	1	0.001	12

Name	Spaces	Mass	Cost	Crew	Power	Beds
Military Sickbay/7	3	7.54	0.181	1	0.008	4
Military Sickbay/8	3	5.16	0.173	1	0.008	4
Military Sickbay/9	3	5.15	0.209	1	0.008	4
Military Sickbay/10	3	4.66	0.205	1	0.008	4
Military Sickbay/11-12	3	4.52	0.252	1	0.002	5
Military Sickbay/13	3	4.07	0.564	1	0.002	5

Recreation Facilities

See p. 60 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Hall/Bar/Conf. Room/7	10	0.2	0.003	0	0
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Civilian Holoventure/9	30	4.14	1.41	0	0.022
Civilian Holoventure/10	30	3.66	0.61	0	0.013
Civilian Holoventure/11	30	3.64	0.302	0	0.012
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Military Holoventure/9	30	34.1	1.71	0	0.022
Military Holoventure/10	30	23.7	0.81	0	0.013
Military Holoventure/11	30	15.6	0.422	0	0.012
Military Holoventure/12	30	11.6	0.384	0	0.012
Military Holoventure/13	30	8.63	0.351	0	0.012
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Shooting Range/7	10	40	0.451	0	Neg.
Shooting Range/8	10	25	0.301	0	Neg.
Shooting Range/9	10	15	0.201	0	Neg.
Shooting Range/10	10	10	0.15	0	Neg.
Shooting Range/11	10	6.01	0.11	0	Neg.
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Shooting Range/12	10	4.01	0.09	0	Neg.
Shooting Range/13	10	2.51	0.075	0	Neg.
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Null G Handball Court/8	35	7.17	0.3	0	0.593
Null G Handball Court/9	35	2.13	0.135	0	0.593
Null G Handball Court/10	35	1.89	0.022	0	0.593
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Stage/7	16	0.5	0.004	0	Neg.
Theater/7	20	2.1	0.015	0	Neg.
Ship's Galley/7	0.5	1.93	0.005	0-1	Neg.
Gymnasium/7	2.5	0.5	0	0	0
Swimming Pool/7	6	27/1.5	0.031	0	0

For swimming pools, the first mass value is when filled, the second when empty. Space vessels with pools should install one spacedock module per pool module to evacuate the water on demand.

Name	Spaces	Mass	Cost	Crew	Power
Luxury Modifications			×5		

Survival Shelters

See p. 67 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Locker Survival Shelter/7	0.5	4.5	0.079	0	0.001
Locker Survival Shelter/8	0.5	3.51	0.062	0	0.001
Locker Survival Shelter/9	0.5	2.82	0.058	0	0.001
Locker Survival Shelter/10	0.5	1.95	0.06	0	0.001
Locker Survival Shelter/11	0.5	0.963	0.04	0	Neg.
Locker Survival Shelter/12	0.5	0.776	0.04	0	Neg.
Locker Survival Shelter/13	0.5	0.651	0.041	0	Neg.
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Small Survival Shelter/7	1.5	12.4	0.203	0	0.002
Small Survival Shelter/8	1.5	10.4	0.194	0	0.002
Small Survival Shelter/9	1.5	8.71	0.209	0	0.002
Small Survival Shelter/10	1.5	5.92	0.216	0	0.002
Small Survival Shelter/11	1.5	2.3	0.131	0	0.001
Small Survival Shelter/12	1.5	1.93	0.131	0	0.001
Small Survival Shelter/13	1.5	2.03	0.233	0	0.001
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Med. Survival Shelter/7	3	22.9	0.363	0	0.004
Med. Survival Shelter/8	3	19.4	0.355	0	0.004
Med. Survival Shelter/9	3	16.5	0.39	0	0.004
Med. Survival Shelter/10	3	11.2	0.404	0	0.004
Med. Survival Shelter/11	3	4.1	0.231	0	0.001
Med. Survival Shelter/12	3	3.5	0.231	0	0.001
Med. Survival Shelter/13	3	3.7	0.435	0	0.001
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Large Survival Shelter/7	8.5	64.8	1.02	0	0.013
Large Survival Shelter/8	8.5	55.7	0.983	0	0.013
Large Survival Shelter/9	8.5	47.1	1.08	0	0.013
Large Survival Shelter/10	8.5	31.4	1.12	0	0.013
Large Survival Shelter/11	8.5	9.7	0.578	0	0.003
Large Survival Shelter/12	8.5	8.2	0.578	0	0.003
Large Survival Shelter/13	8.5	9.2	1.08	0	0.003

Habitats

See p. 66 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Null-G Arena/8	5,000	591	10.1	0	16
Null-G Arena/9	5,000	455	5.65	0	16
Null-G Arena/10	5,000	448	2.61	0	16
Null-G Arena/11	5,000	448	2.53	0	16
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Farm/7	10,000	20,000	0.5	10	0
Park/7	10,000	20,000	0.2	0	0
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Factory/7	10,000	50,000	26	12	10
Factory/8	10,000	50,000	14	12	10
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Factory/9	10,000	50,000	12	12	10
Factory/10	10,000	50,000	10.1	12	10
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Housing/7	10,000	40,000	1.16	0	0.1
Housing/8	10,000	40,000	1.04	0	0.1
Housing/9	10,000	40,000	1.02	0	0.1
Housing/10	10,000	40,000	1	0	0.1
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Plaza/7	10,000	30,000	1.16	0	0.1
Plaza/8	10,000	30,000	1.04	0	0.1
Plaza/9	10,000	30,000	1.02	0	0.1
Plaza/10	10,000	30,000	1	0	0.1

Miscellaneous Systems

See p. 67 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Boarding Clamp/7	3.5	40	36.7	0	0.4
Boarding Clamp/8	2.5	26	24.2	0	0.4
Boarding Clamp/9	1.5	19	18.1	0	0.4
Boarding Clamp/10	1	12.1	12	0	0.4
Boarding Clamp/11	1	9.34	9.02	0	0.4
Boarding Clamp/12	0.5	6.06	6	0	0.4

Name	Spaces	Mass	Cost	Crew	Power
Large Entry Module/7	1	3	0.011	0	0
Large Entry Module/13	0.5	2	0.019	0	0
Small Entry Module/7	0.5	2	0.007	0	0
Ext. Cradle/Mag. Grap./7	1	12.5	0.25	0	0

Name	Spaces	Mass	Cost	Crew	Power
Passage Tube/7	0.5	3	0.006	0	0
Pas. Tube, Armored/7	0.5	6	0.018	0	0

Name	Spaces	Mass	Cost	Crew	Power
Launch Tube/M. Driver/8	2	21	0.4	10	0.5
Launch Tube/M. Driver/9	2	20.3	0.3	10	0.5
Launch Tube/M. Driver/10	2	20.1	0.205	10	0.5

Name	Spaces	Mass	Cost	Crew	Power
Mass Catcher/8	0	5.83	3.02	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Vehicle Bay/7	1.05	0.5	0.003	0	0
Hangar Bay/7	1.5	1	0.005	0	0
Spacedock/7	1	1	0.005	0	0

Mass and cost are only paid once for the two bays; after that, empty space at mass and cost 0 is added at the given volume for each 1 dton of vehicle stowed. The same applies to the spacedock, except that *two* modules are required for each 1 dton of vessel stowed.

Name	Spaces	Mass	Cost	Crew	Power
Hold	1	0	0	0	0

Jump-Troop Systems

See p. 55 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Drop Capsule Ready Rack/7	1	4	0.05	0	0
Drop Capsule Ready Rack/8	1	3	0.05	0	0
Drop Capsule Ready Rack/9	1	2.5	0.05	0	0
Drop Capsule Ready Rack/10	1	2	0.05	0	0
Drop Capsule Ready Rack/11	1	1.75	0.05	0	0
Drop Capsule Ready Rack/12	1	1.5	0.05	0	0

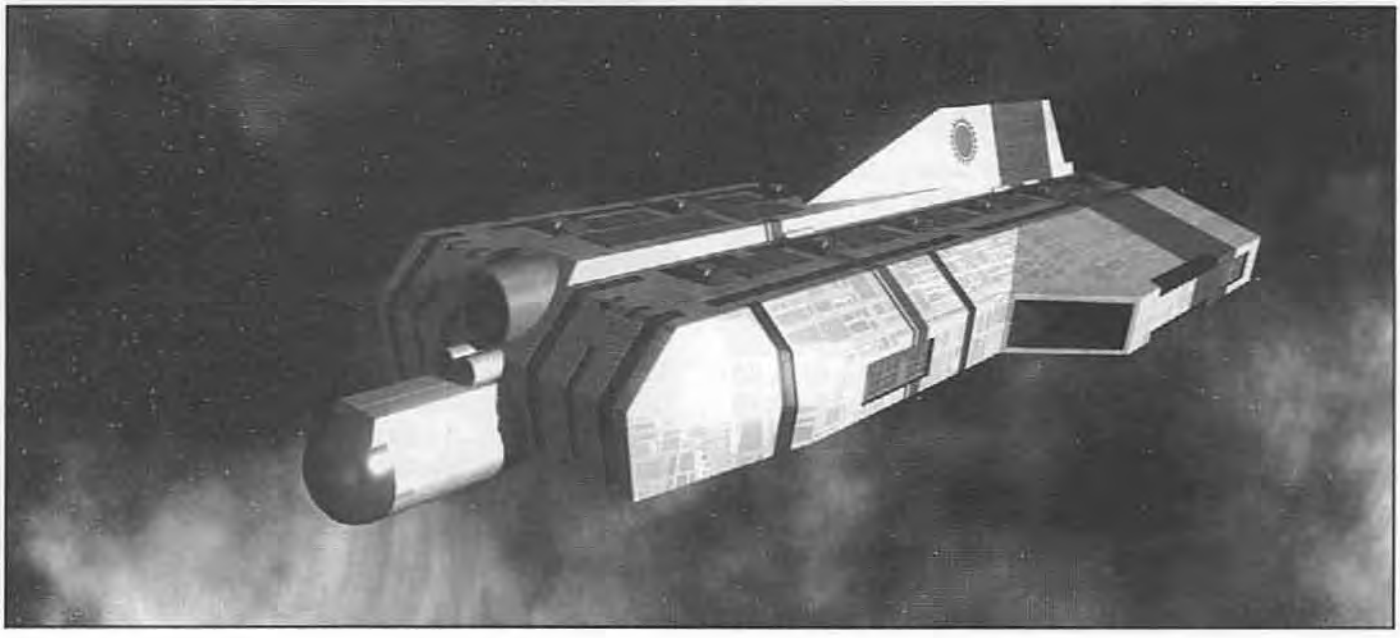
Name	Spaces	Mass	Cost	Crew	Power
B. Dress Ready Room/7	1	4.75	0	0	Neg.
B. Dress Ready Room/8	1	3.5	0	0	Neg.
B. Dress Ready Room/9	1	2.88	0	0	Neg.
B. Dress Ready Room/10	1	2.25	0	0	Neg.
B. Dress Ready Room/11	1	1.94	0	0	Neg.
B. Dress Ready Room/12	1	1.63	0	0	Neg.

These are also commonly called "the Morgue."

Name	Spaces	Mass	Cost	Crew	Power
Drop Capsule Launcher/7	1	12	0.519	0	Neg.
Drop Capsule Launcher/8	1	12	0.604	0	Neg.
Drop Capsule Launcher/9	1	12	0.302	0	Neg.
Drop Capsule Launcher/10	1	12	0.150	0	Neg.

Name	Spaces	Mass	Cost
Drop Capsule/7	0.034	0.925	0.012
Drop Capsule/8	0.034	0.517	0.009
Drop Capsule/9	0.034	0.353	0.008
Drop Capsule/10	0.034	0.269	0.007
Drop Capsule/11	0.034	0.203	0.007
Drop Capsule/12	0.034	0.169	0.007
Drop Capsule/13	0.034	0.145	0.006

Volume is *not* counted against ship's volume; the Drop Capsule Ready Rack module includes space for stowage. Mass and cost *do* count toward ship's loaded mass and fitted cost.



Ore Processors

See p. 67 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Capacity
Ore Processor/7	400	2,230	325	15	200	0.4 dtons/hr
Ore Processor/8	400	2,120	162	10	400	0.8 dtons/hr
Ore Processor/9	400	2,180	247	6	1,200	2.4 dtons/hr
Ore Processor/10	400	2,350	39.3	5	3,600	7.2 dtons/hr
Ore Processor/11	400	2,350	21.1	4	3,600	7.2 dtons/hr

Teleporters

See p. 73 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
T. Portal, Personal/13	1.5	9.6	1.68	1	16
T. Portal, Sm. Cargo/13	12	88.9	15.6	2	148
T. Portal, Lg. Cargo/13	116	889	156	4	1,480

Name	Spaces	Mass	Cost	Crew	Power
T. Poc. Univ., Personal/13	0	0.155	0.015	0	0
T. Poc. Univ., Sm. Cargo/13	0.5	1.44	0.14	0	0
T. Poc. Univ., Lg. Cargo/13	2.5	14.4	1.4	0	0

Name	Spaces	Mass	Cost	Crew	Power
T. Portal, Personal/14	0	0.4	1.6	1	16
T. Portal, Sm. Cargo/14	0.5	3.7	14.8	2	148
T. Portal, Lg. Cargo/14	4	37	148	4	1,480

Escape Capsules

See p. 67 for descriptions of these systems.

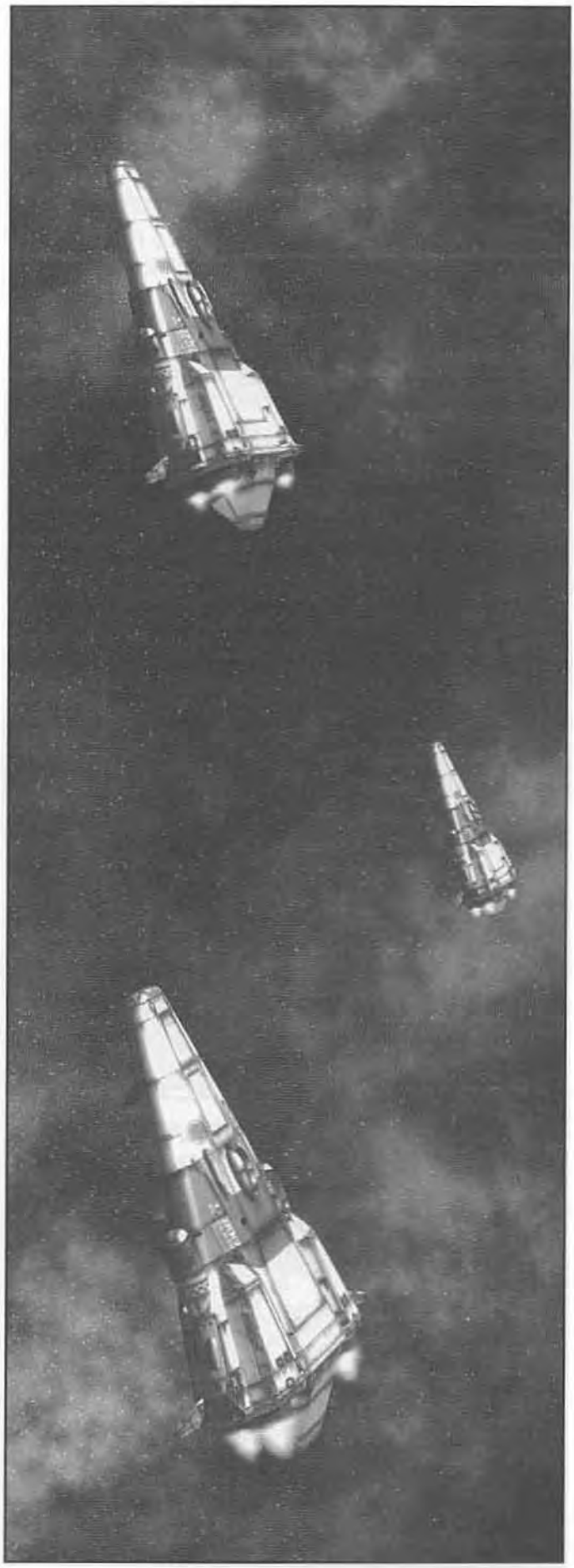
Name	Spaces	Mass	Cost	Crew	Power
Escape Capsule/7	0.5	8.82	1.05	0	0
Escape Capsule/8	0.5	5.4	0.297	0	0
Escape Capsule/9	0.5	3.56	0.17	0	0
Escape Capsule/10	0.5	2.51	0.13	0	0
Escape Capsule/11	0.5	1.29	0.112	0	0
Escape Capsule/12	0.5	1.14	0.111	0	0
Escape Capsule/13	0.5	1.07	0.11	0	0

Beacons

See p. 69 for descriptions of these systems.

Name	Spaces	Mass	Cost	Notes
Small Beacon/7	1	6.82	0.253	62 per case
Small Beacon/8	1	6.76	0.255	125 per case
Small Beacon/9	1	6.71	0.255	250 per case
Small Beacon/10	1	6.66	0.260	500 per case
Small Beacon/11	1	6.56	0.260	500 per case
Small Beacon/12	1	6.46	0.260	500 per case

Name	Spaces	Mass	Cost	Notes
Large Beacon/7	1	6.12	0.074	6 per case
Large Beacon/8	1	6.24	0.074	12 per case
Large Beacon/9	1	6.48	0.077	25 per case
Large Beacon/10	1	6.44	0.079	50 per case
Large Beacon/11	1	6.39	0.079	50 per case
Large Beacon/12	1	6.35	0.079	50 per case



Weapons

See p. 46 for descriptions of these systems. Note that ships often mount turrets with no weapons installed; purchasing and installing turret weapons after construction is relatively simple.

Turret Lasers

See p. 47 for descriptions of these systems.

Standard Lasers

Name	Spaces	Mass	Cost	Crew	Power
Tur. Laser, 43-MJ/8	1	6.69	0.875	0	1.43
Tur. Laser, 101-MJ/9	1	8.63	1.42	0	3.79
Tur. Laser, 250-MJ/10	1	8.3	0.82	0	11.1
Tur. Laser, 390-MJ/11	1	7.53	1.16	0	17.3
Tur. Laser, 405-MJ/12	1	7.8	0.68	0	18
Tur. Laser, 420-MJ/13	1	8.1	0.713	0	18.7
Tur. Graser, 390-MJ/14	1	8.46	1.3	0	19.5

Heavy Lasers

Name	Spaces	Mass	Cost	Crew	Power
Tur. Laser, 130-MJ/8	3	20.2	2.63	0	4.33
Tur. Laser, 303-MJ/9	3	25.9	4.25	0	11.4
Tur. Laser, 810-MJ/10	3	27.6	2.71	0	36
Tur. Laser, 1.3-GJ/11	3	25.1	3.8	0	57.7
Tur. Laser, 1.3-GJ/12	3	25.1	2.18	0	57.8
Tur. Laser, 1.3-GJ/13	3	25.1	2.18	0	57.8
Tur. Graser, 660-MJ/13	3	14.3	2.18	0	33
Tur. Graser, 1.18-GJ/14	3	25.6	3.88	0	59

Mining Lasers

Name	Spaces	Mass	Cost	Crew	Power
Tur. Mining Laser, 2.6-MJ/8	3	10.4	2.08	0	5.2
Tur. Mining Laser, 10.2-MJ/9	3	11.6	4.6	0	23
Tur. Mining Laser, 40-MJ/10	3	10.9	1.09	0	107
Tur. Mining Laser, 46.5-MJ/11	3	12.6	0.648	0	124
Tur. Mining Laser, 46.5-MJ/12	3	12.6	0.634	0	124
Tur. Mining Laser, 46.5-MJ/13	3	12.6	0.634	0	124

Turret Missile Racks

See pp. 46-47 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
250mm Missile Rack/7	1	1.88	0.1	1	Neg.
250mm Missile Rack/8	1	1.45	0.065	1	Neg.
250mm Missile Rack/9	1	1.45	0.033	1	Neg.
250mm Missile Rack/10	1	1.45	0.018	1	Neg.

Name	Spaces	Mass	Cost	Crew	Power
500mm Missile Rack/7	1	6	0.307	1	Neg.
500mm Missile Rack/8	1	4.5	0.23	1	Neg.
500mm Missile Rack/9	1	4.25	0.115	1	Neg.
500mm Missile Rack/10	1	4.13	0.058	1	Neg.

Turret Sandcasters

See pp. 48-49 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew
Sandcaster/7	1	5	0.25	0

High-Energy Turret Weapons

Name	Spaces	Mass	Cost	Crew	Power
Tur. Plasma Gun, 225-MJ/9	1.5	11.3	3.04	0	7.5
Tur. Plasma Gun, 430-MJ/10	1.5	15.8	1.7	0	14.3
Tur. Fusion Gun, 700-MJ/11	1.5	14	2.5	0	23.3
Tur. Fusion Gun, 700-MJ/12	1.5	14	2.5	0	23.3

Name	Spaces	Mass	Cost	Crew	Power
Tur. Par. Beam, 160-MJ/8	3	16	2.9	0	5.33
Tur. Par. Beam, 450-MJ/9	3	22.5	4.16	0	15
Tur. Par. Beam, 860-MJ/10	3	31.6	1.59	0	28.7
Tur. Par. Beam, 1.4-GJ/11	3	28	3.5	0	46.7

Name	Spaces	Mass	Cost	Crew	Power
Tur. Meson Gun, 1.39-GJ/13	3	27.8	3.47	0	46.3

Bay Weapons

See pp. 49-50 for descriptions of these systems.

50-ton Bay Weapons

Name	Spaces	Mass	Cost	Crew	Power
Plasma Gun Bay, 7.4-GJ/9	50	371	99.3	2	247
Plasma Gun Bay, 12.81-GJ/10	50	470	50.4	2	427
Fusion Gun Bay, 23.3-GJ/11	50	467	82.3	2	777
Fusion Gun Bay, 23.3-GJ/12	50	467	82.3	2	777

Name	Spaces	Mass	Cost	Crew	Power
Particle Beam Bay, 2.65-GJ/8	50	266	48.1	2	88.3
Particle Beam Bay, 7.4-GJ/9	50	371	68.4	2	247
Particle Beam Bay, 12.81-GJ/10	50	467	23.2	2	427
Particle Beam Bay, 23.3-GJ/11	50	467	58	2	777

Name	Spaces	Mass	Cost	Crew	Power
Meson Gun Bay, 12.81-GJ/12	50	467	21	2	427
Meson Gun Bay, 23.3-GJ/13	50	467	58	2	777

100-ton Bay Weapons

Name	Spaces	Mass	Cost	Crew	Power
Plasma-Gun Bay, 14.9-GJ/9	100	746	200	2	497
Plasma-Gun Bay, 28.5-GJ/10	100	1,050	112	2	950
Fusion-Gun Bay, 46.7-GJ/11	100	936	165	2	1,560
Fusion-Gun Bay, 46.7-GJ/12	100	935	165	2	1,560

Name	Spaces	Mass	Cost	Crew	Power
Part.-Beam Bay, 5.34-GJ/8	100	535	96.4	2	178
Part.-Beam Bay, 14.9-GJ/9	100	746	138	2	497
Part.-Beam Bay, 28.5-GJ/10	100	1,050	52.6	2	950
Part.-Beam Bay, 46.7-GJ/11	100	936	116	2	1,557

Name	Spaces	Mass	Cost	Crew	Power
Meson-Gun Bay, 28.5-GJ/12	100	1,050	52.6	2	950
Meson-Gun Bay, 46.7-GJ/13	100	936	116	2	1,557

Repulsors

Name	Spaces	Mass	Cost	Crew	Power	Notes
Lt. Repulsor Bay/9	100	400	344	2	720	+1 Dodge
Hv. Repulsor Bay/10	100	460	536	2	3,600	+3 Dodge

Repulsors (Continued)

Name	Spaces	Mass	Cost	Crew	Power	Notes
Md. Repulsor Bay/11	50	205	134	2	1,800	+2 Dodge
Hv. Repulsor Bay/11	100	410	268	2	3,600	+3 Dodge
Md. Repulsor Bay/12	50	193	71.6	2	1,800	+2 Dodge
Hv. Repulsor Bay/12	100	385	143	2	3,600	+3 Dodge
Hv. Repulsor Bay/13	50	193	71.6	2	1,800	+3 Dodge
Ehv. Repulsor Bay/13	100	385	143	2	3,600	+4 Dodge

Dodge bonus is vs. missiles only. See *Combat*, pp. 104-105.

Missile Bays

See p. 49 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
250mm Missile Bay/7	50	94.8	5.43	2	0.05
250mm Missile Bay/8	50	60.9	3.68	2	0.05
250mm Missile Bay/9	50	48.8	1.84	2	0.05
250mm Missile Bay/10	50	45.9	0.85	2	0.05

Name	Spaces	Mass	Cost	Crew	Power
500mm Missile Bay/7	100	601	31.1	2	0.10
500mm Missile Bay/8	100	451	23.4	2	0.10
500mm Missile Bay/9	100	425	11.7	2	0.10
500mm Missile Bay/10	100	413	5.85	2	0.10

Missiles

See pp. 52-54 for descriptions of these systems, including the magazine capacity for racks at different TLs.

Item	Spaces	Mass	Cost	Pilot	Performance
250mm Missile/7	0.012	0.32	0.02	–	0.15 G 0.15 GRds
250mm Missile/8	0.012	0.25	0.02	–	0.33 G 1 GRds
250mm Missile/9	0.012	0.23	0.03	12	5 G 15 GRds
250mm Missile/10	0.012	0.22	0.03	14	6 G 18 GRds
250mm Missile/11	0.012	0.18	0.04	15	8 G 24 GRds
250mm Missile/12	0.012	0.18	0.04	17	10 G 30 GRds
250mm Missile/13	0.012	0.24	0.20	18	55 G 165 GRds

Item	Spaces	Mass	Cost	Pilot	Performance
500mm Missile/7	0.06	1.45	0.07	–	0.2 G 0.2 GRds
500mm Missile/8	0.06	1.48	0.08	–	0.33 G 1 GRds
500mm Missile/9	0.06	1.26	0.08	12	5 G 15 GRds
500mm Missile/10	0.06	1.08	0.07	14	6 G 18 GRds
500mm Missile/11	0.06	1.59	0.15	15	8 G 24 GRds
500mm Missile/12	0.06	1.30	0.14	17	10 G 30 GRds
500mm Missile/13	0.06	1.33	1.02	18	55 G 165 GRds

Item	Spaces	Mass	Cost	Pilot	Performance
SIM-10 Missile	0.012	0.15	0.032	–	6 G 18 GRds
SIM-12 Missile	0.012	0.15	0.022	–	10 G 30 GRds

EW Drones

See p. 55 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew
EW Drone/9	0.06	1.48	0.27	0
EW Drone/10	0.06	0.99	0.16	0
EW Drone/11	0.06	1.74	0.27	0
EW Drone/12	0.06	1.18	0.17	0
EW Drone/13	0.06	1.34	0.55	0

Sand Canisters

See p. 48 for a description of this system. A standard sandcaster holds up to 200 canisters of ready ammunition.

Name	Spaces	Mass	Cost
Sand Canister/7	0.0048	0.06	0.0004

Weapon Storage

See p. 61-62 for descriptions of these systems. Note that the various missile platforms and sandcaster already include storage capacity in their integral magazine.

Name	Spaces	Mass	Cost	Crew	Power
Damper Box/11	4.5	35.6	26.1	0	0.079
Damper Box/12	2.5	13.9	11.5	0	0.04
Damper Box/13	2	6.93	5.74	0	0.02
Anti-blast Magazine/7	1	6.25	0.125	0	0
Anti-matter Bunker/12	0.5	12.5	0.25	0	0

Turrets

See p. 46 for descriptions of these systems. These standard turrets each hold up to 3 spaces of turret weaponry.

Name	Spaces	Mass	Cost (USL/VGSL)	Crew
Turret/7	1	2.45	0.046/0.11	1
Turret/8	1	1.64	0.043/0.103	1
Turret/9	1	1.23	0.042/0.101	1
Turret/10	1	0.825	0.041/0.097	1
Turret/11	1	0.625	0.041/0.097	1
Turret/12	1	0.425	0.041/0.097	1

50-ton External Bays

See p. 19 for descriptions of these systems.

Name	Spaces	Mass	Cost (USL/VGSL)	Crew
50-ton External Bay/7	10	19.5	0.325/0.78	0
50-ton External Bay/8	10	13	0.325/0.78	0
50-ton External Bay/9	10	9.75	0.325/0.78	0
50-ton External Bay/10	10	6.5	0.325/0.78	0
50-ton External Bay/11	10	4.88	0.325/0.78	0
50-ton External Bay/12	10	3.25	0.325/0.78	0

100-ton External Bays

See p. 19 for descriptions of these systems.

Name	Spaces	Mass	Cost (USL/VGSL)	Crew
100-ton External Bay/7	20	30	0.5/1.2	0
100-ton External Bay/8	20	20	0.5/1.2	0
100-ton External Bay/9	20	15	0.5/1.2	0
100-ton External Bay/10	20	10	0.5/1.2	0
100-ton External Bay/11	20	7.5	0.5/1.2	0
100-ton External Bay/12	20	5	0.5/1.2	0

Internal Bays

See p. 19 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew
50-ton Internal Bay/7	50	0	0	0
100-ton Internal Bay/7	100	0	0	0

Spinal Mount Weapons

See p. 50 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Spinal P-Beam, 250-GJ/8	4,460	22,424	4,488	45	8,333
Spinal P-Beam, 420-GJ/8	7,492	37,668	7,536	75	14,000
Spinal P-Beam, 670-GJ/8	11,951	60,085	12,020	120	22,333
Spinal P-Beam, 1-TJ/8	17,837	89,677	17,938	179	33,333

Name	Spaces	Mass	Cost	Crew	Power
Spinal P-Beam, 670-GJ/9	3,910	26,558	6,152	40	22,333
Spinal P-Beam, 920-GJ/9	5,369	36,467	8,447	54	30,667
Spinal P-Beam, 1.8-TJ/9	10,503	71,345	16,524	106	60,000
Spinal P-Beam, 3.1-TJ/9	18,088	122,870	28,457	181	103,333

Name	Spaces	Mass	Cost	Crew	Power
Spinal P-Beam, 569.5-GJ/10	1,513	15,126	1,035	15	18,983
Spinal P-Beam, 870-GJ/10	2,292	22,868	1,568	23	29,000
Spinal P-Beam, 1.7-TJ/10	4,478	44,783	3,063	45	56,667
Spinal P-Beam, 2.7-TJ/10	7,111	70,966	4,865	72	90,000

Name	Spaces	Mass	Cost	Crew	Power
Spinal P-Beam, 530-GJ/11	911	7,858	1,307	10	17,667
Spinal P-Beam, 840-GJ/11	1,443	12,454	2,071	15	28,000
Spinal P-Beam, 1.6-TJ/11	2,749	23,720	3,945	28	53,333
Spinal P-Beam, 2.8-TJ/11	4,810	41,509	6,903	49	93,333

Name	Spaces	Mass	Cost	Crew	Power
Spinal Meson Gun, 820-GJ/10	2,160	21,554	4,038	22	27,333
Spinal Meson Gun, 1.4-TJ/10	3,688	36,798	6,894	37	46,667
Spinal Meson Gun, 2.3-TJ/10	6,058	60,453	11,325	61	76,667
Spinal Meson Gun, 3.4-TJ/10	8,955	89,364	16,740	90	113,333

Name	Spaces	Mass	Cost	Crew	Power
Spinal Meson Gun, 670-GJ/11	1,765	17,603	1,792	18	23,333
Spinal Meson Gun, 1.1-TJ/11	2,897	28,900	2,941	29	36,667
Spinal Meson Gun, 2.3-TJ/11	6,057	60,425	6,149	61	76,667
Spinal Meson Gun, 3.1-TJ/11	8,164	81,442	8,287	82	103,333

Name	Spaces	Mass	Cost	Crew	Power
Spinal Meson Gun, 570-GJ/12	1,512	15,119	939	16	19,000
Spinal Meson Gun, 870-GJ/12	2,291	22,851	1,420	23	29,000
Spinal Meson Gun, 2.1-TJ/12	5,530	55,156	3,426	56	70,000
Spinal Meson Gun, 2.9-TJ/12	7,636	76,167	4,731	77	96,667

Name	Spaces	Mass	Cost	Crew	Power
Spinal Meson Gun, 870-GJ/13	1,495	12,888	2,143	15	29,000
Spinal Meson Gun, 2.3-TJ/13	3,950	34,070	5,665	40	76,667
Spinal Meson Gun, 2.9-TJ/13	4,980	42,957	7,142	50	96,667
Spinal Meson Gun, 3.4-TJ/13	6,869	59,250	9,851	69	133,333

Cockpits and Bridges

See pp. 42-43 for descriptions of these systems. *Scans* ratings are passive/active/radscanner.

Name	Spaces	Mass	Cost	Crew	Power	Scans
Cockpit/Systems/7	3.5	15.2	6.06	1-2	0.227	31/33/–
Cockpit/Systems/8	1	4.45	3.69	1-2	0.127	31/33/–
Cockpit/Systems/9	3	13.4	7.62	1-2	0.502	33/37/23
Cockpit/Systems/10	1	4.9	2.5	1-2	1.25	35/39/29
Cockpit/Systems/11	1	4.7	2.3	1-2	1.75	37/40/31

Name	Spaces	Mass	Cost	Crew	Power	Scans
Command Cockpit/7	5.5	30.5	31.3	1-2	0.773	32/36/–
Command Cockpit/8	2.5	14.6	27	1-2	0.773	34/38/–

Cockpits and Bridges (Cont.)

Name	Spaces	Mass	Cost	Crew	Power	Scans
Command Cockpit/9	5	28.9	24.5	1-2	2.52	37/41/31
Command Cockpit/10	2.5	19.1	11	1-2	4.79	39/42/32
Command Cockpit/11	2.5	17.3	10.2	1-2	6.02	41/43/38
Command Cockpit/12	2.5	16.9	10	1-2	6.02	41/43/38

Name	Spaces	Mass	Cost	Crew	Power	Scans
Light Cockpit/Systems/7	3	11.5	5.57	1	0.024	25/27/–
Light Cockpit/Systems/8	1	3.03	1.22	1	0.014	25/27/–
Light Cockpit/Systems/9	3	11.1	5.88	1	0.051	27/31/23
Light Cockpit/Systems/10	0.5	1.94	0.94	1	0.127	29/33/23
Light Cockpit/Systems/11	0.5	1.9	0.589	1	0.177	31/34/25
Light Cockpit/Systems/12	0.5	1.89	0.589	1	0.177	31/34/25

Name	Spaces	Mass	Cost	Crew	Power	Scans
Basic Bridge/7	2.5	11	4.78	1-5	0.355	31/34/–
Basic Bridge/8	2.5	8.07	5.21	1-5	0.505	33/37/–
Basic Bridge/9	2.5	11.6	6.1	1-5	1.75	35/40/29
Basic Bridge/10	2.5	8.6	4	1-5	2.51	37/41/31
Basic Bridge/11	2.5	7.55	3.22	1-5	3.76	38/42/35
Basic Bridge/12	2.5	7.3	3.1	1-5	3.76	38/42/35

Name	Spaces	Mass	Cost	Crew	Power	Scans
Command Bridge/7	7	34.5	12.8	1-10	0.788	32/36/–
Command Bridge/8	5.5	21.9	12.2	1-10	0.788	34/38/–
Command Bridge/9	5.5	23.7	12.4	1-10	2.54	37/41/31
Command Bridge/10	5	20.9	9.6	1-10	3.80	39/42/32
Command Bridge/11	5	20	8.96	1-10	5.05	41/43/38
Command Bridge/12	5	19.2	8.8	1-10	5.05	41/43/38

Name	Spaces	Mass	Cost	Crew	Power	Scans
Compact, Basic or Command only	-0.5	-0.04	0	-2		

Electronic Systems

See p. 43 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Aux. Control Station/Dup. Controls/7	0.5	0.355	0.013	0-2	Neg.
Aux. Control Station/Dup. Controls/8	0.5	0.355	0.004	0-2	Neg.
Aux. Control Station/Dup. Controls/9	0.5	0.335	0.003	0-2	Neg.
Aux. Control Station/Dup. Controls/10-12	0.5	0.300	0.003	0-2	Neg.
Aux. Control Station/Dup. Controls/13	0.5	0.200	0.004	0-2	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Information Center/7	4	7.66	10.5	10-20	0.01
Information Center/8	4	7.63	10.3	10-20	0.01
Information Center/9	4	4.51	5.28	10-20	0.01
Information Center/10	4	3	2.8	10-20	0.01

Sensor Systems

See pp. 44-45 for descriptions of these systems. *Scans* ratings for multifunction sensor suites are given as passive/active/radscanner values.

Name	Spaces	Mass	Cost	Crew	Power	Scans
Enhanced Sensor Suite/7	4	32.9	11.8	1	1.5	37/38/–
Enhanced Sensor Suite/8	4	31.2	16.1	1	3.25	37/41/–
Enhanced Sensor Suite/9	4	39.7	27.6	1	5	41/43/33
Enhanced Sensor Suite/10	4	41.2	27.3	1	11.3	43/45/37
Enhanced Sensor Suite/11	4	38.7	26.9	1	25	45/47/39

Sensor Systems (Continued)

Name	Spaces	Mass	Cost	Crew	Power	Scans
Advanced Sensor Suite/7	8	69.8	20.1	1	2.25	40/39/–
Advanced Sensor Suite/8	8	65.8	39.2	1	6.23	40/43/–
Advanced Sensor Suite/9	8	78.4	53.6	1	11.3	43/45/34
Advanced Sensor Suite/10	8	82.4	56.8	1	25	45/47/38
Advanced Sensor Suite/11	8	77.1	56.5	1	50	47/49/40
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scans**
Densitometer/11	1	12.5	6	1	Neg.	–/27/–
Densitometer/12	1	12.5	5.4	1	Neg.	–/29/–
Densitometer/13	1	12.5	5.2	1	Neg.	–/31/–

Screens

See p. 50 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Nuclear Damper/10	1.5	32.4	16	4	2
Nuclear Damper/11	1	16.4	8	4	2
Nuclear Damper/12	1	10	4	4	2
Nuclear Damper/13	0.5	4.4	2	4	2
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Meson Screen/10	2	12.5	9.05	4	72.8
Meson Screen/11	1	6.24	4.34	4	36.4
Meson Screen/12	1	5	2.26	4	36.4
Meson Screen/13	1	4.29	1.22	4	36.4
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Black Globe Capacitor/12	1	25	5	0	24 million HP
Black Globe-1/12	10	20.5	51	4	0.00001
Black Globe-2/12	15	41	102	4	0.00001
Black Globe-3/12	20	82	204	4	0.00001
Black Globe-4/12	25	164	408	4	0.00001

Volume, mass, cost, and power are per 8,200 sf of vessel protected for black globes *only*.

Electronic-Warfare Systems

See p. 45 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Jammer/7	33	378	60.1	0	21
Jammer/8	6	31.5	13.8	0	10.4
Jammer/9	3	26.8	18.2	0	15.7
Jammer/10	1	14.5	11.3	0	7.88
Jammer/11	1	15.2	10	0	7.73
Jammer/12	1	16.5	10.3	0	7.73
Jammer/13	1	16.6	10.3	0	7.73
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**
Electronic Warfare/7	3	56.2	11.4	2	0.22
Electronic Warfare/8	3	33.6	11.4	2	1.02
Electronic Warfare/9	3	27.7	14.4	2	5.02
Electronic Warfare/10	3	43.7	13	2	15
Electronic Warfare/11	3	44.9	11.4	2	15
Electronic Warfare/12	3	40.4	10.5	2	15
Electronic Warfare/13	3	37.1	9.85	2	15

Long-Range Sensors

See p. 44 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
FLt. Radscanner/9	2	25	10.1	0	Neg.	Scan 35, Range 10k
MLt. Radscanner/9	3	37.5	15.1	0	Neg.	Scan 36, Range 15k
ULt. Radscanner/9	4	50	20.1	0	Neg.	Scan 37, Range 20k
SLt. Radscanner/9	6	75	30.1	0	Neg.	Scan 38, Range 30k

Long-Range Sensors (Continued)

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
ELt. Radscanner/9	9	113	45.1	0	Neg.	Scan 39, Range 45k
Lt. Radscanner/9	14	175	70.1	0	Neg.	Scan 40, Range 70k
Md. Radscanner/9	20	250	100	0	Neg.	Scan 41, Range 100k
Hv. Radscanner/9	30	375	150	0	Neg.	Scan 42, Range 150k
EHv. Radscanner/9	40	500	200	0	Neg.	Scan 43, Range 200k
SHv. Radscanner/9	60	750	300	0	Neg.	Scan 44, Range 300k
UHv. Radscanner/9	90	1125	450	0	Neg.	Scan 45, Range 450k
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
ELt. Radscanner/10	2.5	28.1	11.3	0	Neg.	Scan 39, Range 45k
Lt. Radscanner/10	3.5	43.8	17.5	0	Neg.	Scan 40, Range 70k
Md. Radscanner/10	5	62.5	25	0	Neg.	Scan 41, Range 100k
Hv. Radscanner/10	7.5	93.8	37.5	0	Neg.	Scan 42, Range 150k
EHv. Radscanner/10	10	125	50	0	Neg.	Scan 43, Range 200k
SHv. Radscanner/10	15	188	75	0	Neg.	Scan 44, Range 300k
UHv. Radscanner/10	22.5	281	113	0	Neg.	Scan 45, Range 450k
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
Md. Radscanner/11	1	12.5	5.01	0	Neg.	Scan 41, Range 100k
Hv. Radscanner/11	1.5	18.8	7.51	0	Neg.	Scan 42, Range 150k
EHv. Radscanner/11	2	25	10	0	Neg.	Scan 43, Range 200k
SHv. Radscanner/11	3	37.5	15	0	Neg.	Scan 44, Range 300k
UHv. Radscanner/11	4.5	56.3	22.5	0	Neg.	Scan 45, Range 450k
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
FLt. PESA Array/8	2.5	30	49.6	0	Neg.	Scan 42, Range 150k
MLt. PESA Array/8	3.5	40	65.6	0	Neg.	Scan 43, Range 200k
ULt. PESA Array/8	5	60	97.6	0	Neg.	Scan 44, Range 300k
SLt. PESA Array/8	7.5	90	146	0	Neg.	Scan 45, Range 450k
ELt. PESA Array/8	11.5	140	226	0	Neg.	Scan 46, Range 700k
Lt. PESA Array/8	16	200	322	0	Neg.	Scan 47, Range 1M
Md. PESA Array/8	24	300	482	0	Neg.	Scan 48, Range 1.5M
Hv. PESA Array/8	32	400	642	0	Neg.	Scan 49, Range 2M
EHv. PESA Array/8	48	600	962	0	Neg.	Scan 50, Range 3M
SHv. PESA Array/8	72	900	1442	0	Neg.	Scan 51, Range 4.5M
UHv. PESA Array/8	112	1400	2242	0	Neg.	Scan 52, Range 7M
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
ULt. PESA Array/9	2.5	30	48.8	0	Neg.	Scan 44, Range 300k
SLt. PESA Array/9	4	45	72.8	0	Neg.	Scan 45, Range 450k
ELt. PESA Array/9	6	70	113	0	Neg.	Scan 46, Range 700k
Lt. PESA Array/9	8	100	161	0	Neg.	Scan 47, Range 1M
Md. PESA Array/9	12	150	241	0	Neg.	Scan 48, Range 1.5M
Hv. PESA Array/9	16	200	321	0	Neg.	Scan 49, Range 2M
EHv. PESA Array/9	24	300	481	0	Neg.	Scan 50, Range 3M
SHv. PESA Array/9	36	450	721	0	Neg.	Scan 51, Range 4.5M
UHv. PESA Array/9	56	700	1121	0	Neg.	Scan 52, Range 7M
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
ELt. PESA Array/10	3	35	56.4	0	Neg.	Scan 46, Range 700k
Lt. PESA Array/10	4	50	80.4	0	Neg.	Scan 47, Range 1M
Md. PESA Array/10	6	75	120	0	Neg.	Scan 48, Range 1.5M
Hv. PESA Array/10	8	100	160	0	Neg.	Scan 49, Range 2M
EHv. PESA Array/10	12	150	240	0	Neg.	Scan 50, Range 3M
SHv. PESA Array/10	18	225	360	0	Neg.	Scan 51, Range 4.5M
UHv. PESA Array/10	28	350	560	0	Neg.	Scan 52, Range 7M
Name	**Spaces**	**Mass**	**Cost**	**Crew**	**Power**	**Scan/Range in miles**
Md. PESA Array/11	3	37.5	60.2	0	Neg.	Scan 48, Range 1.5M
Hv. PESA Array/11	4	50	80.2	0	Neg.	Scan 49, Range 2M
EHv. PESA Array/11	6	75	120	0	Neg.	Scan 50, Range 3M
SHv. PESA Array/11	9	113	180	0	Neg.	Scan 51, Range 4.5M
UHv. PESA Array/11	14	175	280	0	Neg.	Scan 52, Range 7M

Long-Range Sensors (Continued)

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
ULt. AESA Array/8	5.5	37.5	10.6	0	7.5	Scan 44, Range 300k
SLt. AESA Array/8	8.5	56.3	15.9	0	11.3	Scan 45, Range 450k
ELt. AESA Array/8	13	87.5	24.6	0	17.5	Scan 46, Range 700k
Lt. AESA Array/8	18	125	35.1	0	25	Scan 47, Range 1M
Md. AESA Array/8	27	188	52.6	0	37.5	Scan 48, Range 1.5M
Hv. AESA Array/8	36	250	70.1	0	50	Scan 49, Range 2M
EHv. AESA Array/8	54	375	105	0	75	Scan 50, Range 3M
SHv. AESA Array/8	81	563	158	0	112.5	Scan 51, Range 4.5M
UHv. AESA Array/8	126	875	245	0	175	Scan 52, Range 7M

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
ELt. AESA Array/9	4.5	35	12.3	0	17.5	Scan 46, Range 700k
Lt. AESA Array/9	6	50	17.6	0	25	Scan 47, Range 1M
Md. AESA Array/9	9	75	26.3	0	37.5	Scan 48, Range 1.5M
Hv. AESA Array/9	12	100	35.1	0	50	Scan 49, Range 2M
EHv. AESA Array/9	18	150	52.6	0	75	Scan 50, Range 3M
SHv. AESA Array/9	27	225	78.8	0	113	Scan 51, Range 4.5M
UHv. AESA Array/9	42	350	123	0	175	Scan 52, Range 7M

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
Md. AESA Array/10	3.5	31.9	9.78	0	38	Scan 48, Range 1.5M
Hv. AESA Array/10	4.5	42.5	13	0	50	Scan 49, Range 2M
EHv. AESA Array/10	6.5	63.8	19.5	0	75	Scan 50, Range 3M
SHv. AESA Array/10	9.5	95.6	29.3	0	113	Scan 51, Range 4.5M
UHv. AESA Array/10	15	149	45.5	0	175	Scan 52, Range 7M

Name	Spaces	Mass	Cost	Crew	Power	Scan/Range in miles
EHv. AESA Array/11	4.5	35.6	9.77	0	75	Scan 50, Range 3M
SHv. AESA Array/11	6.5	53.4	14.6	0	113	Scan 51, Range 4.5M
UHv. AESA Array/11	9.5	83.1	22.8	0	175	Scan 52, Range 7M

Special Sensors and Add-ons

See pp. 44-45 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Survey Module-Traffic Control/7	5	31.3	409	4-8	0.016
Survey Module-Traffic Control/8	4	21.8	124	4-8	0.034
Survey Module-Traffic Control/9	4	11.1	62.1	4-8	0.031
Survey Module-Traffic Control/10	4	5.31	30.6	4-8	0.022

Name	Spaces	Mass	Cost	Crew	Power
Underwater Electronics/7	1	7.83	4.05	1	0.106
Underwater Electronics/8	0.5	4.13	1.88	1	0.121
Underwater Electronics/9	0.5	2.89	1.45	1	0.136
Underwater Electronics/10	0.5	4.2	3.53	1	0.160
Underwater Electronics/11	0.5	4.47	3.63	1	0.175
Underwater Electronics/12	0.5	4.73	3.73	1	0.19
Underwater Electronics/13	0.5	4.99	3.84	1	0.205

Name	Spaces	Mass	Cost	Crew	Power
Astronomical Instruments/7	0	0.138	2.03	0	Neg.
Astronomical Instruments/8	0	0.055	0.51	0	Neg.
Astronomical Instruments/9	0	0.028	0.255	0	Neg.
Astronomical Instruments/10	0	0.014	0.128	0	Neg.

Name	Spaces	Mass	Cost	Crew	Power
Planetary Survey/7	0	0.25	0.5	0	0.001
Planetary Survey/8	0	0.125	0.25	0	0.001
Planetary Survey/9	0	0.063	0.125	0	0.001
Planetary Survey/10	0	0.5	1.25	0	0.005

Communications Suites

See pp. 43-44 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Enhanced Comms/7	1.5	18	0.257	0	0.006
Enhanced Comms/8	1.5	17.5	0.245	0	0.011
Enhanced Comms/9	1.5	18.8	0.268	0	0.024
Enhanced Comms/10	1.5	18.1	2.1	0	0.017
Enhanced Comms/11	1.5	14.4	1.09	0	0.026
Enhanced Comms/12	1.5	16.3	0.67	0	0.04

Name	Spaces	Mass	Cost	Crew	Power
Advanced Comms/10	13.5	168	6.25	0	0.084
Advanced Comms/11	7.5	93.1	3.25	0	0.084
Advanced Comms/12	4.5	55.6	1.75	0	0.084

Name	Spaces	Mass	Cost	Crew	Power	Notes
Comm. Module (Xboat)/7	81.5	1,010	13.6	0-1	0.023	60k/6M mi range
Comm. Module (Xboat)/8	41.5	514	12.8	0-1	0.023	200k/20M mi range
Comm. Module (Xboat)/9	20.5	252	3.38	0-1	0.023	2M/200M mi range
Comm. Module (Xboat)/10	12	138.1	3.83	0-1	0.023	10M/1B mi range

Computer and Scientific Systems

See p. 45 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power
Computer System/7	4	48.3	120	0	0.08
Computer System /8	4	48.2	120	0	0.08
Computer System /9	2	24	60	0	0.08
Computer System /10	1	12	30	0	0.08

Name	Spaces	Mass	Cost	Crew	Power
Computer Lab/7	2	18.2	900	1	0.03
Computer Lab/8	2	18.1	900	1	0.03
Computer Lab/9	1.5	9.08	450	2	0.03
Computer Lab/10	1.5	4.59	225	6	0.03

Name	Spaces	Mass	Cost	Crew	Power
Enhanced Display/9	2.5	0.3	0.1	0	0.001
Enhanced Display/10	2.5	0.3	0.05	0	0.001
Enhanced Display/11	2.5	0.3	0.025	0	0.001

Name	Spaces	Mass	Cost	Crew	Power
Simulation Lab/9	5	11.4	2.1	2	0.014
Simulation Lab/10	5	10.9	1.55	2	0.014
Simulation Lab/11	5	10.9	1.53	2	0.014

Name	Spaces	Mass	Cost	Crew	Power
Physics Lab/7	2.5	11.2	1.48	1	0.3
Physics Lab/8	2.5	10.6	1.12	1	0.3
Physics Lab/9	2.5	10.2	1.06	1	0.3
Physics Lab/10	2.5	10	1	1	0.3

Name	Spaces	Mass	Cost	Crew	Power
Isolation Lab/7	20	100	10	1	0.03
Lab/7	2	10	1	1	0.003

Name	Spaces	Mass	Cost	Crew	Power
Probe Launcher/Control/7	1	4.13	0.223	0-3	0.003
Probe Launcher/Control/8	1	2.38	0.132	0-3	0.003
Probe Launcher/Control/9	1	1.59	0.066	0-3	0.003
Probe Launcher/Control/10	1	1.2	0.033	0-3	0.003

Drives

See pp. 37-39 for descriptions of these systems. *Thrust* is measured in stons. *Fuel* is measured in dtons per hour (where applicable); see pp. 38-39 for fuel-type abbreviations.

Reactionless Thrusters

See pp. 37-38 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust
Maneuver Drive/8	1	4.13	0.825	1/3	1.5	1.5
Maneuver Drive/Early 9	1	4	1.3	1/10	5	5
Maneuver Drive/Late 9	1	3.75	0.69	1/17	3	30
Maneuver Drive/10	1	3.4	0.16	1/60	4	40
Maneuver Drive/11	1	4	0.65	1/50	10	100
Maneuver Drive/12	1	4	0.65	1/100	10	100
Maneuver Drive/13	1	4.03	4.38	1/25	35	350

Reaction Drives

See pp. 38-39 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Liquid Fuel Rocket/7	0.5	2.07	0.104	0	0	115	86.3 R
Liquid Fuel Rocket/8	0.5	2.1	0.105	0	0	140	92.4 R

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Fission Rocket/7	0.5	2.1	0.419	0	0	4.3	1.29 W
Fission Rocket/8	0.5	2.08	0.416	0	0	9.25	0.555 W

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Solid Rocket Booster/7	1	25.2	0.25	0	0	6	–
Solid Rocket Booster/8	1	25.2	0.25	0	0	7	–

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
HEPlaR/9	0.5	0.85	0.75	0	Neg.	3.75	0.0033 H
HEPlaR/10	0.5	3.7	0.16	0	Neg.	14	0.0125 H
HEPlaR/11	0.5	3.7	0.09	0	Neg.	14	0.0125 H

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Rocket Drive/8	0.5	2.1	0.42	0	0	2.8	0.000336 H
Rocket Drive/E9	0.5	2.1	0.42	0	0	7	0.00084 H
Rocket Drive/L9-10	0.5	2.1	0.084	0	0	28	0.00336 H
Rocket Drive/11-12	0.5	2.1	0.42	0	0	70	0.0084 H
Rocket Drive/13	0.5	2.1	16.8	0	0	1,400	0.168 H

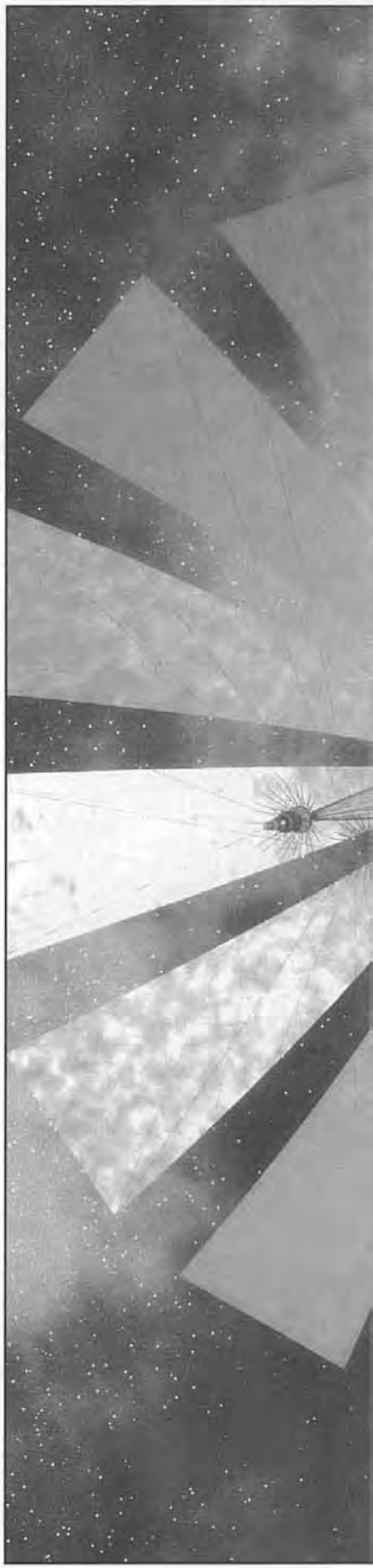
Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Metal/Oxide Rocket/8	0.5	2.06	0.412	0	0	55	35.6 MOX

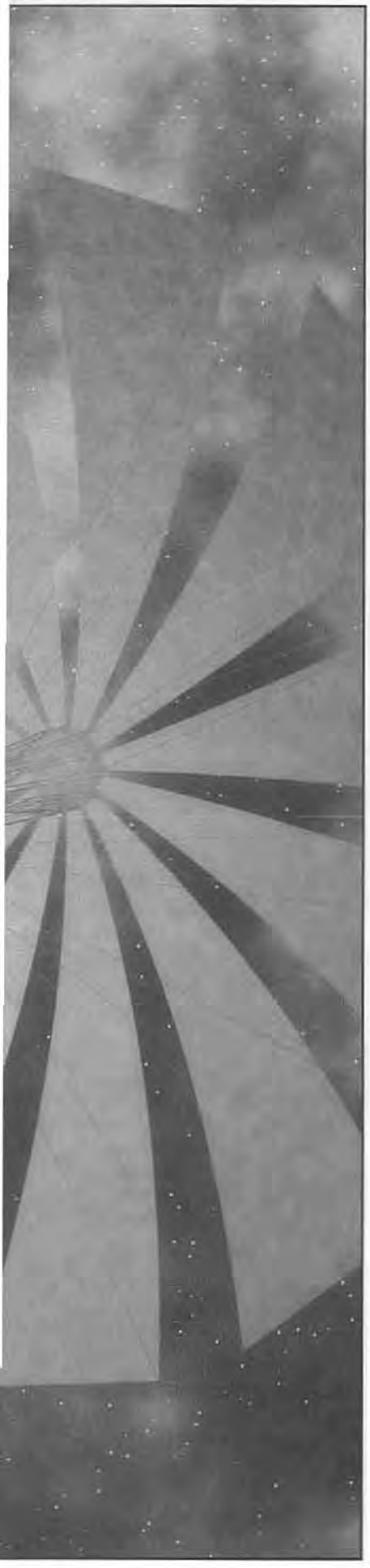
Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Bussard Ramjet/9	1	4	3.2	0	0	0.65	–
Bussard Ramjet/10	1	4	3.2	0	0	6.5	–

Atmospheric Drives

See p. 39 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
Turbo-Ramjet/7	1	4.16	0.833	0	0.35	17.5	0.525 J
Turbo-Ramjet/8	1	4.13	0.825	0	0.42	21	0.567 J
Hyperfan/9	1	4.16	0.416	0	0.55	27.5	3.3 H
Fusion Air Ram/9	1	4.2	0.84	0	0.55	27.5	–
Fusion Air Ram/10	1	4.16	0.833	0	1.1	55	–





Short-Term Reactionless Thrusters

See p. 37 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust
ST Maneuver Drive/8	0.5	3.03	0.605	1/5	1.1	1.1
ST Maneuver Drive/E9	0.5	2.8	0.91	1/14	3.5	3.5
ST Maneuver Drive/L9	0.5	3.13	0.575	1/20	2.5	25
ST Maneuver Drive/10	0.5	2.98	0.14	1/70	3.5	35
ST Maneuver Drive/11	0.5	3	0.488	1/66	7.5	75
ST Maneuver Drive/12	0.5	3	0.488	1/133	7.5	75
ST Maneuver Drive/13	0.5	2.88	3.13	1/40	25	250

Short Term Reaction Drives

See pp. 38-39 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
ST Liquid Fuel Rocket/7	0.5	3.15	0.158	0	0	175	126 R
ST Liquid Fuel Rocket/8	0.5	3.15	0.158	0	0	210	138.6 R

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
ST Fission Rocket/7	0.5	3.07	0.614	0	0	6.3	1.89 W
ST Fission Rocket/8	0.5	3.15	0.63	0	0	14	0.84 W

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
ST Rocket Drive/8	0.5	3	0.6	0	0	4	0.00048 H
ST Rocket Drive/E9	0.5	3	0.6	0	0	10	0.0012 H
ST Rocket Drive/L9-10	0.5	3	0.12	0	0	40	0.0048 H
ST Rocket Drive/11-12	0.5	3	0.6	0	0	100	0.012 H
ST Rocket Drive/13	0.5	3	24	0	0	2,000	0.24 H

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
ST Metal/Oxide Rocket/8	0.5	3	0.6	0	0	80	51.8 MOX

Short-Term Atmospheric Drives

See p. 39 for descriptions of these systems. Power generated is *per module*.

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Fuel
ST Turbo-Ramjet/7	0.5	3.04	0.608	0	0.25	12.5	0.375 J
ST Turbo-Ramjet/8	0.5	3	0.6	0	0.3	15	0.405 J
ST Hyperfan/9	0.5	3.04	0.304	0	0.4	20	2.4 H
ST Fusion Air Ram/9	0.5	3.08	0.615	0	0.4	20	–
ST Fusion Air Ram/10	0.5	3.04	0.608	0	0.8	40	–

Solar Sails

See p. 38 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Thrust	Notes
Solar Sail/7	0.5	22.4	11.2	0	0	0.003712	1.6-square-mile sail
Solar Sail/8	0.5	24.4	24.4	0	0	0.01886	7.5-square-mile sail
Solar Sail/9	0.5	25	25	0	0	0.3288	125-square-mile sail

Jump Drives

See p. 37 for descriptions of these systems.

Name	Spaces	Mass	Cost	Crew	Power	Notes
Jump Drive/9	2	8	5	1/5	10	Max Jump 2
Jump Drive/10	1	4	3.1	1/25	10	Max Jump 4
Jump Drive/11	1	4	3.05	1/50	10	Max Jump 5
Jump Drive/12	1	4	3.05	1/100	10	Max Jump 6

Appendix B

Weapon Tables

See p. GT158 for an explanation of these weapon combat values. The 1/2 and Max Range values for energy weapons are given in *miles* followed by *hexes*, for ease of use in the ***GURPS Traveller*** space-combat system.

Turret Energy Weapons

Standard Lasers

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Turret Laser, 43-MJ/8	1/60	5d×20	2,800/0	8,400/1	28	30
Turret Laser, 101-MJ/9	1/60	4d×40	14,000/1	42,000/4	33	30
Turret Laser, 250-MJ/10	1/60	5d×50 (2)	17,000/2	51,000/5	32	30
Turret Laser, 390-MJ/11	1/60	4d×100 (2)	23,000/2	69,000/7	32	30
Turret Laser, 405-MJ/12	1/60	5d×100 (2)	26,000/3	78,000/8	33	30
Turret Laser, 420-MJ/13	1/60	6d×100 (2)	29,000/3	87,000/9	33	30
Turret Graser, 390-MJ/14	1/60	6d×50 (5)	21,000/2	63,000/6	32	30

Heavy Lasers

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Turret Laser, 130-MJ/8	1/60	6d×30	4,900/0	15,000/1	30	30
Turret Laser, 303-MJ/9	1/60	7d×40	25,000/3	75,000/8	34	30
Turret Laser, 810-MJ/10	1/60	5d×90 (2)	31,000/3	93,000/9	33	30
Turret Laser, 1.3-GJ/11	1/60	7d×100 (2)	43,000/4	130,000/13	34	30
Turret Laser, 1.3-GJ/12	1/60	5d×170 (2)	47,000/5	140,000/14	34	30
Turret Laser, 1.3-GJ/13	1/60	5d×200 (2)	51,000/5	150,000/15	34	30
Turret Graser, 660-MJ/13	1/60	4d×100 (5)	28,000/3	84,000/8	33	30
Turret Graser, 1.18-GJ/14	1/60	5d×100 (5)	37,000/4	110,000/11	33	30

Mining Lasers

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Turret Mining Laser, 2.6-MJ/8	1	5d×5	22/0	66/0	11	25
Turret Mining Laser, 10.2-MJ/9	1	5d×10	140/0	420/0	16	25
Turret Mining Laser, 40-MJ/10	1	5d×20 (2)	210/0	630/0	15	25
Turret Mining Laser, 46.5-MJ/11	1	7d×20 (2)	250/0	750/0	15	25
Turret Mining Laser, 46.5-MJ/12	1	6d×30 (2)	280/0	840/0	16	25
Turret Mining Laser, 46.5-MJ/13	1	5d×40 (2)	300/0	900/0	16	25

High Energy Turret Weapons

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Turret Plasma Gun, 225-MJ/9	1/60	7d×100	1,600/0	4,800/0	27	30
Turret Plasma Gun, 430-MJ/10	1/60	7d×200	2,500/0	7,500/1	28	30
Turret Fusion Gun, 700-MJ/11	1/60	7d×300	3,400/0	10,000/1	29	30
Turret Fusion Gun, 700-MJ/12+	1/60	5d×500	3,700/0	11,000/1	29	30
Turret Particle Beam, 160-MJ/8	1/60	8d×80	1,400/0	4,200/0	27	30
Turret Particle Beam, 450-MJ/9	1/60	7d×200	2,500/0	7,500/1	28	30
Turret Particle Beam, 860-MJ/10	1/60	8d×300	3,800/0	11,000/1	29	30
Turret Particle Beam, 1.4-GJ/11+	1/60	5d×700	5,200/1	16,000/2	30	30
Turret Meson Gun, 1.39-GJ/13	1/60	6d×550 (!)	5,200/1	16,000/2	30	30

Bay Energy Weapons

50-Ton Bay Weapons

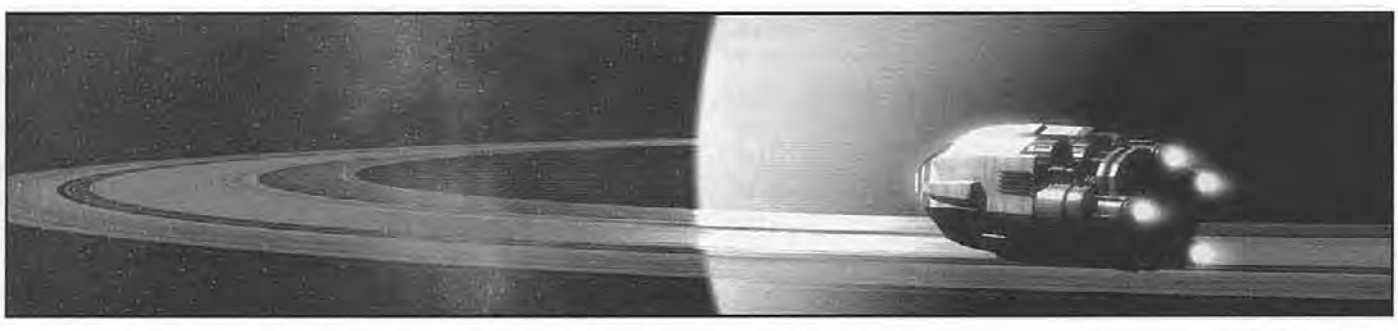
Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Plasma Gun Bay, 7.4-GJ/9	1/60	6d×500	9,300/1	28,000/3	32	30
Plasma Gun Bay, 12.81-GJ/10	1/60	6d×800	13,000/1	39,000/4	33	30
Fusion Gun Bay, 23.3-GJ/11	1/60	6d×1,200	20,000/2	60,000/6	33	30
Fusion Gun Bay, 23.3-GJ/12+	1/60	6d×1,400	21,000/2	63,000/6	34	30
Particle Beam Bay, 2.65-GJ,/8	1/60	5d×440	5,600/1	17,000/2	30	30
Particle Beam Bay, 7.4-GJ,/9	1/60	4d×1,000	10,000/1	30,000/3	32	30
Particle Beam Bay, 12.81-GJ,/10	1/60	6d×1,000	15,000/2	44,000/4	33	30
Particle Beam Bay, 23.3-GJ,/11+	1/60	8d×1,000	21,000/2	63,000/6	31	30
Meson Gun Bay, 12.81-GJ,/12	1/60	6d×1,000 (!)	15,000/2	44,000/4	33	30
Meson Gun Bay, 23.3-GJ,/13	1/60	4d×2,000 (!)	21,000/2	63,000/6	31	30

100-Ton Bay Weapons

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Plasma Gun Bay, 14.9-GJ/9	1/60	4d×1,000	13,000/1	39,000/4	33	30
Plasma Gun Bay, 28.5-GJ/10	1/60	7d×900	20,000/2	60,000/6	34	30
Fusion Gun Bay, 46.7-GJ/11	1/60	9d×1,000	28,000/3	84,000/8	34	30
Fusion Gun Bay, 46.7-GJ/12+	1/60	7d×1,500	30,000/3	90,000/9	35	30
Particle Beam Bay, 5.34-GJ,/8	1/60	7d×400	7,900/1	24,000/2	31	30
Particle Beam Bay, 14.9-GJ,/9	1/60	5d×1,000	14,000/1	42,000/4	33	30
Particle Beam Bay, 28.5-GJ,/10	1/60	8d×1,000	22,000/2	66,000/7	34	30
Particle Beam Bay, 46.7-GJ,/11+	1/60	5d×2,100	30,000/3	90,000/9	35	30
Meson Gun Bay, 28.5-GJ,/12	1/60	8d×1,000 (!)	22,000/2	66,000/7	34	30
Meson Gun Bay, 46.7-GJ,/13	1/60	5d×2,100 (!)	30,000/3	90,000/9	35	30

Spinal Mounts

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Spinal P-Beam, 250-GJ/8	1/60	5d×2,000	54,000/5	160,000/16	36	30
Spinal P-Beam, 420-GJ/8	1/60	6d×2,000	70,000/7	210,000/21	37	30
Spinal P-Beam, 670-GJ/8	1/60	7d×2,000	88,000/9	260,000/26	38	30
Spinal P-Beam, 1-TJ/8	1/60	8d×2,000	110,000/11	330,000/33	38	30
Spinal P-Beam, 670-GJ/9	1/60	6d×3,000	97,000/10	290,000/30	38	30
Spinal P-Beam, 920-GJ/9	1/60	5d×4,000	110,000/11	330,000/33	38	30
Spinal P-Beam, 1.8-TJ/9	1/60	5d×5,000	160,000/16	480,000/48	39	30
Spinal P-Beam, 3.1-TJ/9	1/60	6d×5,000	210,000/21	630,000/63	40	30
Spinal P-Beam, 569.5-GJ/10	1/60	7d×3,000	98,000/10	290,000/29	36	30
Spinal P-Beam, 870-GJ/10	1/60	6d×4,000	120,000/12	360,000/36	38	30
Spinal P-Beam, 1.7-TJ/10	1/60	6d×5,000	170,000/17	510,000/51	39	30
Spinal P-Beam, 2.7-TJ/10	1/60	7d×5,000	210,000/21	630,000/63	40	30
Spinal P-Beam, 530-GJ/11	1/60	6d×4,000	100,000/10	300,000/30	38	30
Spinal P-Beam, 840-GJ/11	1/60	7d×4,000	130,000/13	390,000/39	39	30
Spinal P-Beam, 1.6-TJ/11	1/60	7d×5,000	180,000/18	540,000/54	39	30
Spinal P-Beam, 2.8-TJ/11	1/60	7d×6,000	230,000/23	690,000/69	40	30



Spinal Mounts (Continued)

Name	RoF	Damage	1/2D Range	Max Range	Acc	SS
Spinal Meson Gun, 820-GJ/10	1/60	5d×3,000 (!)	98,000/10	290,000/29	38	30
Spinal Meson Gun, 1.4-TJ/10	1/60	6d×3,000 (!)	130,000/13	380,000/38	38	30
Spinal Meson Gun, 2.3-TJ/10	1/60	7d×3,000 (!)	160,000/16	480,000/48	39	30
Spinal Meson Gun, 3.4-TJ/10	1/60	6d×4,000 (!)	200,000/20	600,000/60	39	30
Spinal Meson Gun, 670-GJ/11	1/60	6d×3,000 (!)	97,000/10	290,000/29	38	30
Spinal Meson Gun, 1.1-TJ/11	1/60	7d×3,000 (!)	120,000/12	360,000/36	38	30
Spinal Meson Gun, 2.3-TJ/11	1/60	9d×3,000 (!)	180,000/18	540,000/54	39	30
Spinal Meson Gun, 3.1-TJ/11	1/60	6d×5,000 (!)	210,000/21	630,000/63	40	30
Spinal Meson Gun, 570-GJ/12	1/60	7d×3,000 (!)	97,000/10	290,000/29	36	30
Spinal Meson Gun, 870-GJ/12	1/60	6d×4,000 (!)	120,000/12	360,000/36	38	30
Spinal Meson Gun, 2.1-TJ/12	1/60	8d×4,000 (!)	190,000/19	570,000/57	39	30
Spinal Meson Gun, 2.9-TJ/12	1/60	6d×6,000 (!)	220,000/22	660,000/66	40	30
Spinal Meson Gun, 870-GJ/13	1/60	7d×4,000 (!)	130,000/13	390,000/39	39	30
Spinal Meson Gun, 2.3-TJ/13	1/60	8d×5,000 (!)	210,000/21	630,000/63	40	30
Spinal Meson Gun, 2.9-TJ/13	1/60	7d×7,000 (!)	240,000/24	720,000/72	40	30
Spinal Meson Gun, 3.4-TJ/13	1/60	6d×8,000 (!)	280,000/28	840,000/84	40	30

Missiles

Name	DR	HEAT Damage	KK Damage
250mm Missile/7	1	6d×60 (10)	–
250mm Missile/8	20	6d×60 (10)	–
250mm Missile/9	25	6d×60 (10)	6d×100 (5)
250mm Missile/10	40	6d×60 (10)	6d×100 (5)
250mm Missile/11	80	6d×80 (10)	6d×100 (5)
250mm Missile/12	120	6d×80 (10)	6d×100 (5)
250mm Missile/13	210	6d×100 (10)	6d×100 (5)

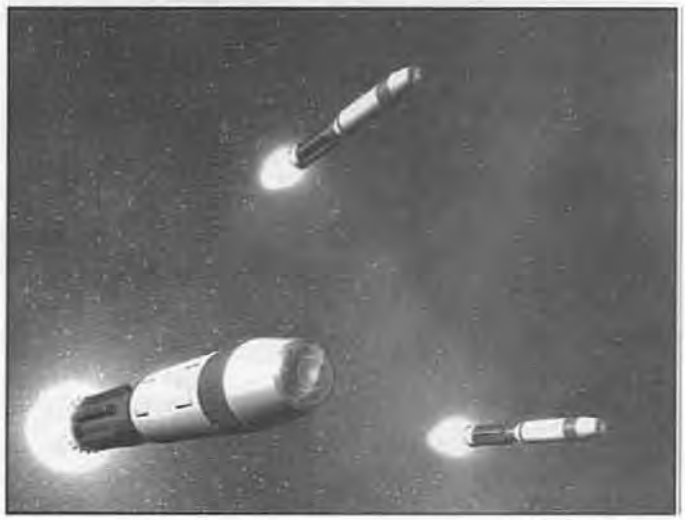
Name	DR	HEAT Damage	KK Damage
500mm Missile/7	1	5d×150 (10)	–
500mm Missile/8	60	5d×150 (10)	–
500mm Missile/9	65	5d×150 (10)	6d×300 (5)
500mm Missile/10	80	5d×150 (10)	6d×300 (5)
500mm Missile/11	300	6d×150 (10)	6d×300 (5)
500mm Missile/12	350	6d×150 (10)	6d×300 (5)
500mm Missile/13	400	6d×200 (10)	6d×300 (5)

Civilian Missiles

Name	DR	HEAT Damage	KK Damage
SIM-10 Missile	40	6d×60 (10)	6d×100 (5)
SIM-12 Missile	120	6d×80 (10)	6d×100 (5)

Deadfall Ordnance

Name	Damage	Skill	Cost
Lt. APDU SSM/10	6d×200 (3)	20	0.02
Lt. APSD SSM/11+	6d×240 (5)	23	0.02
Hv. APDU SSM/10	6d×200 (3)	20	0.10
Hv. APSD SSM/11+	6d×240 (5)	23	0.10
Lt. APDU GB/10	6d×310 (3)	20	0.03
Lt. APSD GB/11+	6d×340 (5)	23	0.02
Hv. APDU GB/10	6d×500 (3)	20	0.08
Hv. APSD GB/11+	6d×550 (5)	23	0.08
Lt. HEAT GB/10	5d×150 (10)	20	0.02
Lt. HEAT GB/11+	6d×150 (10)	23	0.02
Hv. HEAT GB/10	6d×200 (10)	20	0.07
Hv. HEAT GB/11+	6d×200 (10)	23	0.06



Notes

Abbreviations include *SSM:* Spike Submunition, *GB:* Glide Bomb, *APDU:* Armor-Piercing Depleted Uranium, *APSD:* Armor-Piercing Superdense, and *HEAT:* High Explosive Armor-Tapping. *Cost* is per complete missile. *Damage* is per missile for GBs, per submunition for SSMs. Each 250mm SSM carries seven submunitions, each 500mm 38. Also see pp. 52-54 for more information on how these function.

Nuclear Warheads: See p. 53 (and optionally, p. VE187) for damage and other considerations.

SATNUC Warheads: Each SATNUC submunition (seven per 250mm missile, 10 per 500mm) will attempt to attack a vehicle-sized target (size modifier +1 or more) within the burst radius of the round (1,300 yards for 250mm missiles, 3,400 yards for 500mm missiles). Each submunition rolls 3d vs. (warhead's TL + target's size modifier - IR cloaking) to hit. If successful, damage is 6d×2,000. Successful or not, all submunitions will explode on impact. Damage is 6d×200 to everything within the burst radius of the round, and 6d×20 to everything within twice its burst radius. Again, DR is squared against proximity blasts. (See p. VE193 for more information on SATNUCs.)

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JTAS is edited by Jon F. Zeigler, *GURPS Traveller* line editor for Steve Jackson Games.

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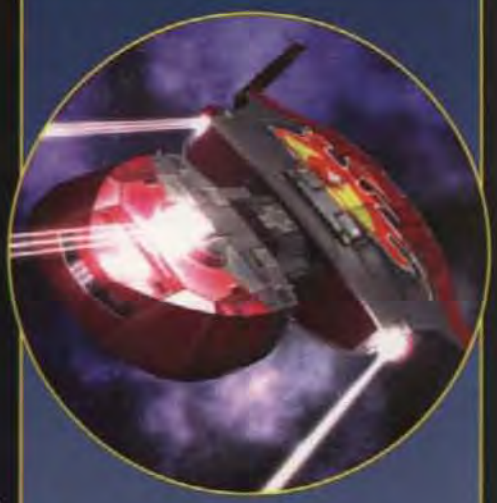

The ***GURPS Basic Set*** and ***GURPS Traveller*** are required for full use of this book in a ***GURPS*** campaign. The background presented here will be of great value to any ***Traveller*** campaign, and will also serve as a source of inspiration for other SF gamers.

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FIRST EDITION, FIRST PRINTING
PUBLISHED SEPTEMBER 2003

ISBN 1-55634-475-9

9 781556 344756 52495

SJG02495 **6613**

Printed in the USA

STEVE JACKSON GAMES
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