ELITE ROLEPLAYING

TECHNICAL MANUAL – 1st EDITION

OR: "YES, BUT WHICH BUTTON DO I PUSH TO FIRE THE PHASERS?"

BY
SCOOTER

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ABOUT THIS DOCUMENT

The Elite Roleplaying Technical Manual was developed to provide a handy reference for the detailed technical background that our members sometimes need. It is written in a style that is accessible to everyone regardless of their level of technical knowledge. Whether you're looking to learn a bit more about warp drive, or just learning about it for the first time, we hope that you'll find this enlightening.

This document is NOT required reading, but it will make you a better roleplayer. Those who do not have a copy of the TNG or DS9 Technical Manual will find this to be extremely helpful, and those who do have either one or both of the aforementioned books will find this to be a lot easier to understand thanks to the reduced amount of technobabble.

This document is divided into five major sections:

I. Roleplaying Introduction. This section will help you with creating and running both single and multi-part plots. Whether you're looking for some inspiration, or wondering how to keep people interested, the answers are within.

II. A Technical Primer. This section touches briefly on both major and minor ship's systems, with a brief description of each system, a more detailed explanation of how it works, as well as definitions of important scientific terms.

III. Standard Operating Procedures. What do you do when you encounter an unknown ship? Should you raise shields to protect the crew or keep the lowered as a sign of non-hostility?

IV. Emergency Procedures. When bad things happen to good starships.

V. A Celestial Bestiary. A collection of weird, sometimes dangerous, and scientifically semi-plausible phenomena to help inspire your imagination.

I. ROLEPLAYING INTRODUCTION

1.0 DRAMATIS PERSONAE

1.1 CREATING YOUR CHARACTER

Creating a character is not only the first step in joining a roleplaying group, but also the most important. More than likely you will be forever attached to and associated with your character. The reasons are two-fold. First and foremost, your character is essentially a combination of your own personality as well as what you aspire to be. This is why Hollywood casting directors literally spend days if not weeks searching for the perfect actors who fully grasp the essence of the character. Secondly, your fellow roleplayers will get to know you through your character and find it both difficult and undesirable to think of you by another name.

Your first inclination might be to create the type of character that you would like to be if you were starring in a Star Trek episode or novel. Unfortunately for you, the universe is not full of heroes who save the universe on a weekly basis. The vast majority of Starfleet personnel are normal, average people, and you need to keep this in mind whilst creating a character. Things such as Romulan defectors and ex-Borg are extremely rare.

When thinking about your character's background, think also of your own background. What did your parents do for a living? In what areas did they encourage you most? Perhaps one or both of your parents died when you were young. Think also about your strong points: are you good at sports, arts, or academics? Of course, you are not limited to your real background, particularly if you choose to play as a species other than human; your character may have grown up on a conquered world. If you plan on getting creative, you might want to ask someone to critique your character biography before you commit to it.

1.2 BECOMING YOUR CHARACTER

Roleplaying requires cooperation. Although one person may initiate a story, everyone must contribute to keep it going. By putting yourself in your character's shoes, you make the experience more enjoyable not only for yourself but also for others. You need to consider how your character's background reflects on their personality. Try to think like a Starfleet officer and approach things in character. Immerse yourself in the game and think about how your character would react. Over time your character should begin to develop identifiable traits.

It is important to keep the mood by staying in character as much as possible. Avoid off-topic chatter as much as possible. Instead of saying hello and goodbye to everyone who comes and goes, greet them in character as you pass by them in the corridor. Not only does this provide a more realistic experience, it also helps everyone to follow the plot because they're not as distracted. Sometimes you need to involve yourself in the plot, and perhaps even help steer it. Don't always rely on everyone else to keep things moving.

As you stand or sit at your station, think about what you would be doing if it were real. One of the primary causes of boredom is when people wait for someone to give them something to do but it doesn't happen. If you aren't currently at a station, think about what tasks you would be doing as part of your duty aboard a starship. Later in this chapter we'll take a look at what the various duties are for each department.

Of course, you aren't always on duty. Make sure to also explore your character's off-duty activities. In-character socializing in the crew lounge over a meal or snack can be one of the most fun aspects of roleplaying. You may also partake in leisure and exercise activities on the holodeck or in your quarters.

1.3 FEDERATION CITIZENSHIP

The United Federation of Planets was founded in 2161, and has since grown from the five founding members to upwards of 150 member worlds, with dozens of planets being considered for membership at any given time. Membership has its benefits, but also its responsibilities. As a Starfleet officer, part of your mission is to seek out potential member worlds and give a preliminary assessment to the Federation Council so that they can determine where to deploy their ambassadors.

The evaluation period for candidate worlds is extremely long, often lasting more than a year, and rightfully so, for once a candidate world is accepted they gain instant recognition as a full member. This is one of the primary reasons why so many worlds desire to join the United Federation of Planets. Member worlds enjoy both economic and military support. Planets which suffer from poverty, sickness, or famine are grateful for the assistance of their fellow members. Border worlds appreciate the protection of Starfleet in their sectors, particularly when their neighbors are not very friendly, as in the case of the Romulan Neutral Zone.

In exchange for these benefits, the Federation Council expects each world to contribute resources to maintain Starfleet, fund research by the Science Council, and provide emergency services for the other Federation members in their area. Planetary officials must regulate trade and provide either ground-based or orbital facilities for this purpose. Last but not least, Federation members must uphold the laws of the Federation and ensure that no one's rights are violated.

There are two ways in which a world can join the Federation. In most cases, they have an existing relationship with the Federation (such as a treaty) and decide to petition for membership. In other cases, a world previously unknown to the Federation will request membership and a Starfleet ship will be sent to investigate. Either way, certain requirements must be met:

- Possess Faster-Than-Light Travel.
- Benefit from One Government.
- Exist Peacefully With Its Neighbors
- Accept the Principles of the Federation.

Colonies are not quite Federation members, but they also enjoy some of the same benefits. A colony is usually sponsored by the planet from which the colonists came from, though not in all cases. Colonies can not send their own representatives to the Federation Council. As a colony grows larger, it may decide to seek independence and become a full member. Alpha Centauri IV, one of the founding members, was the first Earth colony to gain independence.

1.4 SERVING IN STARFLEET

Starfleet was one of by-products from the formation of the United Federation of Planets in 2161. It serves primarily to expand the boundaries of knowledge through exploration and research, but also to defend the borders of the Federation from unfriendly neighboring factions. To serve among Starfleet's ranks is one of the most sought after careers among both Federation citizens and non-citizens.

Starfleet Command is based in San Francisco on Earth, but is supported by more than five hundred command, scientific, strategic, service, and supply posts scattered throughout Federation space, both orbital and planetary. Although all starbases and starships are connected via the subspace communications network, the galaxy is a big place and it is not unusual for a starship to be out of contact with Starfleet for several days. As such, starship captains are given broad discretionary powers to determine the most appropriate course of action when it is not convenient to ask an admiral for guidance. The captain is not completely without guidance of course, for he or she needs only to refer to the Starfleet Manual of General Orders and Regulations, which contains standard operating procedures for all aspects of starship operation.

Given a choice, most cadets would choose to serve aboard a starship, but there are many more possible postings to which he or she might be assigned, including starbases, Starfleet Command itself, scientific outputs, sensors arrays, etc. But before one even becomes a cadet, they must choose which branch to serve in. Starfleet operations are divided into five branches: command, engineering, security, science, and medical. Engineering and security share many commonalities, as do science and medical. As such, personnel in these departments will find their duties overlapping with the duties of the personnel in the other department which shares their uniform color. It is also not uncommon for an officer to transfer from one department to another in the course of their career.

Command. Officers in the command branch ensure the smooth operation of their command and are responsible not only for a mission's ultimate success or failure, but also for the safety of their crews. While the positions of captain and first officer bear the most burden, officers in this branch can be found throughout a starship's organization, applying their skills and abilities in science labs, engineering departments, at the helm of the ship, or in the cockpit of a shuttlecraft. For example, a command officer might supervise repairs on the lateral sensor array, or a lead scientific research team analyzing rock samples. They are trained in crisis management, diplomacy, leadership, tactics, and flight operations.

Science. Science officers oversee scientific research and provide the commanding officer with scientific information needed for command decisions. Some science officers specialize in a certain area, such as botany, anthropology, astrophysics, geology, or chemistry, while others have a broader focus and can handle a variety of scientific conundrums. Combined with their standard Starfleet training, science officers are prepared for almost anything. Every starship has several laboratories on board with numerous experiments and investigations ongoing at any given time, either as part of the primary mission or most often as a secondary mission. While science officers usually report to the Chief Science Officer, a specialist may be asked to advise the command staff directly.

Medical. Medical officers are scientists who specialize in preserving health and treating disease. Most apply their knowledge practically by treating injuries and healing the sick. Others engage in research searching for cures to disease, developing new treatments, and studying alien life forms. Medical officers serving aboard starships often find themselves on the forefront of disease outbreaks. Included in the medical branch are the counselors, who are responsible for the emotional well-being of the ship's crew. They provide individual guidance and advice to crewmembers, and mission-specific advice to commanding officers.

Engineering. Engineers are responsible for maintaining the physical operation of a ship or starbase, from the complex propulsion systems to the simplest auxiliary systems. Not only do they repair equipment damaged in ion storms, but they also maintain systems which are operating normally to ensure that they continue to operate at peak efficiency. As experts in the practical application of science and mathematics, engineers often play a vital role in most missions, whether it be figuring out how an alien device operates, or finding pragmatic solutions to unusual hazards. Engineers, together with security officers, can also be found managing ship operations from the bridge as well as operating transporters.

Security. Security officers serve as a combination of soldier and police officer. They patrol sensitive areas, beam into potentially hostile situations, protect dignitaries, arrest law-breakers, conduct investigations, and handle tactical engagements. Some security officers often receive special training to operate the large-scale defensive systems such as the ship's phasers and torpedo launchers. Security officers, together with engineers, can also be found managing ship operations from the bridge as well as operating transporters.

Every starship and starbase has a commanding officer who is responsible for the operation of the starships or starbase as well as the behavior and performance of their crew. This person is usually of the rank commander or higher, though on some small installations the commanding officer can be as low as a lieutenant. When the commanding officer is otherwise occupied, they rely on their first officer to ensure that everything runs smoothly. The first officer is responsible for maintaining the duty roster and supervising department heads. The actual creation of the duty rosters are the responsibility of the department heads. Department heads are also responsible for prioritization of mission assignments, and last but not least the personnel in their respective departments. While the chain of command may appear to be well-established, there is also some flexibility. It is not unheard of for a senior officer to defer to a junior officer when a decision is based on knowledge from the junior officer's area of expertise.

The life of a Starfleet officer involves a lot of routine. Every day each officer must follow a schedule outlining their duties for the day and tasks which must be accomplished. The duty roster is cycled at regular intervals so that each officer is not always performing the same duties. The life of a Starfleet officer also involves a lot of flexibility. For example, one hour is allotted each morning before an officer is required to report for duty, but an officer may sleep in as long as he or she likes as long as they are able to report for duty at the specified time.

2.0 PLAYING THE GAME

2.1 PLOT DEVELOPMENT

There are two types of roleplaying session formats: episodic and serial. Most roleplaying sessions which take place on the Public Server are in episodic format, where the plot and characters, change from session to session. Each episode is unrelated to the others, except in the case of a story arc. A story arc is a short group of episodes with related plots and usually some or all of the same characters. Most roleplaying sessions which take place in the Virtual Fleet are in serial format, where the characters are the same and each episode flows together to create one long story. In serial format, quite often certain plot elements will pop up early on and not get fully-resolved until towards the end. Serial format also allows the players to explore their characters, as well as the situation, in much greater detail than episodic format can allow even with a story arc.

According to English teachers everywhere, a plot is supposed to consist of four elements: exposition, complication, climax, and resolution. So to begin, we'll need to establish a current mission for our exposition. Given the diverse nature of Starfleet, there are a wide variety of mission types to which a starship may be assigned. While some starships are specifically suited to certain mission types, there are others which are capable of successfully completing a mission from any category, to some extent. The five basic categories are:

- Exploration
- Defense
- Diplomacy
- Emergencies and Natural Disasters
- Scientific

Exploration. There are two types of exploration missions: deep-space exploration and planetary exploration. A deep-space exploration mission could involve cataloguing planetary systems, nebulae, black holes, or other stellar phenomena. Deep-space missions are not usually highly detailed, unless the phenomenon is time-sensitive. Anything more than cataloguing the number of planets and moons in a star system is left for a subsequent planetary exploration mission. Planetary missions begin with a detailed sensor scan of the surface. Atmospheric composition, geological points of interest, and plant and animal life are documented, creating a map of the surface which survey teams use to examine the world more closely upon beaming down or descending via shuttlecraft.

Defense. There are four types of defense missions: patrol, threat alert, tactical, and convoy and escort. Convoy and escort missions are the most uneventful of defense missions. While escorting a fleet of freighters or important dignitaries is not everyone's idea of fun, the completion of these missions is often vital, making such missions higher priority. Most defense missions are patrol missions. Starfleet assigns ships to patrol hostile and potentially hostile areas to show neighboring races that Starfleet is committed to defending Federation space, and to be in an optimal position should one or more of these races decide to attack. Once a starbase or colony is attacked, the patrol mission escalates to a threat alert mission and one or more starships are sent to respond, and may escalate again to a tactical mission if they become engaged in combat. The Federation is obligated to protect both the lives of its citizens, as well as the citizens of its allies, against aggressors.

Diplomacy. There are two types of diplomatic missions: first contact and intergalactic affairs. Starfleet's mission statement for many years has been, to seek out new life and new civilizations. In the case of pre-warp societies, this must be done covertly so as not to make them prematurely aware of other species and potentially disrupt the society's natural development process. In the case of species already possessing warp technology, a first contact mission is like a welcoming committee to the galaxy. Much to the chagrin of many Starfleet officers, the majority of diplomatic missions involve intergalactic affairs. As representatives of Starfleet, a starship captain and his or her crew is often called upon to negotiate trade agreements, arbitrate local disputes, and participate in conferences either as an interested delegate or a neutral observer. A starship often arrives well ahead of a fully-trained ambassador, and so starship captains must draw upon the diplomatic skills they learned at the Academy to speak on behalf of the Federation both tactfully and courteously.

Emergency and Natural Disasters. There are two types of emergency and natural disaster missions: aid and relief, and evacuation. Aid and relief missions involve responding to a planet-wide disaster such as plague or famine. Or it might involve taking measures to prevent a planet-wide disaster from occurring, such as destroying approaching asteroids or relieving tectonic stress. In some cases it may not be possible to prevent the disaster, in which case the mission becomes one of evacuation. Starfleet's largest starships are capable of transporting thousands of refugees to the nearest starbase or suitable world.

Scientific. There are two types of scientific missions: experimentation and investigation. Several investigation missions are happening simultaneously aboard most starships as secondary missions. Among the things being investigated are data and samples collected from previously visited planets, as well as nearby astronomical phenomena that are not part of the starship's current primary mission. Some investigation missions result in the formulation of theories or the design of improved equipment, creating an experimentation mission. During an experimentation mission, the crew quite often is taking orders from a civilian science team, but it could also be that the starship is making a routine visit to a research station at a time coinciding with the execution of a scientific experiment.

In addition to these five categories, there are other possible expositions for our plot. Perhaps Starfleet has sent your ship on a special espionage mission, or maybe you have been tasked with infiltrating an underground group. For Federation non-Starfleet characters, there are trade missions where perhaps the transaction doesn't go according to plan. You can also have character development episodes where for example a Bajoran officer might be struggling with his or her spirituality, or a crew member is struggling with the death of a loved one.

2.2 PLOT TWISTS

After the exposition comes the complication. There are four types of central conflict that can occur in a plot, either on their own or together: Man Against Man, Man Against Nature, Man Against Self, and Man Against the Unknown. In Man Against Man, two people are in disagreement about something and only one side can win. The conflict could be between enemies or even allies, and not necessarily between any of the main characters either. In Man Against Nature, the crew is pitted against the forces of the universe in an effort to achieve their primary missions goals. In these cases it may not be convenient to achieve secondary mission goals. In Man Against Self, a character must overcome some internal turmoil. This type of conflict is more difficult and best executed in conjunction with another type of conflict. In Man Against the Unknown, the solution, and sometimes even the problem itself, is unclear.

On your way to the climax, you will undoubtedly encounter one or both of the two types of plot twists: turns and pinches. A turn takes the plot in a different direction, and answers some questions while asking others. Quite often plot turns come in pairs, with the first turn resulting in most of the action and the second turn tying up the loose ends and returning the plot to its original path. A pinch is a plot device which increases the pressure on the crew. Pinches also usually come in pairs and help to improve the flow of the plot by providing a method by which to achieve certain outcomes.

How these plot twists are executed and how you reach the climax and resolution will be up to you and your fellow roleplayers. You'll need to draw upon your creative juices to inspire you.

2.3 SUBPLOTS

If a plot is already occurring and you are having trouble involving yourself in it, you can create a subplot. A subplot runs in parallel with the main plot, but the events that occur in the subplot have no effect on the main plot. For example, your character's off-duty activities are a subplot (even if there is no plot occurring, since the effect on your fellow crew members is negligible). Sometimes the nature of the main plot makes it difficult for certain characters to participate. Here are some subplot ideas for each department:

- Command: coordinate a team performing a secondary mission.
- Engineering: perform routine maintenance on systems and equipment.
- Security: practice combat skills on the holodeck.
- Science: study astronomical phenomena in the area that is not interesting enough to warrant a change in primary mission.
- Medical: read the latest medical journals or do some research of your own.

Even if you are quite involved in the primary plot, a subplot can still add a lot of fun to the roleplaying session and help to keep everyone on their toes. For example, you could start a weekly poker game, or share a meal with another crew member. Maybe your character is in the habit of exercising every morning. You're only limited by your imagination. Subplots can span episodes in a story arc, or in the case of your personal habits, span all roleplaying sessions of which you are in attendance.

2.4 NON-PLAYING CHARACTERS

Non-playing characters (NPCs) are the bread and butter of roleplaying. The population of the ship simply cannot be limited to the number of playing characters present, for there is far too much work to be done (contrary to certain Star Trek episodes depicting a single person running the entire ship). Being able to use non-playing characters effectively is one of the marks of an elite roleplayer. There are three types of non-playing characters: special guest stars, minor characters, and extras.

Special guest stars are the most developed NPCs. Quite often this is because they are established characters from one of the television series. Minor characters are recurring characters that are somewhat developed, but not fully so that their characters can be explored to some extent as part of a plot or subplot. Extras are the least developed characters, and in many cases do not even have a name. Extras are usually used once or twice and then never seen again.

Just like your own character, you can create a believable and enjoyable non-playing character by putting yourself in their shoes. What is the NPC's motivation? Don't be too hasty to pick a simplistic motivation, or the character won't have much of a personality. Motivations are usually complex and based on several factors. Also remember that "evil" characters do not consider themselves as such; from their perspective, they are doing what is right and you are the evil one. Think also of what the NPC's long-term goals are. Perhaps they are hoping for a promotion, or a transfer. Maybe the NPC is hoping to get married, or if he or she is already married, to have children. An NPC who already has children will behave differently from an NPC who does not.

2.5 BRINGING IT ALL TOGETHER

The concepts discussed in this section are merely concepts until you actually put them to use, which can be easier said than done when you introduce the human element. Everyone may have an idea of what they want to do, but some of those ideas might not be compatible with each other. It's been proven time and again that anarchy doesn't lead to progress, so inevitably there must be a leader, whom we call the Narrator.

In most cases, the Narrator is the Commanding Officer, though in some cases it may be a visiting admiral or a mission specialist temporarily assigned to the ship as an adviser. As the Narrator, it's your job to ensure that the story goes in a single direction instead of in opposite directions. Less experienced roleplayers will be looking to you to move the story along, and you'll need to do what you can to include them. Remember that Starfleet is more collaborative than hierarchical: a good Commanding Officer recognizes that any one of a thousand crew members could have just the right idea to solve a problem. Rather than relying on your own ingenuity, ask your bridge officers to suggest options and get them to examine them to see which one yields the best results.

Of course, there's also the old Earth saying: "Too many cooks spoil the soup," and if your name is Neelix, well then it only takes one. Although it's good to try and include everyone's ideas, as Narrator you must also be discerning. If a player is sidetracking the plot with extraordinary feats or occurrences, it may be necessary to attempt to undo the damage, and if it can be done whilst staying in character, even better. Everyone likes a good story, but it needs to be believable or people will lose interest. Conversely, the story can't be too boring either or people will lose interest. Unfortunately there are no hard and fast rules for the length of time between major plot points, or how in-depth subplots can go without detracting from the main plot. Everything depends entirely on the players, so in most cases you'll need to play it by ear.

If it so happens that you are not the Narrator, don't think that you are just along for the ride. Every player is responsible for helping to move the story along. A burden like that is much too big for one person. When contributing to the plot, be as descriptive as possible. Don't just say a nebula appears on screen, elaborate on it. Describe the colors, and how your character feels when he or she sees it. Offer suggestions when the Commanding Officer is looking for them. If you notice that someone is being left out, try to include them. If you're not in the same department, mention it to their department head.

II. A TECHNICAL PRIMER

3.0 SPACECRAFT STRUCTURE

3.1 FRAMEWORK AND EXTERIOR CONNECT HARDPOINTS

Starships, as well as starbases, are constructed primarily of tritanium and duranium. The first step in construction is the primary spaceframe, which is a grid-like structure to which the hull is attached. Inside this the secondary framework is constructed to which the interior is attached. The primary spaceframe and secondary framework are of course physically attached to each other. The reason for attaching the exterior and interior to different structures is to reduce tension as well as absorb sound and vibration. The secondary framework is segmented for easier refitting in the future. The interior is built modularly so that components can be mass-produced and then attached using work bees.

Since the Ambassador-class, starships have been designed with numerous exterior connect hardpoints, the majority of which are found on the dorsal spine. These hardpoints facilitate connection of the starship's systems with those of a starbase, including: electro plasma system, optical data network, main computers, structural integrity field, inertial dampings field, and matter and antimatter tankage. These connections are used for both monitoring as well as resupplying.

3.2 STRUCTURAL INTEGRITY AND INERTIAL DAMPING

The structural integrity field system compensates for internal and external forces that would otherwise be too much for the spaceframe to handle. The inertial damping system prevents crew members from feeling the effects of acceleration by absorbing potential energy as it is converted to kinetic energy. Both systems consists of several forcefield generators equidistantly located throughout the starship or starbase. Backup generators are also present so that maintenance can be performed without disrupting normal operations, or in case one should fail. Despite the similarity of these two systems, they operate independently and perform different functions.

3.3 SAUCER SEPARATION AND PLANETFALL

Some starships are capable of separating into two or more independent components. In certain emergency conditions, it may be necessary to separate the ship to protect civilians (eg. Galaxy Class) or to gain a tactical advantage (eg. Prometheus Class). This procedure is rarely executed due to its highly complex nature. Secondary systems must be brought online (power core, computer core, etc.) and primary systems must be disconnected (turbolift, power couplings, etc.) prior to beginning separation sequence. The docking latches are then retracted, and each computer must compensate for the change in flight dynamics as the components separate. This is especially dangerous if separation occurs at warp and not all components are independently capable of warp velocity.

Some starships are capable of planetary landing. In some cases it is more efficient to land the entire ship than to use transporters and/or shuttlecraft (eg. planetary evacuation). Like starship separation, there is an amount of risk involved with landing an entire starship. It is important to reduce speed within the atmosphere as much as possible to prevent permanent ecological damage. On certain types of planets, suitable landing areas are rare due to extremely rough terrain.

4.0 COMMAND SYSTEMS

4.1 OPERATIONS MANAGEMENT

Onboard a starship, the Bridge is the primary command center during alert and crisis situations. On a starbase, this function is performed by the Operations Center. The bridge is separate module from the rest of the ship, allowing for easy replacement during a control systems upgrade, and some have dedicated life support systems to protect the senior officers during atmospheric failure. On a starship capable of separation, the Battle Bridge is the secondary command center either during Separated Flight Mode or total Main Bridge incapacity. Engineering serves as the tertiary command center on starships capable of separation, and the secondary command center on starships not capable of separation.

The Bridge directly supervises all primary mission operations, both on and off the ship, and coordinates all departmental activities. Secondary mission functions are also monitored and prioritized from this location via the Operations Management console. The Operations Manager is responsible for priority and resource allocation to minimize conflict between departments and ensure that primary mission goals are not jeopardized. Most of the work is done by the main computer, but some decisions are beyond the scope of the artificial intelligence software.

When more than one course of action is possible, the console will display a menu of all the options. The Operations Manager is not limited by these options, and may input a different option. The amount of decisions required by the Operations Manager increases with the alert status of the ship, and depending on the circumstances it may be necessary to delegate certain portions to additional crew members. For example, environment functions are delegated to the Environment console during red alert status. If there is an away mission in progress, mission operations are delegated to one or more Mission Operations consoles.

4.2 FLIGHT CONTROL

The Flight Control Officer (still often referred to as the Helmsman) navigates and pilots the ship from the Flight Control console. Most of these functions are handled automatically by the main computer, but like the Operations Management console there are often times when human intervention is required, such as executing a maneuver that exceeds the capacity of the inertial damping system.

There are five input modes for specifying a flight plan: destination planet/star system/facility, destination sector, spacecraft intercept, relative bearing, absolute heading, and galactic coordinates. In each case, the main computer automatically determines the optimal flight path, and then the Flight Control Officer decides whether to accept this course or modify it.

Bearings are measured relative to the starship's orientation; in this case 000-mark-0 is straight ahead. Headings are measured relative to the center of the galaxy; in this case 000-mark-0 is the direction of the galactic core. Both bearings and headings are specified as a combination of azimuth and elevation (each specified in degrees).

The Milky Way galaxy is an astronavigational nightmare, due to its rotation which occurs at different rates depending on distance from the core. As a result, things are never in the same place as they were before. Guidance and navigation is accomplished by referencing several artificial navigational devices (Federation Timebase Beacons, subspace radio relays, other ships, etc.) as well as natural celestial. These objects are continually surveyed by passing starships and detailed recordings are downloaded and synchronized during stops at Federation starbases.

4.3 TACTICAL

The Tactical Officer oversees shipboard security functions and starship defense functions from the Tactical console. On some starships, the Tactical console is large enough to accommodate a second Tactical Officer, though under most circumstances the workload is light enough to be handled by one person. During cruise mode, the Tactical console displays readouts of armory inventory and security team personnel assignments. Security teams can be dispatched by voice command or manual input.

Shipboard security functions are divided into three tiers. The first tier covers basic crew safety, using passive scans from internal sensors. During diplomatic and cultural missions, the second tier provides an additional level of protection using active scans from internal sensors. The third tier includes high-level counterintelligence measures to detect signs of sabotage or terrorism; this tier is rarely activated since the probability of such threats is extremely low.

Starship defense functions include shields, phaser banks, and photon and quantum torpedoes. During alert conditions, the Tactical Officer coordinates with the Flight Control Officer with regards to guidance, and the Operations Manager with regards to targeting data via the long and short range sensor arrays. The Tactical Officer also has access to the tractor beams, and may launch sensor probes and message buoys.

4.4 COMMAND STATIONS

The captain's chair is located in the center of the Bridge to maximize efficiency of interaction with other bridge officers as well as provide an unobstructed line-of-sight of the viewscreen. The armrests incorporate small status displays which allow the commanding officer to perform a wide variety of functions without having to get up, from simple log entries to overriding ship operations during emergency situations. Many ships also provide a chair to the captain's right-side for the first officer, with a slightly larger information display. Additionally, some ships have a third chair on the captain's left-side for an advisor, whether it be the ship's counselor, a mission specialist, or an admiral.

4.5 SCIENCE STATIONS

One or more science stations can be used by researchers, science officers, and mission specialists to provide realtime scientific data to bridge personnel. Each station is configured for independent operation by default, but they can be linked together if two or more persons are working cooperatively. The science stations can also be used to coordinate the activities of the science labs, and have a higher priority access to the sensor arrays than the science labs.

4.6 ENVIRONMENT

During Alert situations, monitoring and control of the life support systems is delegated from the Operations Management console to the Environmental Systems station to reduce the workload of the Operations Manager. The Environmental Systems Officer monitors atmosphere, temperature, gravity, inertial damping, shielding subsystems, consumables, and waste management systems.

4.7 ENGINEERING

The Engineering station permits the Chief Engineer to keep an eye on ship's systems while on the bridge, usually during Alert situations. Several redundant ODN links ensure full access even during a major control systems failure. The station is capable of addressing each component of each ship's system individually, providing great flexibility to meet the challenges of the unknown. Some ships boast more than one engineering station, allowing two engineers to work concurrently on a problem. During cruise mode the functions of this station are monitored by Flight Control and Operations Management.

4.8 COMMUNICATIONS

On older starships, a communications station was commonplace. Today, this function is primarily handled by Operations Management. Due to the ever-rising hostilities faced by the Federation, newer ships are again being outfitted with one or more communications stations. These stations provide a facility for decrypting coded transmissions, analyzing background radiation for hidden transmissions, and managing the complexities of fleet communications during joint missions.

5.0 COMPUTER SYSTEMS

5.1 COMPUTER CORES

At the heart of every starship are two or more computer cores. The computer core provides centralized control of all systems on a starship, starbase, etc. Personnel may interact with the computer both tangibly and verbally via the intuitive Library Computer Access and Retrieval System (LCARS) software. Each computer core is capable of fulfilling the requirements of a starship, but redundancy allows room for failure as well as routine maintenance. In the case of failure, failover is virtually instantaneous, with only secondary systems having any noticeable downtime. The optical data network (ODN) is capable of transmitting information at speeds in excess of light; refer to your starship's main computer for exact transfer speeds and memory capacities. In addition to the computer cores, hundreds of subprocessors are located throughout the ship to improve response times and provide additional redundancy. Each subprocessor has an ODN link as well as a dedicated link to one of the computer cores. Certain areas of the ship, such as the Bridge for example, have several subprocessors allowing that area to continue operating even during complete systems failure.

5.2 PERSONAL ACCESS DISPLAY DEVICE

Perhaps the most common piece of technology found in the Federation, the PADD can be used to track appointments and contacts, communicate with friends, write notes, send and receive reports, and remotely control ship's functions. PADDs come in almost as many sizes as there are uses for them.

Each PADD is equipped with a subspace transceiver assembly (STA) allowing the PADD to communicate with the ship's main computer both onboard as well as from a planet's surface. All transmissions are encrypted. If a PADD is brought into proximity of another Starfleet computer system, it is also able to access that particular computer system, though not necessarily to the same extent as the user may not have the same access level on the other computer system. A Starfleet PADD cannot be used to access a non-Starfleet computer system at this time for security reasons.

PADDs are quite often personalized to an individual user, though there are also many non-personalized PADDs which are usually customized for a specific purpose. There is usually no need to give someone a PADD since most information is centrally available from the ship's computer. Some exceptions to this include the use of PADDs in classrooms, since children usually do not have their own PADD, as well various recreational uses, since people do not always want to carry a PADD around while off-duty. Some people prefer to use multiple PADDs to compare information more quickly and easily than switching between sources on a single PADD.

5.3 ISOLINEAR OPTICAL CHIPS

Since 2349, isolinear optical chips have been the primary data storage medium on Federation starships. Composed of linear memory crystal material, each chip is capable of storing 2.15 kiloquads using nanopulse matrix techniques. While an isolinear optical chip is capable of independently managing data configuration, processing speed increases by 335% when used in a computer core. Besides computer cores, isolinear optical chips are used in tricorders and PADDs, as well as with optical chip readers as a method of transferring data in situations where the destination system is not accessible by the originating system.

5.4 BIO-NEURAL GEL PACKS

Starfleet is currently experimenting with bio-neural gel packs as a replacement for isolinear optical chips in computer systems. Isolinear optical chips continue to remain the preferred data storage medium for tricorders and PADDs due to their size. A bio-neural gel pack consists of a flexible plastic package containing synthetic neural cells in a gelatinous organic medium. A starship requires bio-neural circuitry before it can use bio-neural gel packs, and so older starships are easily refitted with bio-neural gel packs.

While bio-neural technology is faster and more efficient than traditional optical processors, it is subject to viral and other infections just like any biological organism. As a result, newer vessels are being constructed with additional safe guards and existing vessels are being refitted.

6.0 WARP PROPULSION SYSTEMS

6.1 WARP FIELD THEORY AND APPLICATION

To overcome the relativistic effects and infinite power requirements of faster-than-light travel, it is necessary to travel along a path shorter than the overall distance. To visualize this, get a piece of paper and draw a circle. The perimeter of the circle represents the curvature of space. Pick a spot anywhere along the circle and draw a point. We will consider this point our present location. In either direction from the first point, move at least 30 degrees and draw another point. We will consider this second point our destination. Using a straight edge, connect these two points with a line. The length of the line connecting the two points is shorter than the length of the arc connecting the same two points, and by following the path of the line we can arrive at our destination in less time, without the undesired time dilation. (I could have illustrated this for you, but you get more benefit out of doing it yourself.)

Leaving our diagram behind, the line becomes a tunnel through subspace. This is similar to how electrons move in an atom. The ship is surrounded by a bubble of normal space, and we can see normal space streaking by us at what appears to be faster than light. Subspace field stress is measured in cochranes, a tribute to Zefram Cochrane who invented warp propulsion. Generally speaking, a warp speed/power graph increases exponentially, though actual values can vary due to quantum friction. The amount of power required to maintain a certain speed is a function of the cochrane value of the warp field. However, the power required to accelerate to this speed is much greater, and is called the peak transitional threshold. As such, traveling at a fractional warp factor can be faster than the next lower integral warp factor, but it is more efficient to increase to the next higher integral warp factor for flights of significant length.

The proverbial pot of gold at the end of the warp scale is Warp 10, also called Eugene's Limit. Warp 10 is unreachable due to the infinite power requirements. In theory, a ship traveling at this speed would occupy all points in all four dimensions of the universe simultaneously. Such a feat could certainly never be accomplished by a starship, let alone a shuttlecraft.

6.2 MATTER/ANTIMATTER REACTION ASSEMBLY

The matter/antimatter reaction assembly provides power to warp propulsion system. It yields a 10^6 greater energy output than the fusion reactors used in impulse propulsion systems. The matter/antimatter reaction assembly consists of four subsystems: reactant injectors, magnetic constrictor segments, matter/antimatter reaction chamber, and power transfer conduits.

The reactant injectors synchronously feed deuterium (^2H) and antideuterium streams into the matter/antimatter reaction chamber. Magnetic constrictor segments help to align and compress these incoming streams, as well as maintain core pressure. Within the reaction chamber, antihydrogen passes through the dilithium (Li_2Te) crystal and reacts with the deuterium (^2H) creating plasma. This plasma is split into two streams and forced towards the warp field nacelles via the power transfer conduits. Along each power transfer conduit are three taps for the electro plasma system which feed other ship's systems.

6.3 WARP FIELD NACELLES

Most starships have an even number of warp field of nacelles. Experimentation with odd numbers of nacelles has shown that two nacelles are most efficient in terms of power generation and maneuvering. This certainly does not mean that odd numbers of nacelles, or even numbers greater than two, do not work. Starfleet has had much success with starships possessing a single warp field nacelle, as well as four warp field nacelles.

As the plasma injectors are fired sequentially, the warp field coils build layers from fore-to-aft according to the pulse frequency in the plasma. These layers reduce the apparent mass of the starship and allow the starship to transition to subspace before reaching the speed of light. The shape of the starship hull helps to shape the warp fields for optimal efficiency both before and during faster-than-light travel. Nevertheless, some Starfleet engineers feel the need to tinker with the warp field controller software to see if they can improve efficiency.

6.4 WARP PROPULSION SYSTEM FUEL SUPPLY

Antimatter is generated at Starfleet fueling facilities by converting protons (p^+) and neutrons (n) into antideutrons ($^2H^-$), which are then combined with positrons (e^+) to create antideuterium. The antimatter is contained by magnetic conduits and compartmentalized tankage. Early starships were also constructed with compartmentalized tankage, but this method was long ago replaced by segregated pods which are better able to withstand the high amounts of stress experienced by a starship in motion. Each pod is capable of holding $100m^3$ of antimatter; a starship consumes an average of $1000m^3$ per year.

Antideuterium's quantum counterpart, deuterium, continues to be stored in compartmentalized tanks, each of which can hold $63{,}200m^3$. The deuterium tanks are chilled to 13.8K (-259°C) allowing the deuterium (^2H) to be stored in an aqueous form. Slush deuterium is created by a process called electro-centrifugal fractioning, which combines deuterium with seawater, snow, and ice.

6.5 BUSSARD RAMSCOOP FUEL REPLENISHMENT AND ONBOARD ANTIMATTER GENERATION

To reduce time between refueling, warp nacelles are equipped with Bussard Ramscoops, named for twentieth-century physicist and mathematician Robert W. Bussard. The ramscoop is capable of distilling deuterium from the accumulation of hydrogen gas found throughout the galaxy. While the hydrogen gas is spread very thin in the galaxy, it can accumulate at a reasonable rate while traveling at high speed. Although only deuterium can be replenished in this manner, onboard antimatter generators can help to replenish the antideuterium supply. Unfortunately, the total fuel replenishment process is only able to regain 10% of the energy expended in the process.

7.0 IMPULSE PROPULSION SYSTEMS

7.1 IMPULSE DRIVE

Sublight propulsion is accomplished via fusion-powered impulse engines. Like the warp propulsion system, the impulse propulsion system is fueled by deuterium, but combines it with liquid cryo-reactants as opposed to anti-deuterium. Small amounts of anti-deuterium may be used on rare occasions for a short period of overthrust.

Each impulse engine consists of four components: impulse reaction chamber, accelerator/generator, driver coil assembly, and vectored exhaust director. Slush deuterium is heated to liquid form, and then quickly cooled to a solid form of pellets. The size of the pellet varies depending on the desired energy output. The impulse reaction chamber turns these pellets into high-energy plasma, which is feed to the driver coil assembly by the accelerator and to the electro-plasma distribution system by the generator. As the plasma passes through the driver coil assembly, the apparent mass of the starship is reduced, which in turn reduces the energy requirements for propulsion. The aptly-named vectored exhaust director then directs the exhaust in the opposite direction of the desired vector in which the ship needs to travel.

All of this is handled by intelligent subroutines which are capable of learning from situations and optimizing flight operations, from improved handling at sublight speeds to better transition from impulse to warp propulsion. Impulse operations are normally limited to 0.25c to reduce time dilation between the onboard computer chronometer and Federation Timebase Beacons.

8.0 AUXILIARY SYSTEMS

8.1 REACTION CONTROL SYSTEM

The reaction control system is designed for higher-precision maneuvering than the impulse propulsion system is capable of. Most operations in and around starbases are limited to RCS thrusters only, especially while docking or undocking. The reaction control system is also used for docking and undocking two starships, or docking and undocking modules of a single starship. Starbases and other orbital facilities are equipped with RCS thrusters for maintaining orbit. Starships also use RCS thrusters while in orbit, moreso to maintain position over a particular point on the surface than to maintain altitude.

Each RCS thruster engine contains a gas-fusion reaction chamber, a magnetohydrodynamic energy field trap, and upper and lower vectored-thrust exhaust nozzles. Like the impulse propulsion system, the reaction control system uses deuterium for fuel. A single nozzle is capable of 3 million Newtons of thrust; the two combined produces 5.5 million Newtons of thrust.

8.2 NAVIGATIONAL DEFLECTOR

The navigational deflector keeps the path in front of the ship clear, from small asteroids to even smaller hydrogen atoms. Any amount of friction, no matter how seemingly insignificant, is undesirable. This goal is accomplished via a series of subspace field distortion amplifiers, powered by graviton polarity source generators. Subspace field coils are used to shape and aim the beam. This causes the deflector to emit subspace and electromagnetic radiation, which interferes with sensors. To compensate, long-range sensors are located directly behind the navigational deflector where there is a clear path between the two axis of the two primary components of the deflector beam. The navigational deflector also interferes with the bussard ramscoop, which is also compensated for by creating small gaps which allow some hydrogen to pass through.

Higher velocities have higher power requirements, and on a related note, most starships in service today have an auxiliary deflector at the front of the saucer to assist the main navigational deflector which is usually positioned further back on the engineering section. The auxiliary deflector may also become the main deflector for starships that are capable of separated flight mode.

8.3 TRACTOR BEAMS

Tractor beams allow a starship to manipulate external objects such as shuttles, other ships, escape pods, and asteroids, just to name a few. A tractor beam consists of gravitons superimposed in subspace to draw an object towards you or push it away from you. The effective range of the tractor beam emitters depends on the mass of the object you want to move, and the speed at which you want to move it. Naturally, heavier objects are easier to move the closer your starship is to them.

9.0 COMMUNICATIONS

9.1 INTRASHIP COMMUNICATIONS

Voice and data signals are primarily routed over the optical data network. There are two backup layers which ensure that communications will be available almost 100% of the time. Establishing a voice connection begins with a person stating their own name, and the name of the person or area they are calling. The computer is always listening for intraship calls, and will attempt to locate the recipient. If successful, audio speakers will be activated at the recipient's location. The recipient needs only to answer; though often people tap their communicator out of habit, this is not necessary while onboard a starship or starbase.

While the computer is trying to locate the recipient, there may be an almost unnoticeable delay, but after that communications are in realtime. The computer will then close the channel if one of the parties explicitly ends the conversation, or ten seconds after neither party says anything to the other. If a recipient is not available, the computer will take a message and alert the recipient when they become available.

9.2 PERSONAL COMMUNICATOR

The personal communicator serves the dual purpose of providing voice communication between away teams and a starship, as well as an easy lock-on contact for the transporter system. Most of the functions are performed by the tiny subspace transceiver assembly, found in most Starfleet mobile devices. By default, all communications are encrypted. For security purposes, communicators are biometrically customized for each user. Another person may use the device only with security override authority.

The sarium krellide power cell can go an average of three weeks without recharging. An audible oscillation will notify the wearer when power is close to depletion. In order to conserve power, the subspace transceiver assembly is normally in standby mode. Tapping the communicator activates a dermal sensor which "wakes up" the subspace transceiver assembly and prepares to send an outgoing message.

At best, the range of a communicator is a mere 1,000 kilometers. This range can decrease depending on geological conditions. In order to communicate with a starship 40,000 kilometers in orbit above, the starship must constantly scan for the communicator's low-power signals and amplify them from person to person or person to ship.

9.3 EXTRASHIP COMMUNICATIONS

Calls between starships, or from a starship to a starbase or planet, begin with a hailing signal packet. This is usually sent via subspace radio, which most species use, though there are still some less advanced species using radio-frequency communications.

Across long distances, the signal is amplified by subspace relay stations to prevent degradation. Within Federation space is Starfleet's own Subspace Communications Network, as well as the Federation's civil communications system. Some star systems have their own local networks. As the galaxy is charted, additional subspace relays are deployed; approximately 500 units are made operational each year.

Starfleet researchers are constantly experimenting with increasing the energy level of communications to push them deeper into subspace, where it has been theorized that the signals will be able to travel a greater distance before decaying, and would make it possible to reduce the number of relays required.

9.4 UNIVERSAL TRANSLATOR

The Universal Translator is a highly complex computer program which removes or reduces the language barrier between different species. It is both capable of translating between known languages, as well as deriving a translation matrix for unknown languages based on audio samples. An ideal sample includes a conversation between two persons in an unknown language. From this, the Universal Translator can figure out many of the basic words in only a few minutes; more time is required for complex words and phrases. Accuracy of the translation matrix can vary depending on the quality of the sample. This can be improved by discussing simple concepts before discussing complex or sensitive subjects. Several weeks are usually required before a translation matrix is suitable for diplomatic exchanges. In some cases, this time can be shortened if similarities to known languages are recognized.

10.0 TRANSPORTER SYSTEMS

10.1 TRANSPORTER SYSTEMS OPERATION

While the computer scans the target location and establishes a coordinate lock, the transporter system performs a quick self-diagnostic. The target location must be confirmed as safe before a coordinate lock can be established. In most cases, the target location is stationary, or moving at sub-light speed. If the target location is moving at warp speed, the origin location must be moving at exactly the same speed.

The molecular imaging scanner creates a quantum-resolution pattern image of the transport subject, and the subject is subatomically disassembled into an energy stream by the primary energizing coils and phase transition coils. The stream passes through the pattern buffer, either to compensate for relative motion between the origin and target, to deliberately delay transport of a subject, or to safely abort the operation. The stream is then transmitted to the target location and reassembled based upon the quantum-resolution pattern image.

The return trip is very similar, with the added step of passing through the biofilter to remove bacteria and viruses that may have been picked up on the other end. If the original target location was another transporter, the transport subject may also have passed through a biofilter during the first trip. In this case, the transporter at the origin location transfers the quantum-resolution pattern image to the transporter at the target location and delegates the task of reassembling the stream to compensate for the microseconds lost during the extra pass through the biofilter.

10.2 OTHER TRANSPORTER FUNCTIONS

In a site-to-site transport, neither the origin or target locations have a transporter pad. The subject is dematerialized at the remote origin, routed through the transporter chamber, and the stream is redirected to its final destination for reassembly. This double-beaming procedure requires twice the normal power requirements, and as such is only used in emergency situations.

To conserve power, cargo transporters operate at only molecular resolution. Molecular resolution is not as precise and not suitable for living objects. Personnel transporters can also operate at molecular resolution if desired.

10.3 LIMITATIONS OF USE

Normal operating range of the transporter is approximately 40,000 kilometers, though this can vary depending on the payload mass, relative velocity, and available power. Interference from deflector shields and other spatial distortions prohibit transport completely. As mentioned previously, transport while at warp is also very difficult.

Worth mentioning is the transporter's duty cycle. Pattern buffers must go through a cooldown period after each transport. To help compensate for this, each transporter has multiple pattern buffers. This is important to keep in mind during medium or large-scale evacuations, and is the reason why escape pods continue to be the preferred method of evacuation from a starship.

11.0 SCIENCE AND REMOTE SENSING SYSTEMS

11.1 SENSOR SYSTEMS

The long-range sensor array normally scans in the direction of flight, searching for possible flight hazards. Minor hazards are swept out of the way by the navigational deflector, and major hazards are avoided by making course corrections. This is by no means the limits of what the long-range sensor array is capable of, for it is often used to scan targets in advance, or entire adjacent sectors. The resolution of the sensor data depends on the distance between the starship and the object or area being scanned.

The navigational sensors are used exclusively for determining the ship's present location and velocity, and the locations and velocities of any nearby objects, whether friendly, hostile, or neutral. Due to the critical nature of these sensors, they are the most heavily-maintained sensor system on a starship. Individual pallets are swapped out after only 70% of their estimated lifetime and refurbished.

Lateral sensor arrays are an assortment of standard Starfleet science packages and mission-specific instrumentation, used chiefly by science department personnel for carrying out secondary mission objectives. Small devices can be installed from service access ports inside the starship, while larger devices must be installed from the outside either by extravehicular activity or workbee.

11.2 PROBES

When it is not safe or convenient to obtain high-enough resolution data from the long-range sensor array, probes can be launched for close-approach data gathering. Small probes are designed to be deployed by the torpedo launchers; these make up the majority of a ship's probe complement. There are also three classes of larger probes which are essentially automated shuttlecraft, packed with sensor and telemetry hardware where personnel support systems normally would be.

There are nine classes of small probes, each with different sensor types, power, and performance ratings. Some of these probe classes are designed for a specific intent, while others are generic or comprehensive. All nine classes are capable of at the least the basic functions, and all are capable of surviving atmospheric entry. Three are even capable of landing, allowing for extended study of a planet's surface and atmosphere. Most probes can be remotely controlled, allowing ship-board personnel to explore hostile or inaccessible environments.

11.3 TRICORDER

Tricorders are multi-function handheld devices used not only by Starfleet officers, but also various civilian organizations. They contain sensors for detecting and analyzing electromagnetic, subspace, chemical, biological, meterological, and geological phenomena. They also contain a subspace transceiver assembly to allow communication with the ship's computer or other tricorders. By no means are these the limits of what is possible with a tricorder, as many Starfleet officers have demonstrated over the years.

12.0 TACTICAL SYSTEMS

12.1 SHIPBOARD PHASERS

The term phaser is actually an acronym, PHASed Energy Rectification, which refers to the process by which energy is converted from one form to another without the need for an intermediate stage. Individual emitters are capable of outputting more than 5 megawatts; however, emitters are normally grouped for optimal firing control, thermal effects, field halos, and target impact.

Energy is drawn from the electro plasma system into the EPS submaster flow regular, which adjusts to the desired power level. From here the energy is sent into the plasma distribution manifold where the energy is distributed to the prefire chambers of each emitter and then discharged. The order in which the emitters are discharged determines the final beam vector.

12.2 PHOTON TORPEDOS

Although photon torpedos were invented in 2215, the model used today came into use in 2271. Within a photon torpedo casing are three tanks: the deuterium holding tank, the antideuterium holding tank, and the central combiner tank. Prior to launch, the deuterium and antideuterium are stored separately to prevent any accidents from happening while the torpedo is still in the launch tube. Shortly after launch, they are transferred to the central combiner tank where each reactant is magnetically suspended until impact. The explosive yield of a photon torpedo is 18.5 isotons.

While a photon torpedo is capable of target tracking, it is possible to manually pilot the torpedo remotely. In most cases, the torpedo's onboard computer is more than capable of successfully carrying out the instructions given by the tactical console on the bridge autonomously. Photon torpedos are also equipped with warp sustainers, which allow them to maintain a slowly degrading faster-than-light velocity. This is very useful in faster-than-light combat situations, where phasers are useless.

12.3 QUANTUM TORPEDOS

As Starfleet encountered more dangerous races in the Galaxy, it became clear that more powerful weapons were needed, leading to the development of the quantum torpedo in 2355. An explosive yield of 52.3 isotons is achieved through rapid energy extraction from a zero-point vacuum. The power source is an uprated 21.8 isoton photon torpedo warhead. When the warhead detonates, the tension on the vacuum membrane multiples causes the reaction to occur at four times the rate of a standard warhead.

As can be expected, a higher explosive yield is much more dangerous at close range, and furthermore not necessary for weaker targets. For these reasons, the quantum torpedo is a supplement to the photon torpedo rather than a replacement, and all starships equipped with quantum torpedos are similarly equipped with photon torpedos. Quantum torpedos should be used only when necessary.

12.4 PERSONAL PHASERS

The Type II phaser is the weapon of choice for away teams entering a potentially dangerous situation. Due to its size, it is normally holstered at the hip. If a concealed weapon is required, the Type I phaser is small enough to fit in your pocket or up your sleeve. In highly dangerous situations, a Type III phaser rifle may be issued, though usually only security officers are trained to use this weapon. Both the Type II phaser and Type III phaser rifle have sixteen power settings, while the Type I phaser has only eight settings. Personal phasers operate much the same as their larger, ship-mounted counterparts.

12.5 DEFLECTOR SHIELDS

Deflector shields are the primary defensive system for starships and starbases. Field energy is concentrated at the point of impact to create a localized spatial distortion. Each generator consists of twelve 32 megawatt graviton polarity sources feeding a pair of 625 millicochrane subspace field distortion amplifiers. Heat is dissipated by a pair of liquid helium coolant loops. When deflectors shields are operating at or near maximum, sensors must constantly be recalibrated to be able to receive data, transporter systems are almost impossible to use, and the warp drive control software compensates for the spatial distortion.

12.6 AUTO-DESTRUCT SYSTEMS

When all else fails, it may become necessary for a captain to destroy his or her ship to prevent it, or its technology, from falling into enemy hands. This tactic is considered a last resort, after all other options have been explored. For safety reasons, only the most senior of officers have the necessary authority to activate the auto-destruct sequence. Once begun, the sequence can only be stopped by precisely executing the correct sequence of inputs; even disabling the computer core will have no effect.

13.0 ENVIRONMENTAL SYSTEMS

13.1 LIFE SUPPORT

Life support is the most critical of all environmental systems. The survival of the crew is more important than anything else. As such, every component of the system is designed with several redundant links to ensure that there is a continuous supply of air, power, and water.

13.2 ATMOSPHERIC SYSTEM

Atmospheric processing units recycle carbon dioxide and other waste gases into breathable oxygen, using photosynthetic bioprocessing. As the terminology indicates, the process is very similar to how plants accomplish the same feat. Additionally, the atmospheric processing units also control temperature and humidity. All three of these factors can be adjusted room-by-room to suit desired operating conditions or personal preferences of certain species.

13.3 GRAVITY GENERATION

Humanoid physiology requires gravitational and electromagnetic fields to ensure proper cellular growth. One of the barriers to long-term space exploration was finding a more suitable solution than the rotating centrifuges employed during the 21st century. The gravity generation system creates a consistent downward force throughout a starship or starbase by emitting graviton particles with a decay time of only a few picoseconds. The gravity generation system is tied into the inertial damping system to minimize turbulence during flight.

13.4 WASTE MANAGEMENT

Another barrier to long-term space exploration was provision for food and water, as well what to do with the resulting waste material after it has passed through the digestive system. Already in the late 20th century, scientists began experimenting with recycling wastewater into drinking water. This is accomplished in three steps:

1. Mechanical filtration removes solids and particulates.
2. Osmotic and electrolytic fractioning removes dissolved and microscope contaminants.
3. Water is superheated to 150°C for biological sterilization.

The various waste sludges recovered, as well as regular trash, are similarly reprocessed into raw materials for the matter replication system. When possible, the least energy-intensive methods are used to reduce the overall resynthesis energy cost. Hazardous materials go through a special process of being converted to inert carbon particles before being stored for matter replication.

14.0 CREW SUPPORT SYSTEMS

14.1 CREW SUPPORT

Starfleet considers its personnel to be its most valuable resource. In addition to providing life's necessities, Starfleet also provides its personnel with tools to carry out their duties, as well as recreational facilities. Although Starfleet maintains a dedicated research and development branch, many technological and procedural advancements have come from regular personnel based on experience or independent research.

14.2 MEDICAL SYSTEMS

Physical well-being of the crew is essential to maintaining efficiency. Each starship and starbase is equipped with a variety of medical facilities including intensive-care wards, laboratories, surgery suites, therapy facilities, biohazard isolation units, and a dental care office. An average medical staff consists of four staff physicians, three medical technicians, twelve registered nurses, and eight research personnel.

Each intensive-care ward is equipped with a biobed sensor and support unit, which allows the creation of a sterile environment for minor surgical procedures. It incorporates several diagnostic and life support tools including biofunction sensors, automated administration of intravenous medication, cardiovascular support, and emergency defibrillation. Additionally, an overhead sensor cluster includes more biofunction sensors, as well as a forcefield generator to reduce the possibility of harmful organisms entering or leaving the biobed area. For a completely sterile environment, a dedicated surgical suite must be used.

When the patient can't come to sickbay, sickbay can come to them thanks to portable medical kits which include a medical tricorder, hypospray, respirator, defibrillator, sample kit, bandages, and a small variety of medication. A hypospray permits medication to be air-injected directly into the bloodstream without mechanical penetration of the skin.

14.3 CREW QUARTERS SYSTEMS

The interior of a starship or starbase consists of numerous modules connected together. Some modules are work areas, but the most common modules are living areas. Crew quarters modules come in a variety of configurations, but each contains a bedroom, bathroom, and living/work area. Adjacent modules can be combined to accommodate families. Personnel assigned for more than six months may also customize their quarters to some extent; for example, furniture can be changed to suit personal tastes. Some quarters and lounge areas can be converted for emergency medical usage on short notice.

14.4 FOOD REPLICATION SYSTEM

Maintaining a supply of food rations was one of the barriers to long-term space exploration in the 21st century. Matter replication technology allows the creation of thousands of food selections from a digitally stored molecular pattern matrix. The food replication system uses much of the same technology and principles as the transporter system. Take note, however, that only 82% of waste material can be reprocessed, which necessitates replenishing the raw food stock material at starbase. The raw food stock material consists of several commonly used molecules, and additional molecules can be created molecularly, though at a higher energy cost. Starfleet's R&D branch is currently experimenting with quantum-level replicators, which will allow even greater accuracy in reproducing foods and beverages. Unfortunately the energy cost prohibits wide-scale deployment of this technology, though many are optimistic that further research into quantum technology will help reduce this to levels below those used by molecular replicators.

14.5 TURBOLIFT PERSONNEL TRANSPORT SYSTEM

Rapid intraship personnel transport is provided by the turbolift system. The turboshaft network consists of several horizontal and vertical arteries, with redundant access I between each point to reduce wait times. Each turbolift car is equipped with its own inertial damping system to reduce acceleration effects. Turbolift cars accept both vocal and manual input, and are connected to a network of traffic control computers which determine the optimal route from location to destination. During reduced power scenarios or turbolift system failure, movement between decks is possible via the Jefferies Tubes.

14.6 HOLOGRAPHIC ENVIRONMENT SIMULATORS

Whether for business or pleasure, the holographic environment simulator is one of the most useful pieces of technology onboard a starship or starbase. Although originally intended for recreational purposes, they have proven extremely useful for determining the outcome of various actions, from which a decision can be made as to which action will be carried out in the real universe. The holographic imagery and matter conversion subsystems together can create realistic people, places, and objects that are almost indistinguishable from reality. This realism is simultaneously the primary advantage and disadvantage, causing some personnel to abandon the real universe for the fictional one.

The basic mechanism behind the holographic environment simulator is the omni-directional holo diode. Large groups of these devices generate the light of which the environment consists of, and the forcefields that make it possible to interact with the environment. They are supplemented by speakers which emit the sounds you hear, by atomizers which emit the scents you smell, and by replicators which provide the food you taste.

When a person or persons move around inside a holographic environment simulator, it is actually the environment which is moving around them. Not only is it possible to convince someone that they have traveled a distance, but also that the distance between them and another person is greater than reality. Although the environment can be logically as big as desired, the physical size of the holographic environment simulator limits the number of people that can co-exist within simultaneously.

15.0 AUXILIARY SPACECRAFT SYSTEMS

15.1 SHUTTLECRAFT OPERATIONS

For situations where personnel transporter systems are not possible, practical, or even preferable, shuttlecraft are the method of transportation. Shuttlecraft come in three basic types: personnel shuttle, cargo shuttle, and special-purpose craft. In addition to the standard-size shuttlecraft, there is also the smaller shuttlepod and the larger hopper.

Shuttlecraft are normally lightly armed or completely unarmed, and capable of only the lowest warp speeds. Most shuttlecraft can seat at least two persons, and some can seat up to six additional passengers.

15.2 EXTRAVEHICULAR ACTIVITY

After four hundred years of space exploration, the need for personnel to be able to enter a hostile environment still exists. Three different types of extravehicular garments are available: the low pressure environment garment, the standard extravehicular work garment, and the augmented personnel module. The level of comfort each garment offers directly correlates with the duration each garment can be worn.

III. STANDARD OPERATIONS

16.0 OPERATING MODES

16.1 CRUISE MODE

Cruise mode refers to the normal operating condition of a starship. Primary operational personnel are divided into three eight-hour shifts, while secondary operational personnel may choose to divide themselves into only one or two shifts so that personnel may work together.

16.2 YELLOW ALERT MODE

Yellow alert is a condition of heightened preparedness for a possible emergency. On-duty personnel are directed to their stations, and the next shift is alerted to be ready for a possible transition to red alert. Yellow alert mode may be activated by any supervisor of a primary mission operation; or automatically upon detection of unknown spacecraft or a system failure.

16.3 RED ALERT MODE

Red alert is a condition invoked during a state of emergency in which the safety of the crew is endangered. On-duty personnel are directed to primary stations, the next shift is directed to secondary stations, and the previous shift is directed to secondary and special assignment stations.

16.4 EXTERNAL SUPPORT MODE

External support mode is a state of reduced activity while a starship is docked with a starbase or other support facility. During external support mode, the ship will receive umbilical support for some or all of its power requirements, permitting key systems to be shutdown for maintenance.

16.5 BLUE ALERT MODE

Blue alert describes three related conditions which involve the evacuation of personnel from one area to another, without the need to leave the ship entirely. During separated flight mode, blue alert is activated during separation or reintegration. On starships capable of planetfall, blue alert is activated during landing or takeoff. Blue alert may also be activated automatically upon environmental systems failure to warn personnel in the area to evacuate.

16.6 REDUCED POWER MODE

During reduced power mode, all non-essential systems are shutdown for maximum power conservation.

17.0 RULES OF ENGAGEMENT

17.1 SHIP CONTACT PROTOCOLS

While the contact remains unidentified:

1. Bring shields to standby if they are not already.
2. Switch from active sensors to passive sensors.
3. Attempt communication on all frequencies.
4. If contact actively scans your ship, implicit permission is granted to actively scan their ship.
5. If contact raises shields, you may raise shields. If contact powers weapons, definitely raise shields.

If the contact attacks your ship:

1. The captain's primary responsibility is the safety of his crew (General Order Five), unless the contact poses a threat to the Federation as a whole (General Order Two).
2. If possible, retreat to a safe location and report to Starfleet Command.
3. If it is not possible to retreat, or the contact is from a known culture, the captain may use his or her best judgment in determining what action to take.

17.2 TACTICAL GUIDELINES

- As per General Order Ten, a Starfleet vessel never initiates combat except with a known enemy during wartime.
- If deflector shields are capable of withstanding the opponent's full primary weapon, it is preferable to disable the opponent's ship rather than destroy it.
- Only the Commanding Officer or First Officer may order weapons fire; firing weapons without orders will result in court-martial.
- Torpedos should only be used when phasers are insufficient, or to end the engagement more quickly with reduced loss of life.

17.3 AWAY TEAM GUIDELINES

- Treat all encountered beings with the same respect and dignity you would give to a Federation citizen.
- Maintain complete and accurate tricorder scan logs of all actions and observations.
- Remain within communicator contact, and preferably eyesight, at all times. Report to the Away Team Leader and Mission Operations at regular intervals.
- Take only what you need, and leave nothing behind.
- Avoid hostilities to the best of your ability, and never initiate them.
- If combat ensues, end it as quickly as possible with as little damage as possible.

IV. EMERGENCY OPERATIONS

18.0 EMERGENCY SUPPORT SYSTEMS

18.1 FIRE SUPPRESSION SYSTEM

If the environmental monitoring sensors detect a sudden increase in temperature, or the presence of toxic fire gases, the fire suppression system will automatically be activated. It may also be manually activated by a crew member via their personal communicator. The fire suppression system erects a containment forcefield around the fire, causing it to rapidly be extinguished due to lack of oxygen. The forcefield will remain in place until the temperature has dropped to normal levels.

18.2 LIFEBOATS

If it is no longer safe to remain onboard the starship or starbase, the crew can evacuate via the lifeboats, or autonomous survival and recovery vehicles. Each ASRV is equipped with subspace radio equipment, and is capable of atmospheric entry and landing. ASRVs can also be combined to extend life support duration.

19.0 EMERGENCY RESPONSE PROCEDURES

19.1 SIF/IDF FAILURE PROCEDURES

In the event of a failure of the structural integrity field and/or inertial damping field, the Commanding Officer shall:

1. Ensure that a backup generator has been brought online for each generator that has gone offline, such that at least two generators are online at all times.
2. When backup generators are no longer available, declare Yellow Alert status and determine whether to continue with primary and secondary mission operations.
3. If more than half of the generators are offline, decelerate to one quarter impulse or less.
4. If all generators are offline:
    a. Declare Red Alert status.
    b. Stabilize the situation.
    c. Take steps to minimize potential risk.
    d. When it is safe to do so, switch to reduced power mode.
    e. Request assistance from Starfleet Command.
    f. If it is no longer safe to remain onboard, abandon ship.

19.2 WARP CORE SHUTDOWN PROCEDURES

In the event of warp core pressure or thermal limits exceeding safe levels, the Chief Engineer shall:

1. Close the plasma valve to the warp field coils.
2. Close the reactant injectors.
3. Vent remaining gases overboard.

19.3 WARP PROPULSION SYSTEM FAILURE PROCEDURES

In the event of a catastrophic failure to one of the components of the warp propulsion system, the Chief Engineer shall:

1. Close the upstream valves for the fuel and power supplies of the affected systems.
2. Send engineering teams with pressure suits into damaged areas to assess and repair.
3. If it becomes too dangerous to remain in damaged areas, evacuate engineering teams and erect forcefields.
4. If the forcefields are no longer able to protect the crew from the effects of the damage, eject the damaged hardware into space.

19.4 IMPULSE POWER SHUTDOWN PROCEDURES

In the event of excess thermal loads or thrust imbalance, the Chief Engineer shall:

1. Close the deuterium valve.
2. Bleed residual energy into space or into the power network.
3. Interrupt the normal coil pulse order in the driver coil assembly.

19.5 IMPULSE PROPULSION SYSTEM FAILURE PROCEDURES

In the event of a catastrophic failure to one of the components of the impulse propulsion system, the Chief Engineer shall:

1. Close the upstream valves for the fuel and power supplies of the affected systems.
2. Send engineering teams with pressure suits into damaged areas to assess and repair.
3. If it becomes too dangerous to remain in damaged areas, evacuate engineering teams and erect forcefields.
4. If the forcefields are no longer able to protect the crew from the effects of the damage, eject the damaged hardware into space.

19.6 EXTERNAL MEDICAL EMERGENCY PROCEDURES

In the event of a medical emergency on another ship, station, or planet, the Chief Medical Officer shall:

1. Consult with the Commanding Officer and Security Officer to determine if it is safe to transport to the area of emergency.
2. Ensure the medical staff is preparing sickbay and secondary treatment areas.
3. Lead a survey and triage team to the accident site and evaluate the extent of the casualties. Separate patients into these three categories:
    a. Individuals with minor injuries that do not require immediate attention.
    b. Individuals with major injuries that require immediate attention.
    c. Individuals with severe injuries that are beyond help.
4. Transport patients to the treatment areas, beginning with individuals with major injuries.
5. Once all patients have been transported to treatment areas, have the survey and triage team assist with treatment.

V. A CELESTIAL BESTIARY

20.0 PLANETARY PHENOMENA

20.1 COMETS DISLODGED FROM AN OORT CLOUD

Some star systems have a large belt of frozen comets orbiting at the outer rim, called an Oort cloud. If a large object were to collide with one of these comets, the comet would fall towards the sun, possibly colliding with one or more planets along the way. Oort clouds are named for Dutch astronomer Jan Hendrick Oort.

20.2 DESTRUCTION OF MOON OR PLANET FROM TIDAL STRESS

Planets with several moons have the potential for gravity-induced tidal stresses between the moons and the planet. These stresses can sometimes grow strong enough to tear one or more moons apart, resulting in the creation of a ring around the planet, or even to tear the planet itself apart. Some fragments may collide with other moons or planets in the star system.

20.3 IONIZED GAS TORUS

Volcanic moons have a tendancy to create torus-shaped gas clouds along their orbital path. The corresponding planet's magnetic field ionizes the gas, which could interfere with sensor readings.

20.4 PANSPERMIA

The hypothesis that microbes (the seeds of life) are ubiquitous in the universe, that they may have delivered life to Earth, and that they may deliver or have delivered life to other habitable bodies. Panspermia can be said to be either interstellar (between star systems) or interplanetary (between planets in the same solar system). This theory was long disputed by scientists due to lack of compelling evidence until stardate 46731.5 when a genetic puzzle was completed that contained a message from an extinct race claiming to have seeded the galaxy eons ago with their DNA.

20.5 PLANETARY NEBULA

A planetary nebula is an astronomical object consisting of a glowing shell of gas and plasma formed by certain types of stars at the end of their lives. They are in fact unrelated to planets; the name originates from a supposed similarity in appearance to giant planets. They are a short-lived phenomenon, lasting a few tens of thousands of years, compared to a typical stellar lifetime of several billion years. About 1,500 are known to exist in our galaxy.

21.0 STELLAR PHENOMENA

21.1 BINARY STARS

At the heart of most star systems are binary stars; that is, two stars orbiting each other. If there is significant difference between the gravity of the two stars, hot plasma or gasses may flow from one star to the other; this is called an accretion bridge. If the two stars are orbiting too close together, they may undergo violent periods of nova outbursts, which can damage any nearby objects.

21.2 BLACK HOLE

A black hole is a concentration of mass great enough that the force of gravity prevents anything from escaping it except through quantum tunneling behavior. The gravitational field is so strong that the escape velocity near it exceeds the speed of light.

21.3 PULSARS

Pulsars are rotating neutron stars that are observable as sources of electromagnetic radiation. The radiation intensity varies with a regular period, believed to correspond to the rotation period of the star.

21.4 SOLAR FLARES

A solar flare is a violent explosion in a star's atmosphere with an energy equivalent to tens of millions of hydrogen bombs. Solar flares take place in the solar corona and chromosphere, heating plasma to tens of millions of kelvins and accelerating the resulting electrons, protons and heavier ions to near the speed of light.

21.5 SUPERNOVA

Supernovae refer to several types of stellar explosions that produce extremely bright objects made of plasma that decline to invisibility over weeks or months. There are two possible routes to this end: a massive star may cease to generate fusion energy from fusing the nuclei of atoms in its core and collapses inward under the force of its own gravity, or a white dwarf star may accumulate material from a companion star until it undergoes a thermonuclear explosion. In either case, the resulting supernova explosion expels much or all of the stellar material with great force.

22.0 INTERSTELLAR, GALACTIC, AND OTHER STUFF

22.1 DARK MATTER

Particles of unknown composition which do not emit or reflect enough electromagnetic radiation to be detected directly, but whose presence can be inferred from gravitational effects on visible matter such as stars and galaxies. Estimates of the amount of matter present in galaxies, based on gravitational effects, consistently suggest that there is far more matter than is directly observable.

22.2 GALACTIC BARRIER

An energy field surrounding the Milky Way Galaxy which completely encompasses the galactic disk and prevents conventional starship travel beyond the edge of the galaxy. A theory has suggested that the barrier is not meant to keep explorers "in" the galaxy, but to keep something from beyond the galaxy "out". It is also uncertain whether or not the energy barrier is a natural or artificially created phenomena.

22.3 NEBULA

A large cloud of interstellar dust and gas, often the remnants of an exploded star or a star system in the making. Although very thin, the dust and gas can be a hazard to a starship traveling at high impulse speeds. If the nebula is near a star, it could glow with the star's radiation; a spectacular sight, but causes interference with sensors.

22.4 SUBSPACE

When a starship is traveling at faster-than-light speeds, the ship itself does not enter subspace. Instead, the ship is surrounded by a field of energy, a warp field. It is the warp field that extends into subspace, allowing the starship to travel at faster-than-light speeds while it remains in normal space. This concept of faster-than-light travel is asymptotically limited by the idea that if the warp field is too strong, the ship itself will be too deeply submerged in subspace, which has negative genetic effects on living things. In addition, at high warp factors (each factor being a subspace field layer surrounding a ship) the energy required to sustain the field grows exponentially.

22.5 WORMHOLE

A topological feature of spacetime that is essentially a "shortcut" through space and time. A wormhole has at least two mouths which are connected to a single throat. If the wormhole is traversible, matter can 'travel' from one mouth to the other by passing through the throat.

23.0 SPECTRAL CLASSES

23.1 CLASS O – DARK BLUE

Class O stars are very hot and very luminous, being strongly violet in colour, in fact most of their output is in the ultraviolet range. These stars have prominent ionized and neutral helium lines and only weak hydrogen lines.

23.2 CLASS B – BLUE

Class B stars are extremely luminous and blue. Their spectra have neutral helium and moderate hydrogen lines. As O and B stars are so powerful, they live for a very short time.

23.3 CLASS A – LIGHT BLUE

Class A stars are amongst the more common naked eye stars. As with all class A stars, they are white or green. Many white dwarfs are also A. They have strong hydrogen lines and also ionized metals.

23.4 CLASS F – WHITE

Class F stars are still quite powerful but they tend to be main sequence stars. Their spectra is characterized by the weaker hydrogen lines and ionized metals.

23.5 CLASS G – YELLOW

Class G stars are probably the most well known if only for the reason that our Sun is of this class. They have even weaker hydrogen lines than F but along with the ionized metals, they have neutral metals.

23.6 CLASS K – ORANGE

Class K are orangish stars which are slightly cooler than our Sun. They have extremely weak hydrogen lines, if they are present at all, and mostly neutral metals.

23.7 CLASS M – RED

Class M is by far the most common class if we go by the number of stars. All our red dwarfs go in here and they are plentiful; more than 90% of stars are red dwarfs.

24.0 PLANETARY CLASSES

24.1 CLASS A – GEOTHERMAL

Very young planets, Class A worlds are less than 2 billion years old. Their diameters range in size from 1,000 to 10,000 km. They are located in the biozone or coldzone regions of a star's solar system. Their surfaces are partially molten and may feature active volcanoes. Their atmospheres, if any, are primarily hydrogen. Class A planets cool over time to evolve into Class C worlds. They almost never have life forms.

24.2 CLASS B – GEOMORTEUS

Young planets, Class B worlds are less than 10 billion years old. Their diameters range in size from 1,000 to 10,000 km. They are located in the hotzone region of a star's solar system. Their surfaces are partially molten and may feature active volcanoes with an overall high surface temperature. Their atmospheres, if any, are extremely tenuous, with few active gases. They almost never have life forms.

24.3 CLASS C – GEOINACTIVE

Class C worlds range in age from about 2 to 10 billion years old. Their diameters range in size from 1,000 to 10,000 km. They are located in the ecozone or coldzone regions of a star's solar system. Their surfaces are geologically inactive, with usually cold temperatures. Their atmospheres, if any, are usually frozen upon their surface. They almost never have life forms.

24.4 CLASS D – ASTEROID/MOON

Most asteroids and planetoids fall under Class D. They are commonly found orbiting planets as moons. They range in age from about 2 to 10 billion years old. Their diameters range in size from 100 to 1,000 km. They can be located in any temperature region of a star's solar system. Their barren surfaces are geologically inactive, covered with craters, and have normally freezing temperatures. Their atmospheres, if any, are tenuous. They almost never have life forms.

24.5 CLASS E – GEOPLASTIC

Class E worlds are younger than 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are located in the biozone region of a star's solar system. Their surfaces are molten, and have high temperatures. Their atmospheres are primarily hydrogen with other reactive gases. Class E planets cool over time to evolve into Class F worlds. Life forms, if any, are Carbon-based.

24.6 CLASS F – GEOMETALLIC

Young planets, Class F worlds range in age from 1 to 3 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are located in the biozone region of a star's solar system. Their surfaces are actively volcanic. Their atmospheres primarily contain hydrogen compounds. Class F planets cool over time to evolve into Class G worlds. Life forms, if any, are silicon based.

24.7 CLASS G – GEOCRYSTALLINE

Young planets, Class G worlds range in age from 3 to 4 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are located in the biozone region of a star's solar system. Their surfaces are still crystallizing. Their atmospheres contain carbon dioxide and other toxic gases. Class G planets cool over time to evolve into Class N, O or P worlds. Life forms, if any, are primitive single-celled organisms.

24.8 CLASS H – DESERT

Class H worlds range in age from 4 to 10 billion years old. Their diameters range in size from 8,000 to 15,000 km. They are located in the hotzone, biozone or coldzone regions of a star's solar system. Their surfaces are barren, hot, and arid, except in the coldzone where they can be covered with empty tundra. Their atmospheres may contain heavy gases and metal vapors. Life forms, if any, would have to be both drought and radiation-resistant flora and fauna.

24.9 CLASS I – GAS SUPERGIANT

Class I planets range in age from 2 to 10 billion years old. Their diameters range in size from 140,000 to 10 million km. They are usually located in the coldzone region of a star's solar system, but can exist in any region. They are solid gas, tenuous, comprised mostly of hydrogen and hydrogen compounds, and may have water vapor as well. Temperatures vary in the cloud layers. They may contain a solid metallic mass core. They also radiate heat. A Supergiant can have hundreds of moons and also water ice rings. Life existing on a Class I is uncertain. Life forms, if any, have to exist in the biozone layers of the upper atmosphere. They may be single-celled organisms, or creatures and plants that would have to be constantly airborne.

24.10 CLASS J – GAS GIANT

Class J planets range in age from 2 to 10 billion years old. Their diameters range in size from 50,000 to 140,000 km. They are usually located in the coldzone region of a star's solar system, but can exist in any region. They are solid gas, tenuous, comprised mostly of hydrogen and hydrogen compounds, and may have water vapor as well. Temperatures vary in the cloud layers. They may contain a solid metallic mass core. They also radiate some heat. A Gas Giant can have dozens of moons and also water ice rings. Life existing on a Class J is uncertain. Life forms, if any, have to exist in the biozone layers of the upper atmosphere. They may be single-celled organisms, or creatures and plants that would have to be constantly airborne.

24.11 CLASS K – ADAPTABLE

Class K planets range in age from 4 to 10 billion years old. Their diameters range in size from 5,000 to 10,000 km. They are located in the ecozone region of a star's solar system. They have rocky, barren surfaces with only trace amounts of water. Their atmospheres are thin, mostly carbon dioxide. Life forms, if any, are limited to single-celled organisms and algae. Class K planets are suitable for human colonization through terraforming.

24.12 CLASS L – MARGINAL

Class L planets range in age from 4 to 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are located in the ecozone region of a star's solar system. They have rocky, barren surfaces with little water. Their atmospheres are oxygen/argon with a high concentration of carbon dioxide. Life forms, if any, are limited to plant life. Class L planets are suitable for human colonization with some terraforming.

24.13 CLASS M – TERRESTRIAL

Class M planets range in age from 3 to 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are always located in the ecozone region of a star's solar system. Their surfaces are comprised with a relatively thin tectonic layer floating on a molten rock mantle, usually with active volcanoes present. Class M planets have an abundant amount of water necessary for life to exist. Their atmospheres contain oxygen/nitrogen with other trace gases. Life forms are almost always present, flourishing as extensive plant and animal life. Usually a sentient race is also present.

24.14 CLASS N – REDUCING

Class N planets range in age from 3 to 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are usually located in the ecozone region of a star's solar system. Class N worlds are barren and rocky. Their surfaces temperatures are usually high due to an intense greenhouse effect. Water exists, but only as vapor. They have extremely dense atmospheres containing carbon dioxide and sulfides. Life forms, if any, would have to be adapted to such an extremely harsh environment. There may be single-celled organisms living in the upper layers of atmosphere.

24.15 CLASS O – PELAGIC

Class O planets range in age from 3 to 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are always located in the ecozone region of a star's solar system. Class O worlds have an extreme abundance of water covering more than 80% of their surface. They have Class M-like atmospheres, with oxygen/nitrogen and other trace elements. There is almost always life, however almost all of it is aquatic plant and animal life, with little land masses to evolve surface creatures. Sentient races evolving on such worlds may be aquatic in nature.

24.16 CLASS P – GLACIATED

Class P planets range in age from 3 to 10 billion years old. Their diameters range in size from 10,000 to 15,000 km. They are usually located on the extreme edge of the ecozone region of a star's solar system. Class P worlds have an extreme abundance of water, however much of it is frozen in ice, covering more than 80% of the surface. They have Class M-like atmospheres, with oxygen/nitrogen and other trace elements. There is usually hardy plant and animal life surviving in the tundra.

24.17 CLASS Q – VARIABLE

The environment of a Class Q fluctuates because they orbit a variable output star. These planets range in age from 2 to 10 billion years old. Their diameters range in size from 4,000 to 15,000 km. They are usually located in the hotzone or ecozone regions of a star's solar system. Surfaces range from molten rock to water and/or carbon dioxide ice due to the variable output of the star they orbit. Their atmospheres range from tenuous to extremely dense. Life, if any, would have to rapidly adapt to sudden changes in temperatures.

24.18 CLASS R – ROGUE

Class R rogue planets do not orbit stars. They range in age from 2 to 10 billion years old. Their diameters range in size from 4,000 to 15,000 km. Surfaces are usually barren however some may be temperate due to geothermal venting. Atmospheres tend to be filled with volcanic outgassing. They are not believed to support life, however some may have animal and non-photosynthetic plant life.

24.19 CLASSES S AND T – ULTRAGIANTS

Class S and Class T planets are super gas giants. They range in age from 2 to 10 billion years old. Their diameters range in size from 10 to 50 million km (Class S) and 50 to 120 million km (Class T). They are usually located in a solar system's coldzone, however they can be in any region. Their surface is tenuous, composed of hydrogen, and hydrogen compounds. They radiate considerable heat and tremendous gravity. The atmosphere varies in temperature, pressure and composition at different layers. There may also be water vapor present. Life forms may only exist as single-celled organisms if any exist at all. They may have hundreds or thousands of moons, some of which may be terrestrial planets of Class M, O and P.

24.20 CLASSES X, Y AND Z – DEMON

Classes X, Y, and Z are reserved for planets referred to as "Demon" worlds. They are usually hostile to humanoid life because they contain turbulent, sometimes volcanic environments with atmospheres filled with toxic and corrosive gasses. They range from 10,000 to 50,000 km in diameter, and can reside in any region of a star's solar system. They generate thermionic radiation, and exhibit very high surface temperatures. Life forms, if any, will probably be silicon based or mimetic in nature, as experienced on Demon class worlds of the Delta Quadrant.

BIBLIOGRAPHY

Colville, Matthew, et al. Narrator's Guide. Canada: Decipher, 2002.

Colville, Matthew, et al. Player's Guide. Canada: Decipher, 2002.

Hite, Kenneth. Starfleet Operations Manual. Canada: Decipher, 2003.

Okuda, Michael and Denise. The Star Trek Encyclopedia. New York: Pocket Books, 1997.

Sternbach, Rick, Michael Okuda. Star Trek the Next Generation Technical Manual. New York: Pocket Books,1991.

Sternbach, Rick, Michael Okuda. Star Trek Voyager Technical Guide. California: Paramount Pictures, 1994.

Wikipedia contributors (2006). Various. Wikipedia, The Free Encyclopedia.

Zimmerman, Herman, Rick Sternbach, Doug Drexler. Star Trek Deep Space Nine Technical Manual. New York: Pocket Books, 1998.