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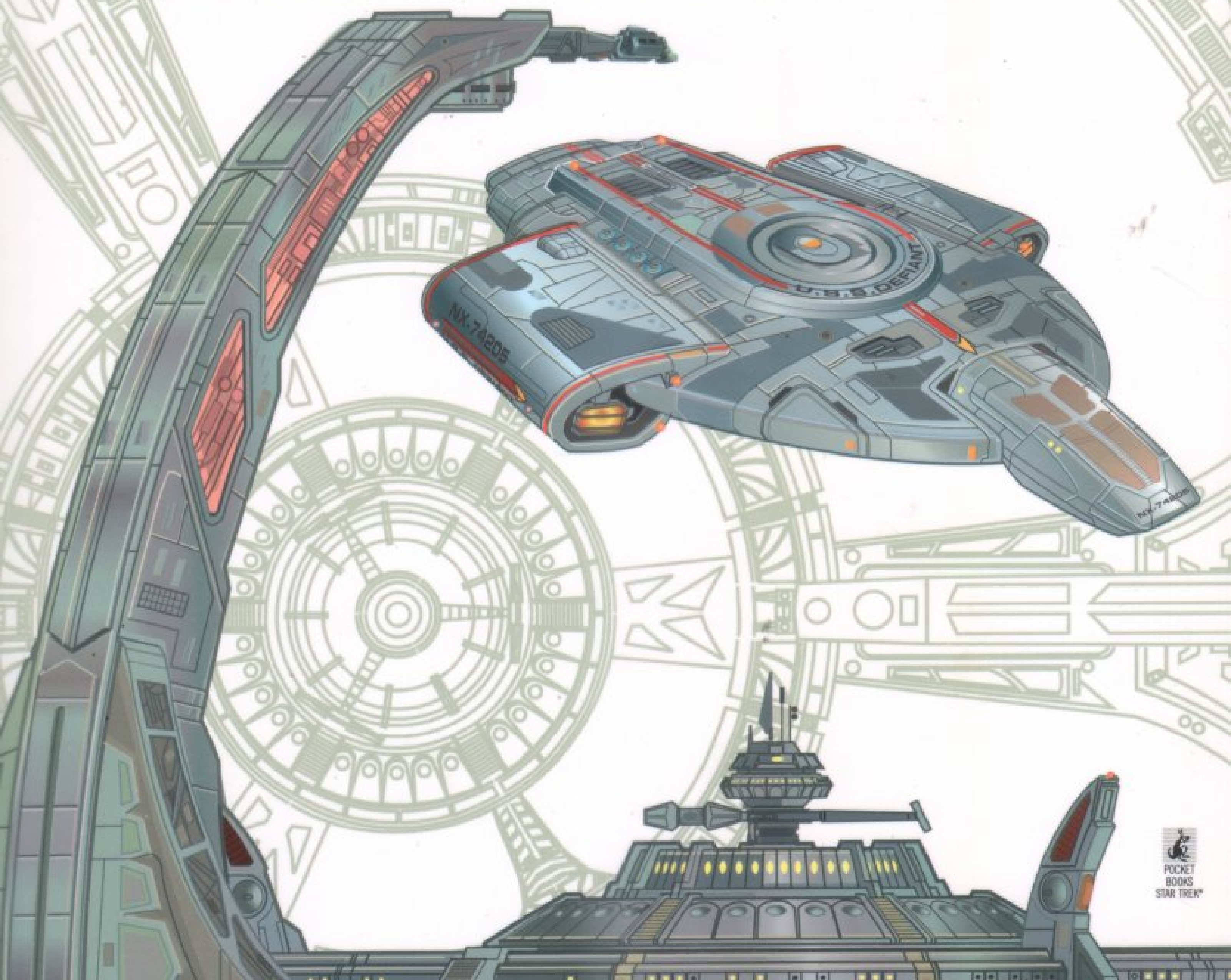

HERMAN ZIMMERMAN • RICK STERNBACH • DOUG DREXLER

WITH A SPECIAL INTRODUCTION BY IRA STEVEN BEHR

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INTRODUCTION BY IRA STEVEN BEHR

...in which the writer candidly discusses his lifelong pencil dependency, lavishly praises his fellow authors, and reveals the secret message contained in every page of the Deep Space Nine Technical Manual.

I am writing this introduction with a number two pencil on a yellow legal pad.

All right, stop laughing.

And enough with the Luddite jokes, already. They're not that funny.

The fact is, with the exception of the scripts I've written with Robert Hewitt Wolfe and Hans Beimler (no Luddites, they), all my television work has been written with a pencil.

"The Nagus" was written with a pencil.

"The Rules of Acquisition" was written with a pencil.

"The Maquis, Part II" was written with a pencil.

All my scripts for *Star Trek: The Next Generation*...you get the idea.

I like writing with a pencil. It's messy and chaotic, and out of chaos comes creativity...or so I keep telling myself every time someone asks me why I don't use a computer.

Now I admit it's ironic that the executive producer of a *Star Trek* television series turns out to be computer illiterate. But in my case, it's really not very surprising. My wife likes to point out that I can't work a toaster oven, either. The only reason I bring any of this up is to prove to you that if anyone is in desperate need of a *Deep Space Nine Technical Manual*, it's me. Of course, I realize that many of you out there have been waiting patiently for it as well. Perhaps you're one of those loyal fans struggling to build your very own *DS9* space station (exact in every detail) in your backyard. Or maybe you need some clarification on how to get your defensive shields on-line? Then this is the book for you. Need a floor plan of the captain's office? It's in here. Have hullplate manufacturing questions? Not anymore. Even if you haven't turned your basement into a replica of the Utopia Planitia Fleet Yards, this book can still come in handy. You can drop terms like "cryogenic fluid transfers" or "surge tanks" at the next party you attend and have the hard facts to back them up. So you see, this book may be just the confidence builder you've been needing.

But let's make one thing clear: no matter how much you may need this book, I need it more. You have to know a lot of things to write a *DS9* script. For instance, on any given day, I might need to know the metallurgical composition of a Cardassian lifeboat. Now what are the chances of my knowing that? Slim to none—at least before I owned this book. (The answer is beznium tellenite, and neffium-copper-borocarbide, in case you're interested. And I'd like to take a moment to address the editors at Pocket Books—what the hell took so long? I mean, we've only been waiting six years. And while we're at it, whatever happened to the *Deep Space Nine Companion*? Another book that could've made my life a lot easier.) Anyway, the good news is that the *Technical Manual* is finally here. I expect we'll all find it handy.

Now I'd like to say a few words about that production designer par excellence, Herman Zimmerman. Anyone who watches *DS9* knows what a fantastic job Herman does for the show. He builds these huge, beautiful sets every week, then tears them down and builds other huge, beautiful sets to take their place. But what really impresses the hell out of me is that, in addition to *being* a great production designer, Herman *looks* like a great production designer. You know what I'm saying? This guy could wear an ascot around his neck and still look cool. The man has style. That's Herman Zimmerman...production designer for the new millennium.

I've known Rick Sternbach, artist, illustrator, and all-around smart guy, for almost ten years. I'm proud to say that hanging on the walls of my house—next to my Italian *Wild Bunch* poster and my framed photo of Sammy Davis, Jr.—are two Sternbach originals. They date back to our *TNG* days, and one of them, ironically, is of a wormhole. But mostly, I feel indebted to Rick because he had a laser-disc player before I did, and when I asked him if I should buy one, he said "yes." I love my laser-disc player. Thanks for the advice, Rick. And don't worry, I don't blame you for this whole DVD mess. Who knew?

To truly understand Doug Drexler, you have to go beyond the obvious. Sure he's a talented illustrator and graphic designer. But the key to Doug is his eyes. Look at them closely and you'll discover a Merlin the Magician looniness lurking beneath the surface. I'm convinced Doug knows secrets of the universe that the rest of us can't even imagine. He's also a big Sinatra fan, so you know the guy has taste.

For almost thirty years, critics, academics, and fans have tried to figure out the reason for *Star Trek*'s continuing popularity. Many theories have been put forth—everything from the emotional resonance of its main characters to its optimistic vision of the twenty-fourth century to the strong, humanistic principles embedded in its storytelling. Plus, we blow things up real good. Now all of these theories have some validity, but none of them seem to strike at the heart of the issue. To me, the real message of *Star Trek* can be found in every page of this book. That message, which elevates the spirit of its fans, and provides them with an almost subliminal sense of peace and well-being, is simply this: technology is good. And in the twenty-fourth century, it will get even better. Its impact on our lives will prove to be both beneficial and benign, and that in spite of warp drive and replicators, transporters and holosuites, tricorders and tractor beams, our essential humanity will remain unchanged.

Is this message accurate? Only time will tell. But I do know this: in these waning days of the twentieth century, as the world around us seems to be defined more and more by the technology that keeps it running, it's nice to think that maybe, just maybe, the human race isn't doomed to evolve into the Borg.

So you see, the book you hold in your hands is not just a technical manual. Oh no, it's much more than that. Better to think of it as a kind of techno-bible for the future—a sacred text to remind us that, no matter how advanced technology might become, in the end, it's only a bunch of machines.

Now if I can just find the page where they tell you how to work the toaster oven....

Ira Steven Behr
Los Angeles, CA

AUTHORS' INTRODUCTION

Within the last eight years, since the *Star Trek: The Next Generation Technical Manual* was published, we have witnessed many additions to the *Star Trek* universe, including the birth of two new television series, a traveling exhibition, a Las Vegas attraction, and four more *Star Trek* feature films. The television shows alone have added many new volumes to the library of *Star Trek* data, and at the beginning of this new technical manual project for *Deep Space Nine*, we were faced with an imposing collection of new characters, races, spacecraft, weapons, and political crises in the galaxy. Not only did we compile blueprints and technical data for the space station and its systems, but we needed to sift through six seasons of material on the Starfleet runabouts, the *U.S.S. Defiant*, and the myriad Cardassian, Bajoran, Ferengi, Klingon, Jem'Hadar, and even Romulan ships and devices. The manual could not focus simply on the physical space station, but needed to include the races struggling to control it. By comparison, the illustrations and text required in this new volume made field-stripping the *Galaxy*-class *U.S.S. Enterprise* look like a walk in the park. We *still* don't know everything there is to know about that ship, either.

Much of this book is an exercise in comparisons and contrasts, and we hope it will be as interesting for the reader to discover them as it was for us. In a way, we were looking at some of the equipment and procedures as if we were Starfleet intelligence analysts, poking around inside Cardassian and Jem'Hadar technology. As before, we wanted to give some idea of what might lay behind the wall panels and bulkheads, in the case of the unseen hardware, and to expand a bit on the structures we've seen each week. While the advances in computer-generated imagery, miniature construction, and video compositing have enabled us to see strange and wonderful objects in the world of Deep Space 9, we wanted to show some of the things only hinted at in the episodes.

We would like to believe that the *Star Trek: The Next Generation Technical Manual* helped our writers and entertained our readers by generating new technological concepts or elaborating on established ones. We also want to emphasize that, like that earlier work, this book should not be viewed as a constraint on the writers or anyone else who wants to create *Star Trek* stories. We have learned over the years that structures and systems are remarkably flexible; we can replace a torpedo warhead or build a new cargo bay with a few keystrokes. True, hundreds of episodes have been added to the history, but there are still many more tales to be told in a galaxy as large as the Milky Way.

It is our wish that this new manual serves to show that there really is more than one solution to a design problem, and that differences in hardware—or people—should not become an impediment to their working together. By the time you read this, if all has gone according to plan, the first elements of the International Space Station (ISS) will already be in Earth orbit, built and crewed by different cultures, almost four hundred years ahead of Deep Space 9. By 2004, the ISS promises to be the largest and heaviest structure ever assembled in space and the brightest object in the night sky. We know for a fact that many people responsible for designing and building this space station have followed *Star Trek*, in its various incarnations, for over thirty years, and have derived at least a modicum of inspiration from its stories of exploration, scientific discovery, and contact.

I. DEEP SPACE 9

1.0 DEEP SPACE 9 INTRODUCTION

The fact that the Federation has not fallen totally into the hands of its enemies is attributable solely to the vigilance and resourcefulness of its people, the stalwart and selfless defenders of our member worlds and outposts. Never before in the history of interstellar civilization have we witnessed galactic turmoil on the present scale. The struggles we are enduring are irrefutable evidence of that. Whether or not Starfleet and the UFP can continue to make a stand on so many fronts is simply not known.

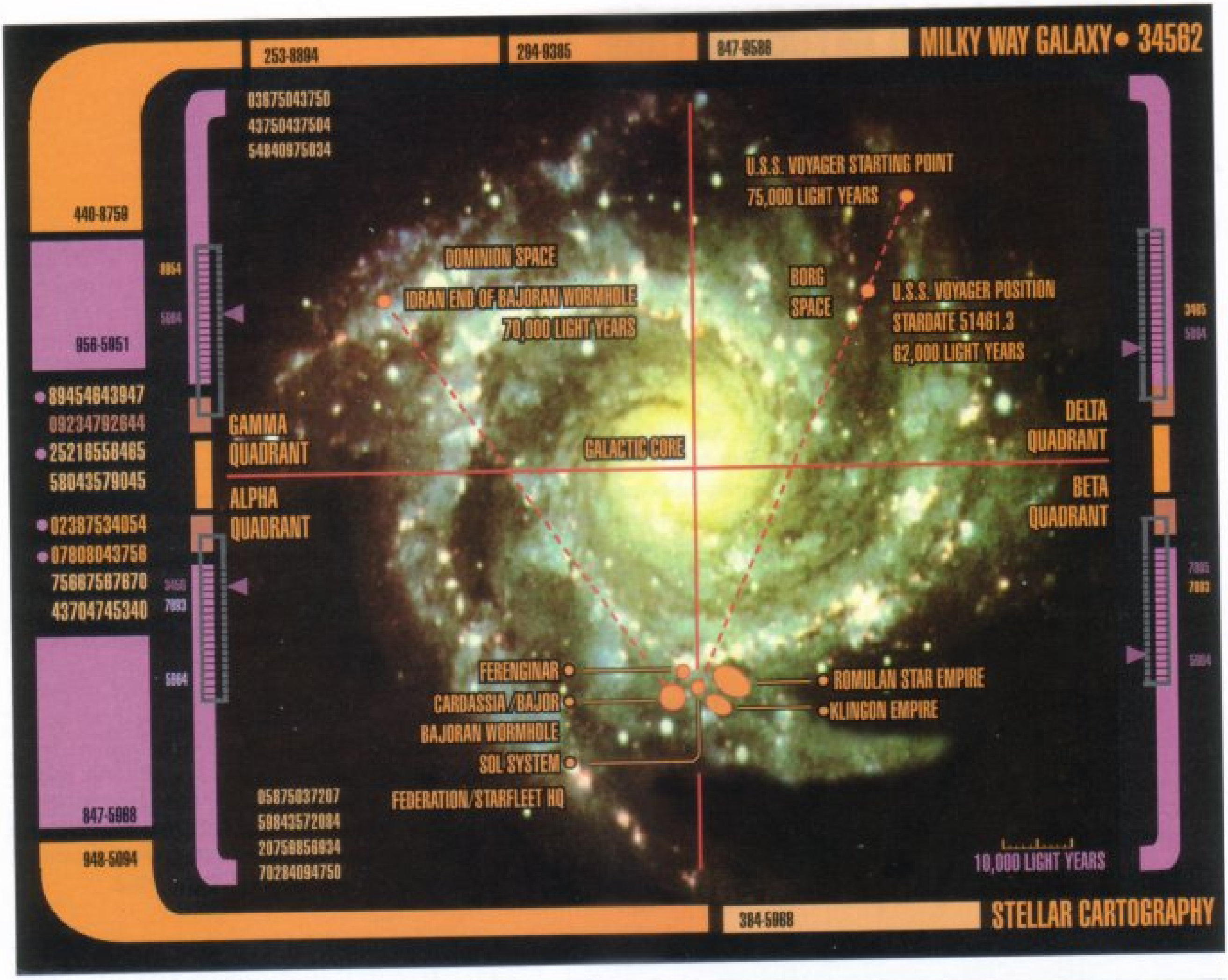
But we will try.

Jaresh-Inyo
President
United Federation of Planets
October 2373

1.1 THE STRATEGIC SITUATION: TEROK NOR TO DEEP SPACE 9

The tensions and outright war arising in the Bajor Sector are well known, though rather more difficult to fully comprehend or bring to a peaceful conclusion. Threat forces from the Alpha Quadrant, particularly the Cardassians, have joined with the Dominion fleets from the distant Gamma Quadrant to endanger the survival of many races. As with the Q incident, which brought the Federation into early direct conflict with the Borg, the discovery of a stable, artificially generated wormhole has reduced the time before the Alpha Quadrant would make contact with the Founders, the Vorta, and the Jem'Hadar.

Deep Space 9

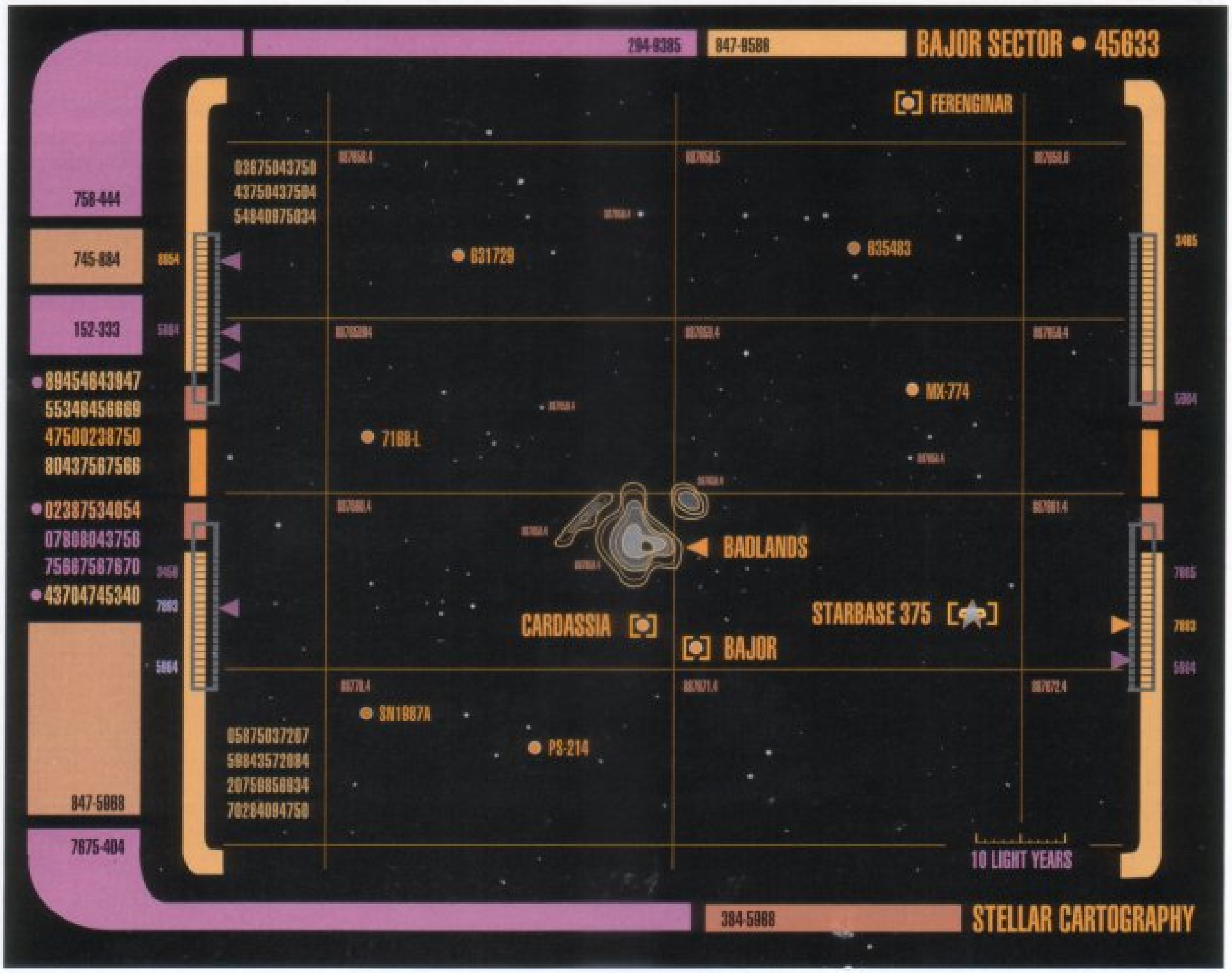


GALACTIC SPACE

The Milky Way Galaxy has become a rapidly shrinking system of stars in the context of warp velocities and cultural contacts. Wormholes, alternate universe states, temporal rifts, and other tunneling phenomena have contributed to the accelerated pace of humanoid movements and hostile operations, and no resolution to the antagonism appears in sight. Federation scientists have studied the major subspace tunneling phenomena and continue to search for others along what are being labeled as scalar phoci or energetic domains that seem to cluster in specific parts of the galaxy (see illustration). Artificial wormholes have been examined in an attempt to harness the technology for defensive and scientific purposes. Data on additional natural conduits are being compiled and analyzed in an effort to gain any advantage over threat forces across galactic distances. A parallel effort has been underway to bring home the *U.S.S. Voyager*, which was pulled across 75,000 light-years to the Delta Quadrant. Although the *Voyager* entry conduit and the Bajoran wormhole are not caused by the same entities, the fact that the two origin points lie within a scant 3.2 light-years of one another bolsters the suspicions of most Federation quantum physicists that tunneling phenomena may be more common than first suspected.

LOCAL STELLAR NEIGHBORHOOD

The battlegrounds surrounding Deep Space 9 involve at least twelve sectors and the worlds contained within them. The Bajoran and Cardassian star systems, some 50 light-years from the core Federation worlds, are separated by 5.25 light-years (see illustration). This seemingly wide gulf, believed to have been crossed by early Bajoran explorers hundreds of years before warp technology was discovered in the region, ultimately proved to be no real impediment to the Cardassians in their bid to occupy Bajor. Starfleet analysts believe that in the eighteen years between 2328, when Cardassia annexed Bajor, and 2346, when Terok Nor was built, the designs for a general-use space station were modified to make large-scale uridium mining feasible. In the current time frame, the distance between the two systems is uncomfortably small, requiring Starfleet to maintain a presence in the Bajor Sector, however fluctuating that presence appears in terms of fleet numbers and deployed weapons systems.



THE BAJOR SYSTEM

The situation on a star-system scale is remarkably benign, if one excludes Bajor and Deep Space 9. The fourteen planets revolving about Bajor-B'hava'el, the central star, include eight terrestrial worlds, three gas giants, and three ice/rock conglomerates (see illustration). All of the terrestrials are basic Hartmann bodies consisting of nickel-iron cores and silicate mantles, with varying proportions of metals and other elements and compounds, depending on the solidification distance from the sun. The gas giants are hydrogen-helium masses with varying proportions of methane, ammonia, sulfides, and metallic sodium. The frozen outer worlds consist mainly of water and methane ices and small amounts of rocky materials. A standard variety of cometary and asteroidal objects round out the mix, with occasional appearances by both within the inner system, visible from Bajor.

A relatively small number of crew-tended outposts and monitoring stations had been established on selected uninhabited planets and moons by Bajoran resistance forces prior to the Cardassian retreat. These hidden, automated stations continue to function with little required maintenance and have been supplemented with Starfleet subspace monitoring devices, emergency beacons, and supply caches. Some Cardassian deuterium-fueling operations had been established around the gas giants, but were removed, and Starfleet tankers now perform routine Bussard collection and condensing of starship and station fuel. No antimatter production facilities for starship operations have been established, due to security considerations. All antimatter arrives from secured starbases closer in to the Federation perimeter.

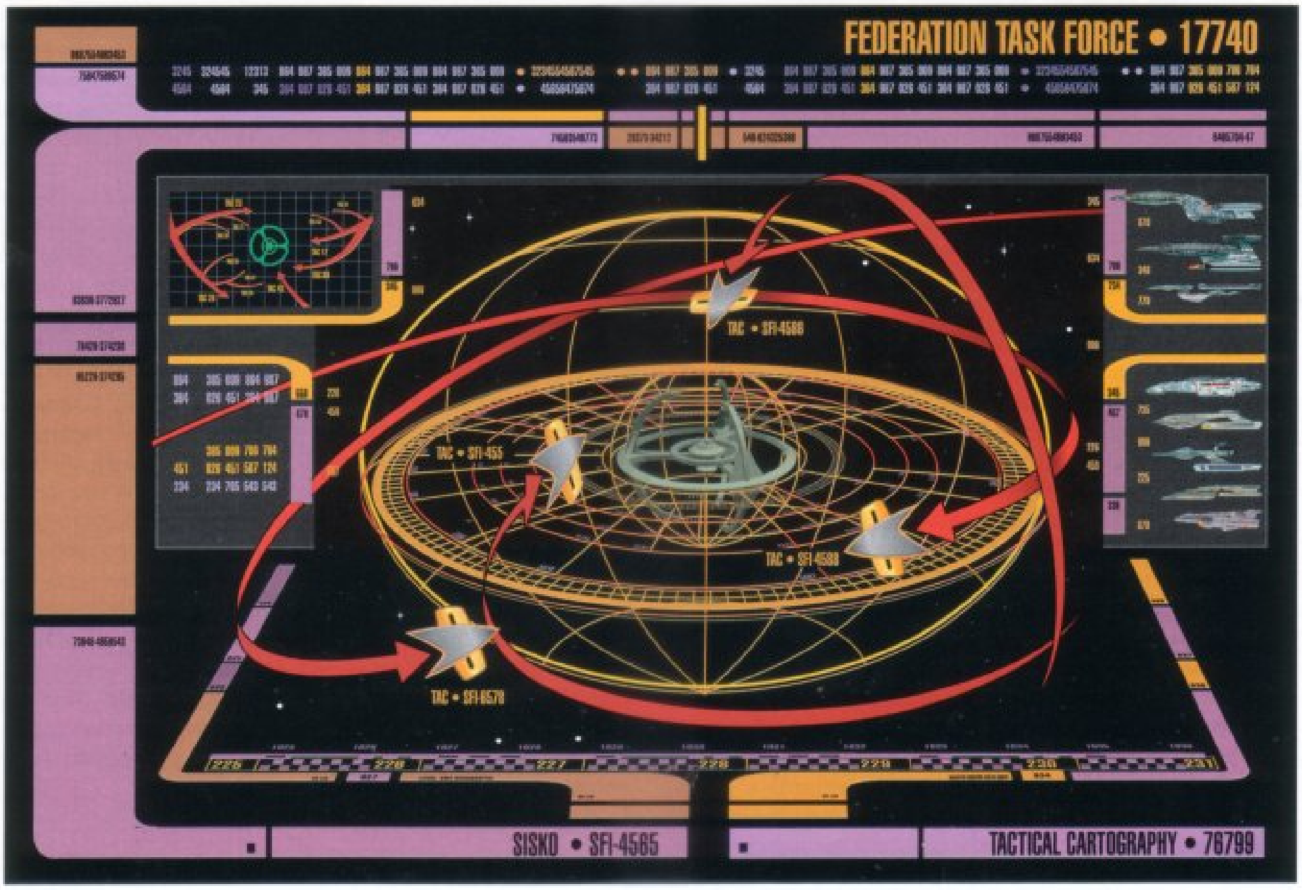
Bajor itself remains on course with its rebuilding efforts following the end of the occupation. The temporary retreat by Starfleet had limited impact on the rebuilding, particularly in the areas of materiel redirections, but the major impact was on station operations, since the focus of the Cardassian/Dominion offensive was Deep Space 9. Currently, replicator and agricultural technology continues to flow into Bajor from Federation centers, while Federation membership remains under discussion between Bajoran and Federation delegations.

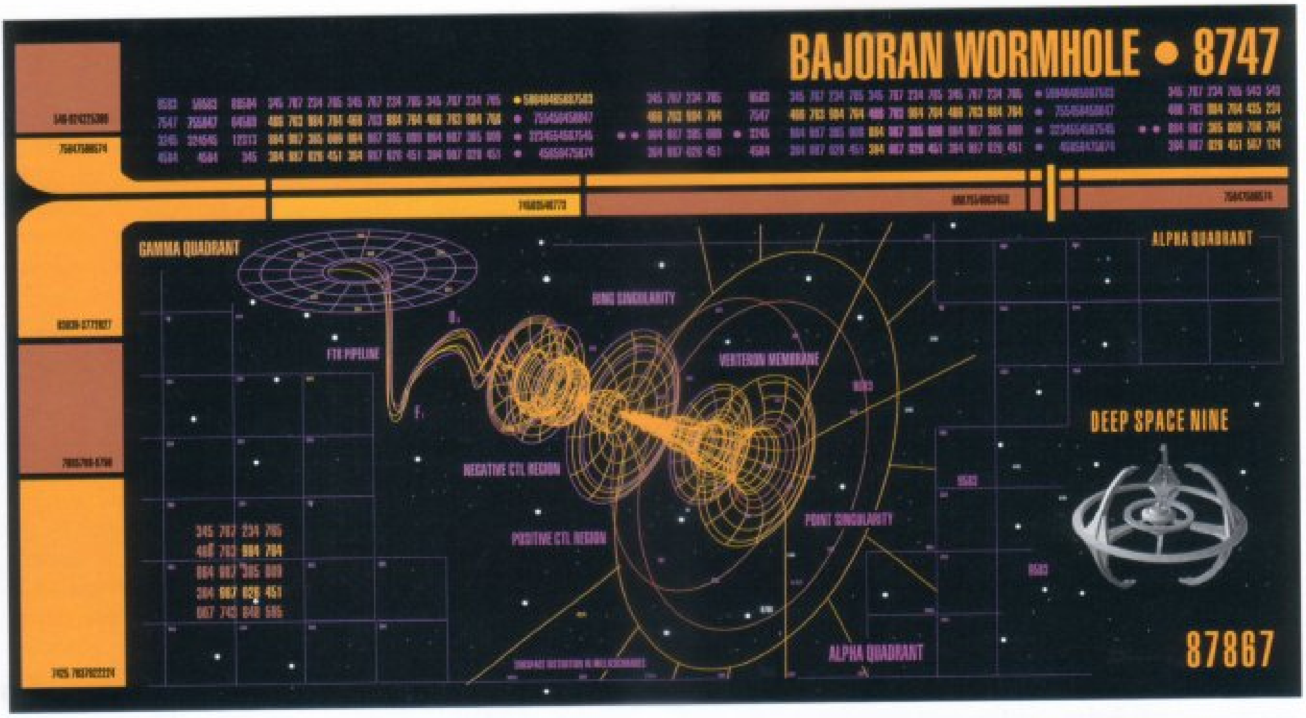
OPERATION RETURN

The Starfleet offensive mounted to retake Deep Space 9 in 2374 was designated Operation Return, and this effort proved to be one of the costliest to Starfleet in lives and space vessels (see illustration). This operation pointed up not only Starfleet's strengths, but its admitted shortcomings. The lasting effect of the action has not yet been determined, though computer simulations are ongoing to calculate threat force strategic, tactical, and industrial movements, based on existing algorithms and intelligence-gathering operations. With the combined Cardassian and Dominion capabilities in the Alpha Quadrant crippled for the time being, the combat situation has been reduced to more manageable levels. Both sides have continued to add to hardware, manpower, and supplies, with occasional hostilities along spatial borders.

In terms of rapid vehicle production, refitting, and weapons loadouts, Starfleet was able to perform a series of miracles. Large numbers of warp vessels, not yet fully constructed in their shipyard assembly fixtures, were brought up to basic flight standards and given, on average, 35 percent more phaser and photon torpedo capability (see 14.4). Most internal habitable spaces, such as living quarters and laboratories, were left uninstalled, allowing for increased weapons supplies and other defensive gear.

The difficulties encountered by Starfleet Command in preparing for Operation Return centered around vessel deployments, intelligence, and security deficits. Some fleets were selectively reduced in sectors of active conflict according to specific risk-assessment calculations. Starfleet Command authorized the ship movements if, and only if, the ships could be restored to their original theaters of operation when the Deep Space 9 reacquisition of assets was concluded. Intelligence operatives and remote sensor data were not as numerous or as effective as Starfleet desired. Various barriers compounded the problem; few sympathetic Cardassian individuals could be found to penetrate military ranks, not enough time existed for covert activities, and transmissions or couriers of gathered data were stymied by heavy security measures, made more difficult by the ongoing discord between Cardassian Central Command and the Obsidian Order. Security on the Starfleet side was occasionally compromised, primarily through remote sensing by the Cardassians and Dominion forces. Seemingly stealthy movements of Starfleet assets were detected by one or more large subspace antenna arrays. Additionally, some computer security systems were breached by unknown agents, requiring more robust levels of access protocols and user ID verification. The damage to Starfleet, Bajoran, and Klingon defenses is still being evaluated.





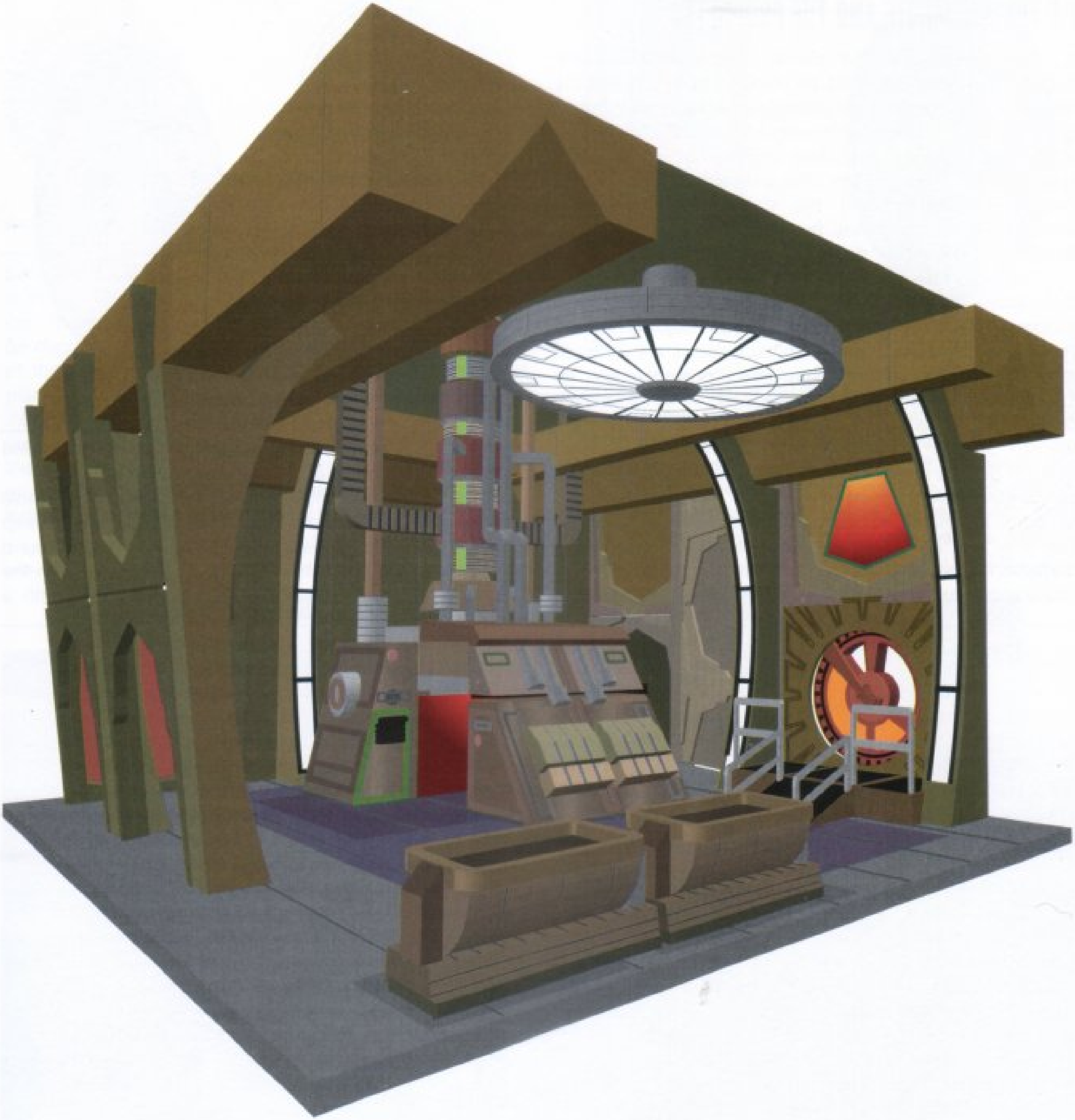
THE WORMHOLE

The verteron-driven tunneling phenomenon often referred to simply as the Bajoran wormhole remains focus of the Deep Space 9 mission (see illustration). Despite the impediments to a constant, unified alliance among the Federation, Bajoran, and Klingon governments, and the extremely ambiguous involvement of the Romulans, the wormhole has been preserved in a relatively stable condition. The actual wormhole dynamics, however, are still the subject of research and debate and remain largely under the control of the resident entities known to the Bajorans as the Prophets and the Pah-wraiths. As such, the instantaneous physical readings may be placed along a scale of previous values that has been correlated as stable to anomalous. While the wormhole remains "operable" with the assistance of its alien race, the Dominion forces within the Gamma Quadrant also remain an ever-present danger if and when large numbers of their vessels make the crossing.

The Bajoran star system, as well as those stellar families in the surrounding space, represent valuable untapped supplies of minerals, metals, and fuels to Bajor and to threat forces in the region, mainly those of the Cardassian Union. Planetology specialists have determined that Bajor and Cardassia do possess similar abundances of crustal resource; Cardassian near-subsurface access to the materials they require for their present level of civilization is more limited than that of their Bajoran counterparts. During the Cardassian occupation of Bajor, vast supplies of uridium ore were found to be easily tapped (see facing illustration), and the costs of building and operating a mining station were well below a comparable mining effort on Cardassia itself, and so Terok Nor was created.

The resources necessary for Cardassia are keyed directly to the level of technological development the world government and its military deems acceptable. Cardassia Prime and its associated systems long ago exceeded the technology level for a comfortable standard of life for all their citizens at roughly the same time they achieved warp travel, a critical milestone seen by nearly 87.9 percent of deep-spacefaring cultures. The basic humanoid affinity for acquisition, warfare, and conquest by these same cultures is well understood and need not be elaborated upon here, though it is a reality in the galactic environment that must be dealt with. Despite the claims that Cardassia—or any warp-capable race—is poor in resources, the fact remains that the achievement of warp flight and related technologies, most importantly replicator devices, virtually ensures that with the proper administration their race will flourish.

Since the retaking of Deep Space 9, the Bajoran government has resumed making trade inroads with surrounding star systems as far away as the near-side races in the Beta Quadrant. Remaining geological strata containing uridium, duranium, rodinium, and other valuable ores have been analyzed and cataloged for further extraction and refining. It is believed that with the continued Starfleet presence in the sector, regardless of full Federation membership issues, Bajor will surpass pre-occupation economic levels within five years.



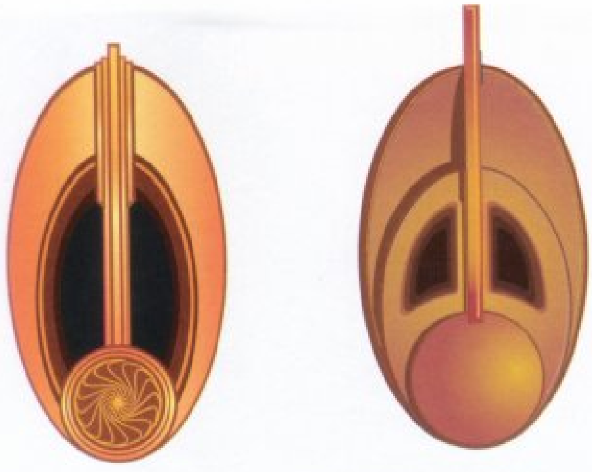
Ore processing plant

1.2 THE WORMHOLE AND THE PROPHETS

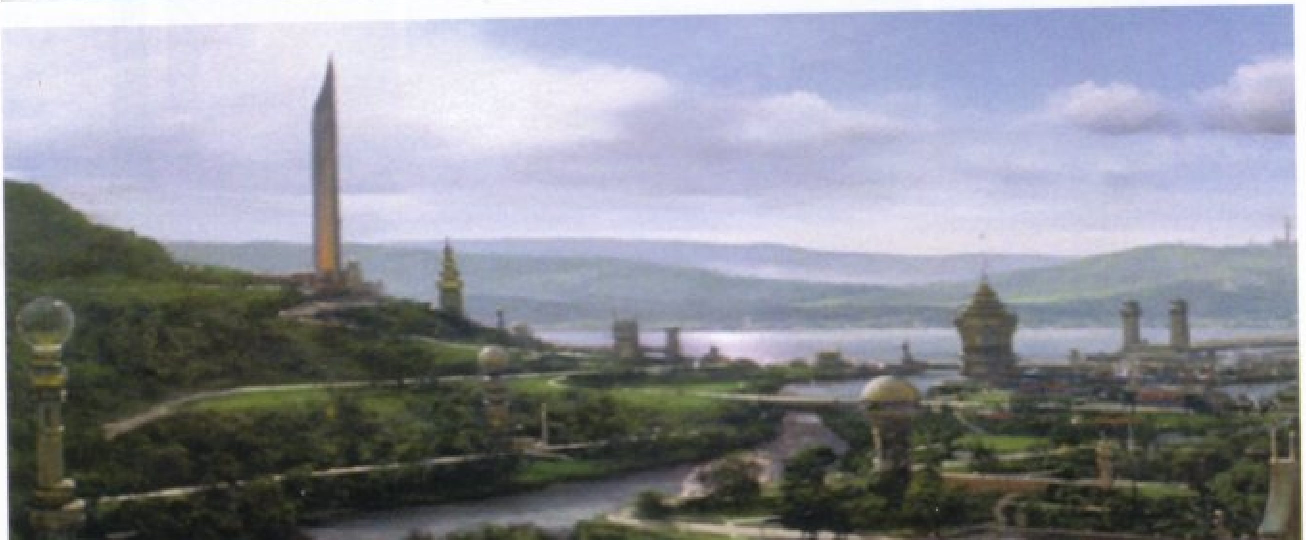
The Bajoran civilization stands at an unenviable place in galactic history, bounded by strong ties to its religious beliefs; its agrarian and technological heritage; its proximity to two violent, oppressive races of warriors; and its affiliation with newfound defenders who cannot yet welcome them as equal partners. The principal cause of the Bajoran people's consternation is the stable wormhole within which, they believe, reside the Prophets of the Celestial Temple who guide their daily lives and growth.

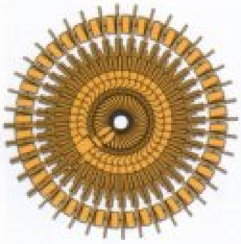
The wormhole terminus exists in the star system's distant plasma torus known as the Denorios Belt, some three hundred million kilometers from the sun, Bajor-B'hava'el. The detectable astrophysical characteristics are quantifiable; the reasons for the wormhole's presence and its future are not. If the entities in the deep verteron domain continue to interact with Captain Benjamin Sisko and the Bajoran people, the answer may one day be revealed through Sisko's role as the Emissary. The galactic space surrounding Deep Space 9 is known to be riddled with temporal anomalies, omnipotent races, a mirror-universe interface, and an assortment of other astronomical phenomena, not all of which may be natural in origin. Of particular note are appearances of cometary bodies and wormhole changes that are believed to have coincided with recorded prophecies.

The basic mechanics and properties of the wormhole have been studied thoroughly since 2369, when Deep Space 9 was first moved outward from its orbit around Bajor. It is known that the Bajor terminus moves with the Denorios plasma field in an orbit about the sun with a



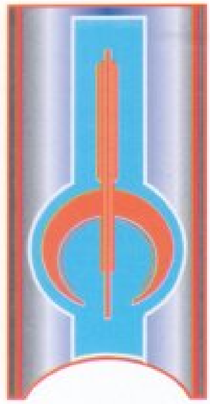
Bajoran symbols *Communication badge*





Religious icon

Welcome sign

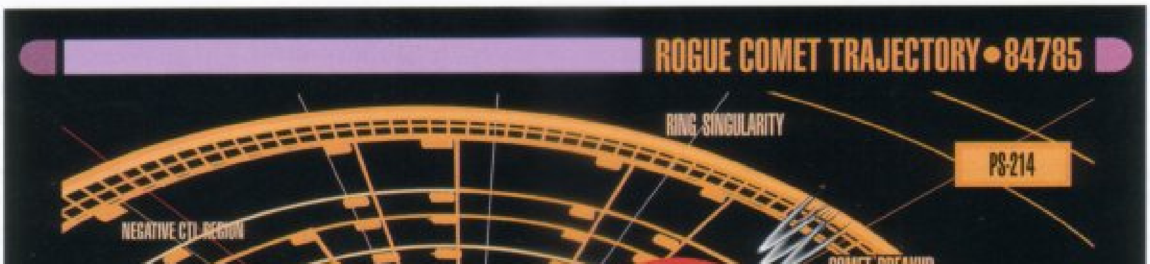


Militia

Provisional government

period of 13.5 years. The average orbital period of the belt is faster, 13.1 years, creating periodic density waves that can upset station operations. The orbital plane is inclined 38 degrees to that of Bajor, but only 11.5 degrees to that of the ecliptic created by Bajor IX, the largest gas giant planet in the system. Historical back-trace calculations indicate that the subspace inversion event each 50.23 years has been visible from Dahkur Province for at least the last thirty-five hundred years, and possibly as far back as thirty thousand years, with corrections for minor perturbations, axial precession, and tidal slowing.

Federation scientists believe that the terminus of the wormhole near the Idran star system, seventy thousand light-years away, is also in an extremely slow oscillation about a central point, though not enough positional and velocity data have been collected to tell for certain. The Bajor terminus orbit about the sun is moving an insignificant amount relative to its total wormhole length; given that the system's inclination to the plane of the galaxy is



Many Bajorans believe that the comet event of 2371 was predicted in historical writings

68.9 degrees, a ratio of 1 part in 2.1 trillion is the accepted value. If there is a numerical relationship between the Bajor orbit and the Idran end motion, it is not yet understood, and may not yield answers anytime soon, because of the assumed nature of the wormhole as an artificial—and changeable—construct.

The deep structure of the wormhole is thought to be made possible through the creation of a twelve-dimensional helical verteron membrane, which shapes the tunneling domain of the wormhole. Without a constant energy flow tuned by condensed verteron nodes which exist at irregular intervals within the perceived domain, the terminus ends collapse from a tube with a topology of Genus 1 to a sphere with a topology of Genus 0. If a single terminus is open, the topology remains at Genus 0, since a single opening results in a single surface. The fact that the Bajor terminus orbits the sun implies that the quantum emergence point possesses definite mass, though the exact nature of this mass is assumed to be weakly interacting material related to dark matter. The terminus as well as the domain interior do interact with various substances and electromagnetic (EM) fields, so the dark matter component is probably only one of many entangled layers and quantum strings. A variant of the Prophet entities, the Pah-wraiths, had been ejected from the wormhole domain to one known subsurface location on Bajor, indicating that the entities can apparently exist outside of the wormhole as self-contained energy structures.

Spacecraft making the crossing are warned to travel only on impulse, normally one-millionth as energetic as matter-antimatter reactions for warp flight. The initial flight requirement for crossing vessels to project individual verteron streams was relaxed, and most ships were able to make the impulse journey without incident. Warp fields produce a massive destabilizing effect on the wormhole, which results in more field rebound damage to the energy-producing vessel than to the wormhole itself.

Military *Military* *Prylar* *Kai*

The repeated contacts between the Bajorans and the Prophets, through the Orb artifacts discovered scattered throughout the star system, have been seen by many historians and scholars as evidence of a guiding influence by a highly advanced race of beings. New contacts with the wormhole entities have occurred with Captain Sisko, who has experienced repeated visions that are believed to have originated with them. At the heart of these contacts lie the issues of simultaneity and linearity of time, long studied by cosmologists and quantum physicists. Since it is an

Bajoran Orb case

An ancient painting of B'Hala

accepted fact in the galaxy that temporal mechanics can be dealt with by advanced humanoids working with equally advanced technology, the nature of time as perceived and controlled by the wormhole entities is becoming a more known quantity. Put more simply, to a unified civilization that can effortlessly perform time travel, the temporal activities of the wormhole entities is no longer a complete surprise. Mysteries surrounding Captain Sisko, the prophecies, and the Orb artifacts still abound, however, and humanoid technology continues to use its tools to understand them.

Bajoran earring

The Orbs, in particular, defy complete analysis. Outwardly appearing as rounded hourglass shapes, the Orbs are characterized by current evaluations as similar to self-sustaining Leyton sequence confinement fields that exist only partly in normal space, perhaps 5 percent. The other 95 percent may remain embedded within the verteron membrane. If the Orbs maintain an energetic connection with the wormhole, the energy pulses that create the visions in the humanoid contactees can indeed originate with the Prophets themselves.

Of the nine different Orbs discovered in the Bajor system, only three currently reside with the religious leaders of Bajor. Eight had been seized by the Cardassians during their retreat in 2369. One, the Orb of Prophecy, remained behind and provided the first non-Bajoran contact. Another, the Orb of Wisdom, was obtained by the Ferengi grand nagus and later returned to the Bajoran people. A third, the Orb of Time, was returned by the Cardassians in 2373. Six more are assumed still held by the Cardassian military-led government. Intelligence reports concerning the Cardassian efforts to utilize and possibly control the Orbs indicate that they have met with little success beyond accumulating scan data, and they may be close to giving up their attempts.

There is little question that the Bajoran people have held the wormhole and its enigmatic entities sacred for many thousands of years. Their artistic lives are influenced by their beliefs and the physical realities of the Orbs and wormhole, as seen in their distinctive architecture, jewelry, and other works of two- and three-dimensional design. In these cases, the scientific minutiae of their Prophets mattered little. Faith and tribute were given life through the creation of form, the application of color, and the celebration of their culture. The ancient city of B'hala, which flourished some twenty thousand years ago, is one example of the marvels of the precursor civilization that eventually led to present-day Bajor. The archeological connections between this early Bajor and the mystery of the Emissary are slowly being uncovered, even as Starfleet and Bajor deal with Cardassia and the Dominion.

1.3 TECHNOLOGICAL ASSESSMENT OF THE CARDASSIAN UNION

Throughout the early years of the conflict between the Cardassian Union and the Federation, particularly between 2355 and 2359, Starfleet engineers and scientists examined all incoming data about this new threat force. Soon after the first technical analyses were transmitted to Starfleet Headquarters, the engineers joined with strategists and tacticians to begin formulating defenses against the weapons and space vessels being encountered. Upgraded artificial intelligence (AI) systems also began constructing probability trees of predicted warfighting capabilities. The ongoing Cardassian hostilities, combined with the Jem'Hadar and Dominion incursions, have altered the balance of power in the galaxy. Numerous lateral redeployments of Starfleet personnel and hardware have been necessary to deal with intelligence-gathering, countermeasures, and threat-containment issues. Concurrently, the fluctuating political allegiances in both the Alpha and Beta Quadrants now require constant, rapid, updated assessments of all non-Federation spheres in the areas of science, technology, sociology, and economics. This is being done in order to synthesize a more accurate picture of the complete galactic tactical and sociopolitical situation. In turn, these evaluations will allow the Federation to better manage its assets on the broad scale, and Starfleet to better deploy its forces on the regional scale. Both are essential to the survival of the Federation and its member systems.

By itself, the Cardassian Union constitutes an Index 21 culture on the Weibrand logarithmic developmental scale of 1 to 100, where 1 equals any pre-warp civilization, and 100 equals the base level of the unaffected races (UR), such as the Cytherians, the T'Kon, and ultimately the Q. It should be noted that the wormhole entities, the Prophets, and the Pah-wraiths, are ranked as Index 90 and as such are not included in the UR catagory. In comparison to the Cardassians, the Federation is rated at Index 23. With the new alliance with the Dominion, the Cardassian Union is now rated at Index 24. While the difference of a single rating point does not automatically signal the overthrow of a lower-index culture, it does require increased readiness for conflict.

That the Cardassians and the Bajorans share a common heritage has at least some bearing on the postulated cycles of technological emergence and decline that have marked their two histories. The relative proximity of the two star systems and their similar chemical and metallurgical makeup insured that advanced technology was possible on both habitable worlds, including impulse and warp flight. While the complete story of both ancient cultures' past efforts at space flight has yet to be written, the current capabilities of both worlds is well documented. At the time of the occupation of Bajor and the construction of Terok Nor in 2346, Bajor had stabilized as an Index 20 civilization and, at least in this case, was overrun by the Cardassian forces.

Starfleet Intelligence believes that the current Cardassian industrial base includes Cardassia Prime (see illustration) and at least fifteen other neighboring worlds supporting major scientific and fabrication facilities. One hundred fifty-three additional orbital and deep interstellar facilities are thought to make up the bulk of their off-world assets. When applying all of their available resources, the Cardassian Union is capable of producing, deploying, and supporting a large armed fleet and accompanying combat troops on a continuing basis. Estimates of space vessel production rates, troop conscription, and large-scale weapons developments are as follows:

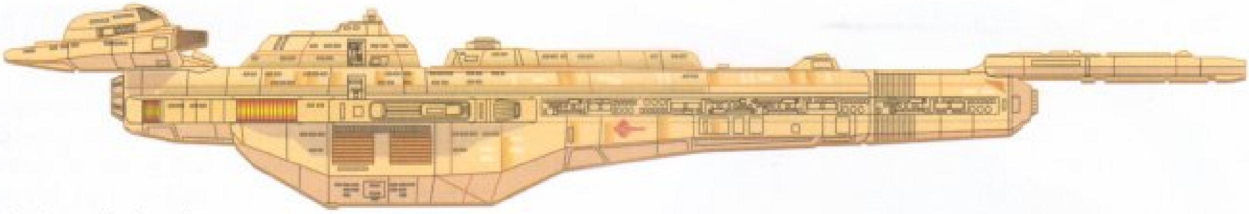
Cardassian Standard

Regimental

Obsidian Order

Retired uniform

Current uniform



Galor-*class attack cruiser*

ITEM	NO. PER STANDARD YEAR
Galor-class battle cruiser	63
Galor-class warship	15
Fighter	352
Freighter	188
Heavy penetrator	443
Base-level Troops	583,000
Glinn-level Officers	21,600
Gul-level Officers	8,900
Planetary disruptors	430
Photon torpedoes	54,300
Offensive EM devices	230
Biogenic weapons	430

Cardassian scientific knowledge is believed to be comparable to that of all other principal Alpha and Beta Quadrant civilizations, due in part to deliberate as well as inadvertent information diffusion throughout the two quadrants. Most scales of matter and energy manipulation are familiar to the Cardassians in theory, if not application. The realization of newly discovered principles and techniques as practical inventions in critical areas has traditionally lagged by five to seven years, according to historical data. This has not prevented the Cardassian Union from advancing across galactic space, though the bias toward increased military production has had a classic adverse effect on its civilian population.

Analysis of Cardassian hardware, particularly in the forms of spacecraft materials, computer systems, and weaponry, has yielded some noteworthy differences in design methodology and fabrication techniques, as compared to frontline Starfleet equipment (see 16.0):

• **Embedded warp engines.** Use of embedded warp engines deep within starship spaceframes takes advantage of a smaller radius defensive-shield bubble. A slight but acceptable disadvantage exists in that the warp field becomes less efficient.

• **Defensive shields.** These same defensive shields require less power than Starfleet counterparts, while maintaining good protection against phasers and photon torpedoes though additional layers of EM energy reflection and conversion coatings.

• **Structural materials.** Radically different proportions of structural materials appear in similar components from ship to ship; this may indicate either assembly adaptations and/or raw-materials availability issues.

• **Spacecraft construction.** Spaceframe and hull layer construction are simpler and more robust, requiring less structural integrity field (SIF) energy to maintain hull stability.

• **Navigational deflector.** The *Galor*-type navigational deflector incorporates redundant disruptor beam emitters as a nominal hardware design.

• **Computer core.** Spaceborne computer hardware is designed with higher levels of reinforcement against vibration and subspace field shock.

• **Armament.** Shipboard disruptor weapons are believed to operate semiautonomously during periods of high crew-battle workload.

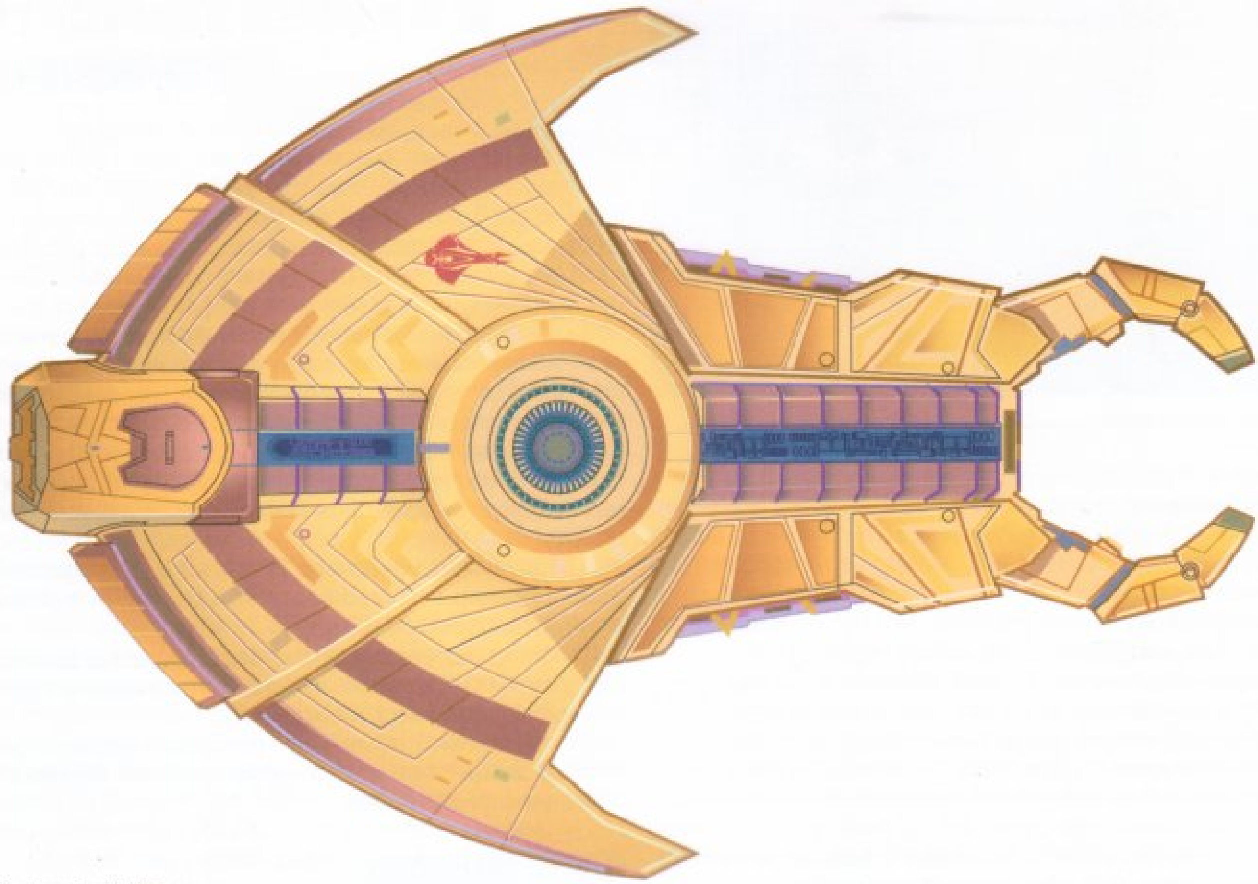
PREDICTED ADVANCEMENTS

The old Earth observation that nothing stimulates scientific and technological progress better than warfare readily applies to the present struggle. Undoubtedly, the Cardassian Union will benefit from its alliance with the Dominion, though exactly what advances will unfold remains to be seen. Starfleet Intelligence continues to conduct wide-ranging reconnaissance missions from the Sol Sector, Deep Space 9, Starbase 375, and other strategic locations in the Alpha Quadrant in the effort to target specific emerging technologies in the Cardassia-Bajor theater of operations. Besides the ongoing effort in artificial wormhole generation, key areas being studied include the following:

• **Convergent-force matter disruption.** This energy manipulation technique is thought to amplify an initial "seed" pulse of energy to produce in a localized volume the high temperature and radiation-pressure conditions present in a stellar core.

• **Negative matter annihilation.** The long-postulated negative matter weapon has not yet been perfected, but obstacles or projectiles of negative matter, having unchanged spin and charge but negative mass, would cause normal matter to silently disappear on contact, with a net detectable energy release of zero.

• **K-layer subspace concealment.** In theory, a starship equipped with the proper warp symmetry generators



Cardassian fighter

could lie in wait undetected in a deep subspace domain, close to its target, until ordered to attack. Variants on the use of the K-layer involve biogenic weapon delivery, piggy-back signal concealment, and "matter switching" applications, where physical materials can be swapped across the subspace interface.

• **Transwarp computation speeds.** Theoretical computer core devices able to run at 500 to 750 times faster than light (FTL) speeds may be possible. Present research attributed to Cardassian scientists predicts breakthroughs in energy-field stability and circuitry density within ten years.

• **Defensive shield impermeability.** Total energy isolation is being studied as a subspace field generation method which allows no interaction between an established shield bubble and an outside force. When active, all energy radiated toward the bubble will refract with zero EM transfer. There is no known countermeasure predicted in the present computational model.

CARDASSIAN THREAT FORCE DEFICIENCIES

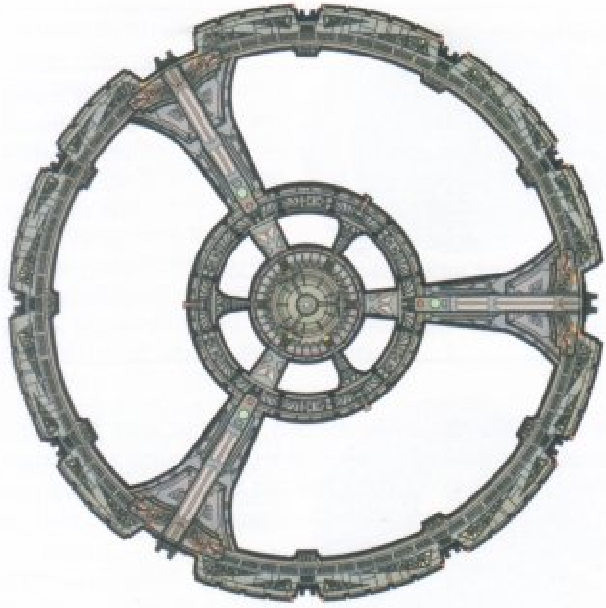
Any assessment of the Cardassian Union as a danger to the Federation and its associated worlds must also include possible weaknesses to be exploited. As part of Starfleet's overall strategic plan to regain peace and stability in the Alpha Quadrant, a number of promising hardware deficits are being explored, despite the aforementioned possible advancements. They include a predisposition in defensive shields to overloading, warp core stability loss under high-stress flight maneuvers, computer virus penetration problems in older warships, loss of fire control sensor lock during multiple-launch conditions, and inefficiencies in warp engine trail masking.

Cardassian phaser pistol

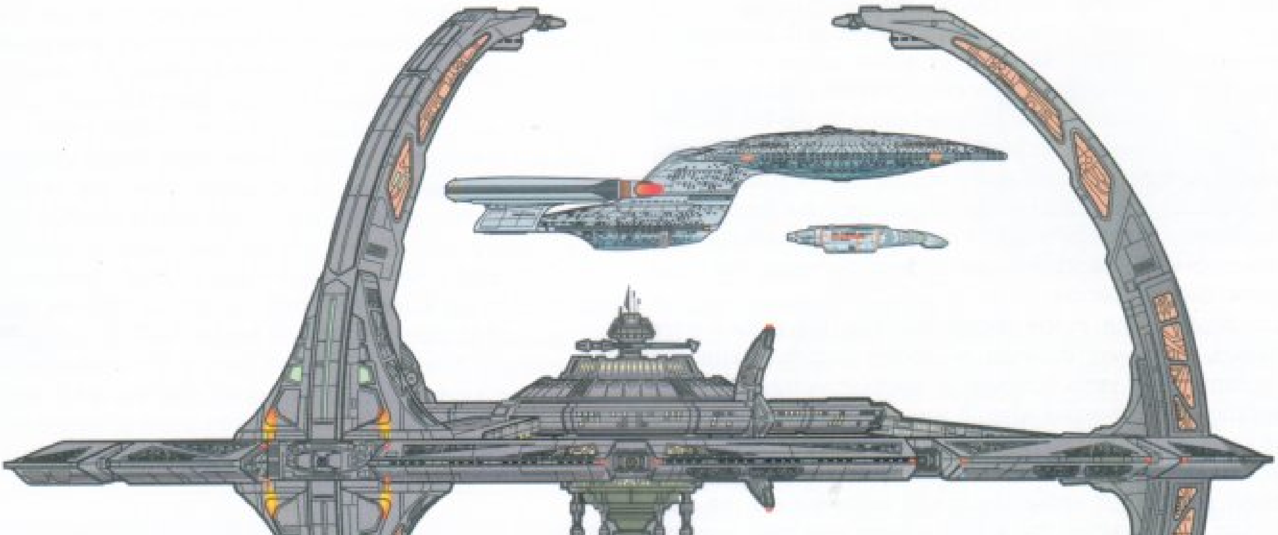
1.4 STATION OVERVIEW

By any standard of measurement, Deep Space 9 is an extremely large free-flying orbit station irrespective of its origins or current custodians. However, it is not the largest artificial structure ever encountered. That honor is already claimed by the Dyson Sphere discovered in the Beta Quadrant. At least three major Starfleet starbases dwarf Deep Space 9 in sheer size and mass, but the former Terok Nor is the largest spaceborne materials refining facility known to date.

The shape descriptors filed with Starfleet's Technology Assessment Directorate classify Deep Space 9 as a Hybrid Planar-Columnar Triradial structure. Its basic form is that of a set of nested flattened rings built out from a vertical stepped-cylinder core. Emerging above and below the ring plane are three tall pylons with wide buttresses and inwardly sweeping curves. As with most space structures, each shape on the original Terok Nor has been designed to perform a particular function. It must be pointed out that varying artistic and industrial engineering styles abound in the galaxy, and there is no doubt that the functionality of



Top view of Deep Space 9



U.S.S. Enterprise-*D*, U.S.S. Defiant, *and Deep Space 9 shown to scale*

DIMENSIONS

Overall Diameter	1451.82 meters
Habitat Ring Diameter	579.12 meters
Upper Core Diameter (Max)	285.90 meters
Mid-Core Diameter (Max)	182.88 meters
Lower Core Diameter (Max)	184.46 meters
Ops Diameter (Max)	59.43 meters
Height of Core (Ops to Fusion Exhaust Cone)	368.80 meters
Height of Docking pylons (Total)	969.26 meters
Height of Weapon Sail Towers	192.02 meters

the hardware has been melded together with a stylistic sense that appears to govern the Cardassians as builders. Indeed, the design of Terok Nor has been heavily influenced by the architectural marvels created by Tavor Kell on Cardassia Prime.

The massive assemblage of steels and composites, which grew to its present proportions in orbit about the besieged Bajor, can be broken down conceptually into a number of logical components. In 2346, the core assemblies supported the control, scientific, maintenance, recreational, computing, and power-generating areas of the station. The Habitat Ring housed the station's Cardassian masters. The Docking Ring provided cargo movement and storage spaces. The Docking Pylons processed raw materials into refined ones, contributing to the Cardassian economic base. The current form is different mainly in the way the station is used by its residents; the Habitat Ring is populated by a wider variety of cultures, the Promenade supports a larger number of merchants and visitors, and the pylons no longer process uridium ore using the labor of the Bajoran people.

At one time in the design process, the pylons were turned to sweep outward to better accommodate the movements of large numbers of freighter vessels. The orientation was reversed when it was deemed a better move to keep all station appendages within a smaller, more powerful defensive shield envelope. Docked vessels as well as ships suspended within the shield envelope can be protected. Ships within the shield volume can hold position with active thrusters set to station-keeping or can be secured by tractor beam.

The basic dimensions of the station have been determined from auto-geometer scans taken by off-station Starfleet ships and corrected for EM scattering and subspace scan frequency drift. The scans revealed a curious shape anomaly present in all three ring structures. Three apparently random points on each ring exhibit a subtle deformation, either inboard or outboard, by an average of 0.47 meters. While not yet explained by subspace shock, impact, internal pressure, or thermal imbalance, the deformations do not seem to have an adverse effect on the station structure.

1.5 STARFLEET SUPPORT

Starfleet Command, as an instrument of United Federation of Planets (UFP) policy, has provided both spacecraft and supplies to support the operation of Deep Space 9. Some twenty-five starships, runabouts, and shuttles have been redeployed from other assignments to afford the station a mobile defense and continued transportation between the station and the core Federation worlds. In addition, Starfleet Materiel Supply Command has transferred almost thirty-seven million metric tonnes of equipment and consumables from Alpha Quadrant depots to help reconstruct and maintain the space station.

The spacecraft deployment officially attached to the station involves only nine vehicles: the *U.S.S. Defiant*; the runabouts *U.S.S. Rio Grande* and *U.S.S. Rubicon*, two Type-6 shuttlecraft, and four standard Work Bee utility vehicles. All other vessels assigned to support roles are attached to nearby starbases and secured Federation worlds and are not normally based at Deep Space 9. The *Defiant* is the primary station defense and reconnaissance vessel and is equipped with a cloaking device on loan from the Romulan Star Empire. The normal docking location is Port 1, Pylon 1, within view of the commander's office. The *Defiant* class has recently gone into limited yard production as a front-line starship (see 14.1). Spares and upgrade equipment are channeled to the station by regular Starfleet vessels or a variety of threat-confounding conduits, including commercial freighters and research craft.

The runabout inventory has proved to be of variable quantity due to inadvertent attrition. Though it is not attributed to any major design flaws, nonetheless the runabout has suffered a loss rate of 3.2 units per 100,000 hours of operational time, second only to the Type-6 and Type-9 shuttlecraft, both of which have incurred a loss rate of 8.9 units per 100,000 hours. Three runabouts are continuously hangared at Deep Space 9 within specialized storage and maintenance bays (see 14.2). The Type-6 shuttles and Work Bees are also hangared in the runabout bays within partitioned sections of the main volumes.

Major fleet operations relating to Deep Space 9 defense automatically become the authority of Starfleet Command, using as much predeployment intelligence from the station and its ships as can be compiled. Any threat force movements that cannot be countered by the *Defiant* and two runabouts must be augmented by patrolling fleet vessels from Starbases 375, 257, and 211. Larger threat forces must be countered by Starfleet assets assembled from bases and yards closer to the UFP perimeter, layer by layer, through the defensive territory structure. The outbreak of unlimited warfare by threat forces requires a total UFP mobilization under the Single Integrated Operational Plan (SIOP).

United Federation of Planets, Paris, Earth

Great Seal of the United Federation of Planets

SUPPORT FLIGHT PROCEDURES

Starfleet Command maintains all physical transport and communications ties to Deep Space 9 through channels leading back to the Federation Council in San Francisco and the UFP president's offices in Paris on Earth. The various directorates at Starfleet Command receive mandates from the Federation Council, clearing them to allocate ships, personnel, and cargo. Availabilities of required equipment and consumables are determined, and all cargoes are moved by starship from Earth and other UFP member systems to staging areas such as Starbase 375 (see illustration). Final clearance to traverse the last leg of the run must be given by a starbase, once the exact defensive situation at Deep Space 9 is understood. Dedicated personnel transportation is handled in similar fashion, with or without escort vessels, depending on the priority of the transfer. Specialized high-warp courier vehicles can be employed for critical missions and are able to cover the 50.3–light-year distance between the station and the UFP inner perimeter within six days. This is equivalent to warp 9.92, and is accomplished by using alternating twin matter-antimatter reaction cores and nacelle pairs. A modified four-engine version of the *Defiant* pathfinder spaceframe has proven successful in surpassing the 1,000 light-year/year efficiency barrier.

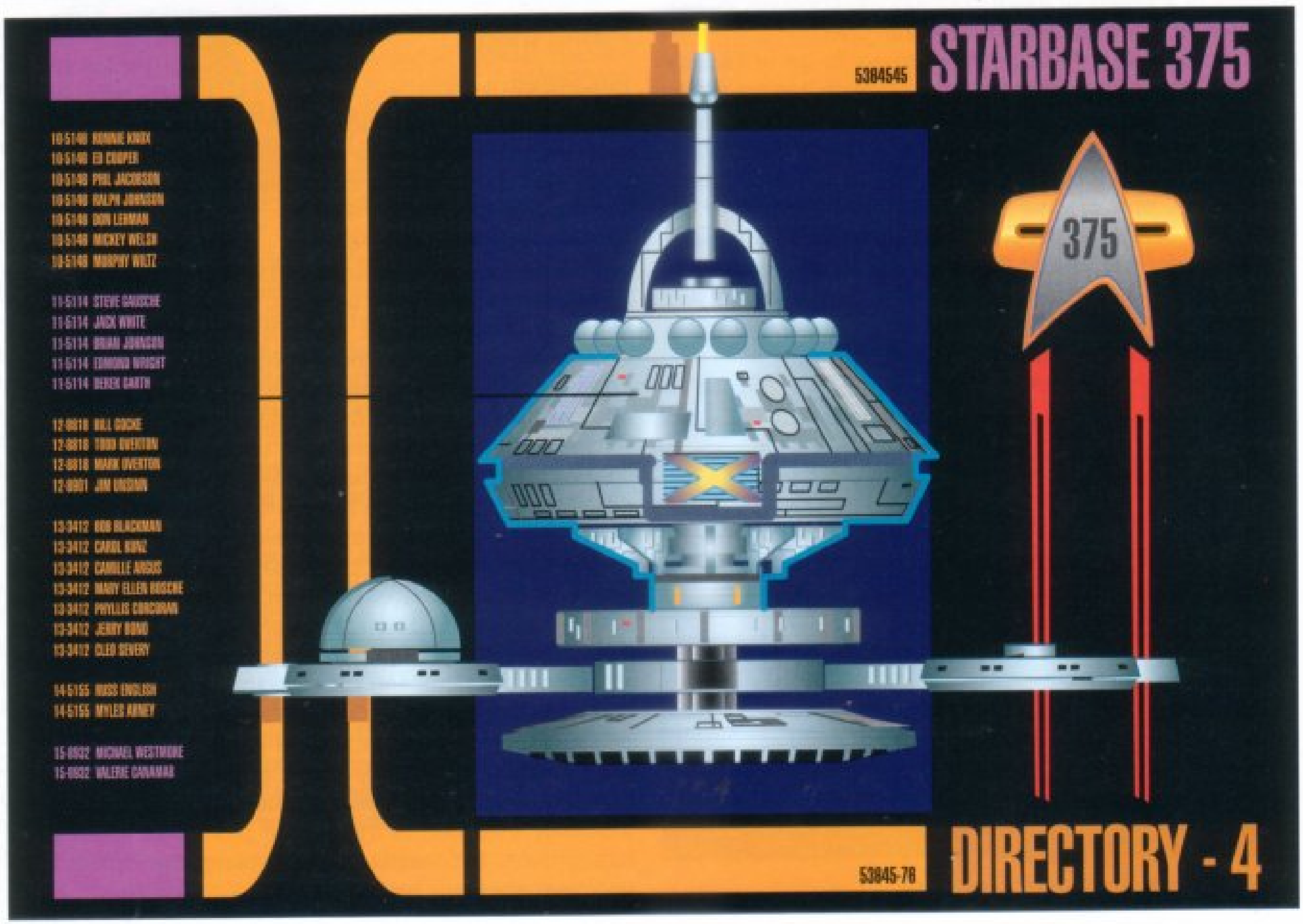
Starfleet Headquarters, San Francisco, Earth

Communications between Deep Space 9 and Starfleet relating to support operations pass along an adaptable subspace relay network, as do all vital computer, voice, and visual data streams (see 7.5). All real-time calls and formal requests are logged with Starfleet Command on Earth, and the response time of the call will be handled according to urgency of need. Emergency evacuations, for example, will be in work by a nearby starbase before the original message reaches the UFP. More routine resupply orders will be processed by the Materiel Supply Command (MSC). Complex requests involving large structures and spacecraft are handled by a joint tasking group within Starfleet Command and the Federation Council.

Shipments of Starfleet-originated equipment and consumables are made in standard cargo containers and involve instrumentation, breathing gases, potable fluids, foodstuffs, medicine, and tools. Escorted freighter convoys and single starship runs are common transfer methods. High-security items, such as weapons systems and powerpacks, arrive at the station by both open and covert means.

STARFLEET CORPS OF ENGINEERS

Vitally important to the reconstruction of Deep Space 9 was the Starfleet Corps of Engineers (SFCE), which also handles any required modifications and maintenance involving large-scale structures and hardware systems. An average of thirty-five resident engineers and technicians are based at the station, and are overseen by the chief of operations. An affiliate group of twenty-eight Bajoran engineers work together with the Starfleet crews and have



been trained to maintain the station in the absence of Starfleet personnel. Engineering equipment assistance is provided in the form of tools, spares, replication gear, computer databases, and heavy equipment manipulation booms and extravehicular activity (EVA) systems. This last area involves interior and exterior spacesuit operations, and Work Bee autonomous cargo and repair pod missions (See: 13.4, 14.3).

The SFCE crews have been instrumental in many episodes of station repair, including the destruction of Upper Pylon 3 by Jem'Hadar forces. Computer templates of the pylon structure and internal systems were used by the engineering crews to form new components, and seamless meld framing and hull plating together, once the damaged materials had been cut down and prepared. Every instance of threat weapons fire that has penetrated the station defensive shield envelope must be analyzed by SFCE and Bajoran personnel for microfracturing and alloy destabilization. Full patching and rebuilding are performed if required. The crews are also responsible for monitoring the total station structure for tension, compression, and torsional flexing in the Denorios Belt environment, as well as radiation effects from all known EM and subspace sources. Unique energetic effects not already stored in the structural database are added whenever encountered, in order to create new repair protocols.

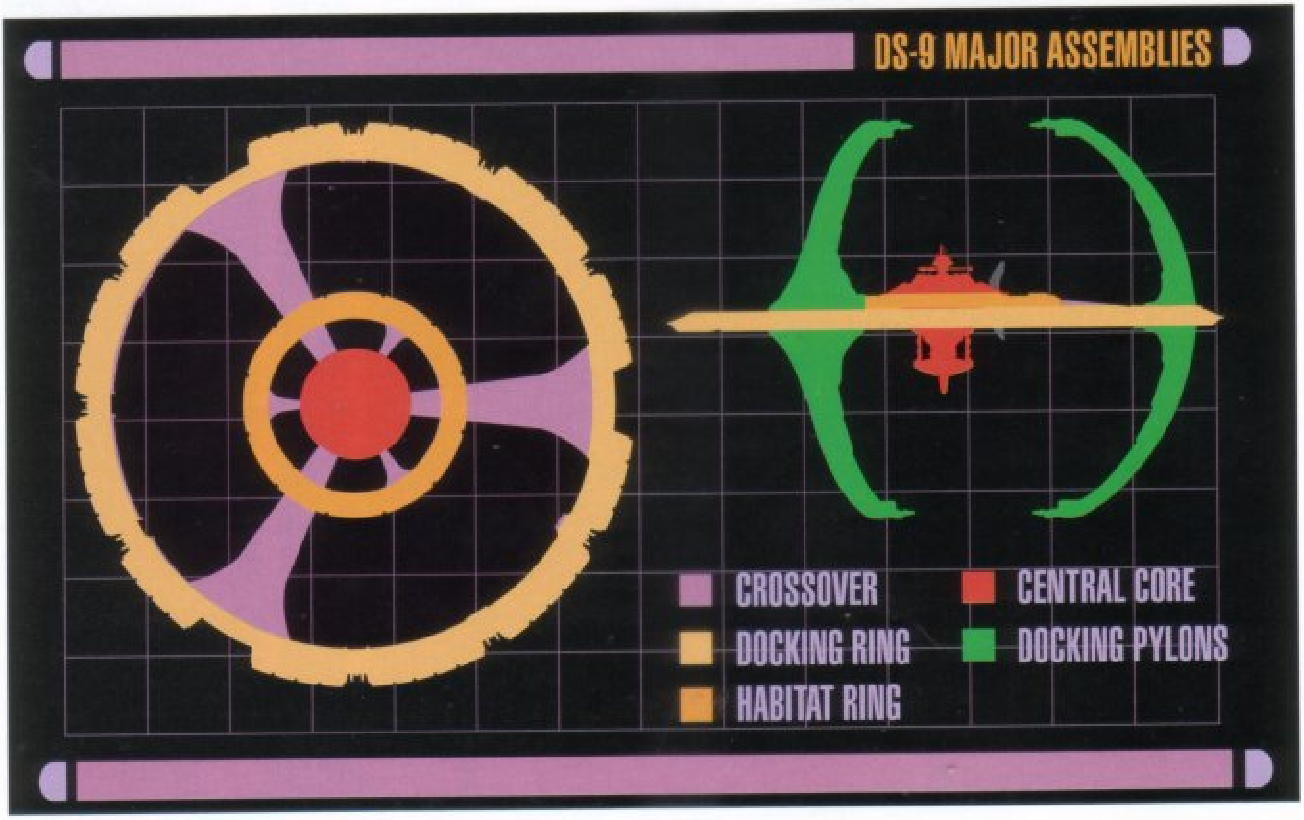
1.6 STATION CONSTRUCTION MILESTONES AND UPGRADES

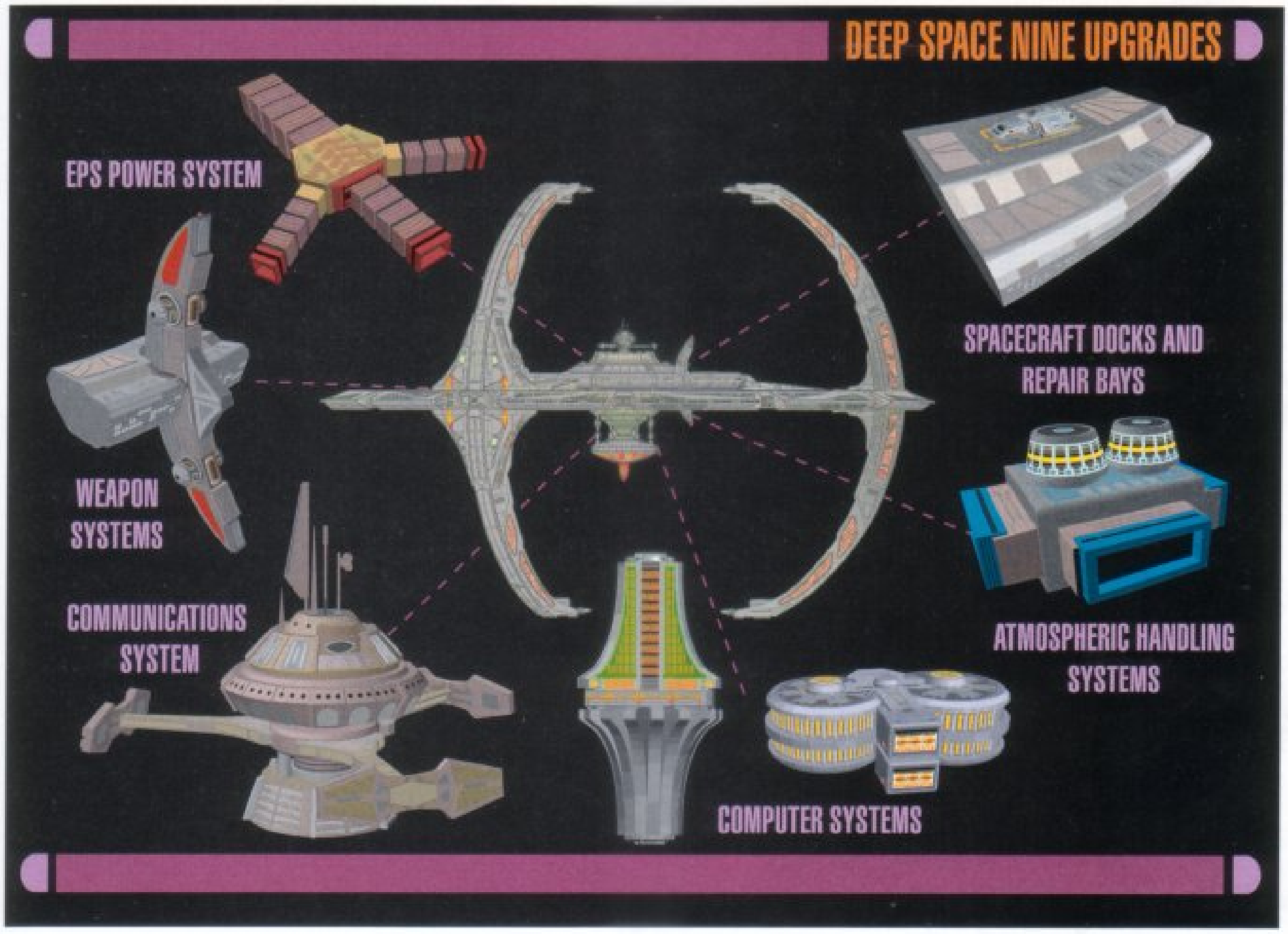
Approximately 3.65 teraquads of data on the construction of Terok Nor has been compiled by Starfleet Command, based on intelligence reports, Cardassian computer file reconstructions and decryptions, and surviving Bajoran records of the occupation. Not all of the data can be reconciled, though enough have been pieced together to present a reasonable understanding of the sequence in which the station was constructed. As mentioned, the total construction time has been documented as 2.7 standard years.

It is now known that not all of the station construction materials originated in the Bajor system. It is estimated that fully 30 percent of the central core framing was machined from asteroidal materials in the Cardassian system and moved across 5.25 light-years into orbit around Bajor by Cardassian freighters for assembly. During that time, the surface facilities on Bajor began fabricating hull plating, power conduits, fusion generator components, and internal utilities equipment. As a curious example of how the Cardassians operated, the entire ops module was also brought to Bajor as a single prefabricated assembly from Cardassia Prime. It is believed that the high-energy alloy furnaces available on Bajor early in 2343 were not adequate for some of the critical structures and were subsequently upgraded and in some cases replaced, all at great cost to Bajor in resources and personnel.

The sequence of assembly for the major station sections proceeded as follows:

- **Assembly 1: Mid-Core.** Framing members for the Mid-Core were delivered by freighter and gamma welded in synchronous orbit 37,576 kilometers above the surface of Bajor. Computer cores, deuterium fuel tanks, and minimal life-support systems installed to create initial habitable spaces. Temporary command center established at dorsal end of Mid-Core. Hull plating begun after completion of Lower Core framing.
- **Assembly 2: Lower Core.** Framing arrived from Cardassia Prime and Bajor; gamma welding continued on framing and hull plating. Lower Core internal work spaces, residences, and utilities gear installed. Section prepared for addition of fusion generators.
- **Assembly 3: Upper Core.** Framing and hull plating shipped up from Bajor and assembled. Temporary command center transferred from Mid-Core and docked to Upper Core. All Upper Core workspaces and systems equipment installed.
- **Assembly 4: fusion generator.** Upper shell of generator housing framed and plated; fusion reactors installed. Lower shell framed and plated. Carbon composite thermal blocks and sodium exhaust cone installed.
- **Assembly 5: Promenade and security corridor.**





Temporary command center dismantled to allow for Promenade framing and hull plating. Reactive shield armor installed. Complete station atmospheric pressure integrity established. All remaining core systems installed.

- **Assembly 6: Ops.** Permanent Cardassian command center (now ops) docked to structural core; gamma-welded. Turbolift connections established. Defensive shield generators and emitters installed.
- **Assembly 7: Habitat Ring.** Framing and plating shipped from Bajor and assembled. Minor crossover bridges and horizontal turbolift paths established. Weapon sails fabricated in nearby orbit and attached.
- **Assembly 8: Docking Ring and pylons.** Large crossover bridges framed and plated. Turbolift and cargo paths established. Pylons erected from crossovers prior to Docking Ring framing. Ore refining equipment installed in pylons. Pylon docking ports installed. Docking Ring framed and plated. All remaining systems installed.

STARFLEET AND BAJORAN UPGRADES

In the months preceding the formal acceptance of Deep Space 9 station authority by then-Commander Benjamin Sisko, Starfleet Command, working with the Bajoran provisional government, moved quickly to add equipment and personnel to the new outpost. Their overall job was to adapt the existing systems to work with familiar Federation technology. Heading the tasking list was the priority assignment to add much-needed defensive hardware to protect the station from threat force attack, namely the retreating Cardassians. Nearly all station systems required some degree of power, atmospheric, or duotronic translation or conversion. Those systems deemed acceptable in pure Cardassian form were initially left unchanged.

The Cardassian systems that underwent the greatest modifications include the following:

- **EPS power system.** All interfaces to Starfleet devices were configured with step-up plasma phase inverters, EPS level limiters, and variable auto-input controllers. Not all of these power-conditioning measures were effective at first, but subsequent repairs and upgrades have brought station operations up to an acceptable level of reliability.
- **Atmospheric handling systems.** By and large, the Cardassians maintained a living environment that was too

hot and too dry as compared to that deemed comfortable by other humanoid species. Starfleet and Bajoran engineers reconfigured the environmental control systems for the station's common areas to produce twenty-two degrees Celsius and 18 percent humidity conditions, and left the remaining controls in private residences and secure work areas to be regulated by individual users.

- **Computer systems.** As in the case of the power conversions, the onboard isolinear-based computer systems required a complex set of adaptive interface devices to work with Starfleet systems and programming. In most cases, the Cardassian computer control circuitry that maintained the station on a basic level worked without translation, provided the operators understood the Cardassian language, 243-bit programming code, and how the equipment functioned (see 4.1). While the majority of the computer-controlled systems were not sabotaged, enough hazardous security devices, deeply buried programs, and computer viruses were left to warrant staying on guard against continued dangers.
- **Weapons systems.** Large-scale Starfleet shield energy generators were installed as backups for the existing defensive shield system. These generators could produce a variety of field and particle types and were interfaced with the Cardassian systems via redundant step-up EPS couplings. New phaser emitters were installed into the existing weapon sail towers, as were magazines and launchers for standard photon torpedoes. Rotary phaser and torpedo launchers were subsequently installed in spaces once used as monitoring and observation facilities (see 10.0).
- **Spacecraft docks and repair bays.** Since not all starships operating in the galaxy conform to all docking ports, modifications had to be made to many of the berthing facilities on Deep Space 9 to accept Starfleet hatch fittings (see 6.2, 6.3). The most extensive work was done on the six pylon docking ports, three large Docking Ring ports, and the new runabout launch bays. The runabouts required six large volumes cut into the Habitat Ring to accommodate the pressurized bays and electrohydraulic pads (see 14.2).
- **Communications systems.** New subspace radio transceiver assemblies and ops-mounted antennae were installed to provide secure voice and data communications between Deep Space 9 and neighboring star systems, starships, and Starfleet Command (see 7.0). Numerous intrastation transceivers were also installed, either interfaced with Cardassian components or bypassing them to talk directly to Starfleet systems.

2.0 STATION STRUCTURES

2.1 MAIN SKELETAL STRUCTURE

The central framing skeleton to which all station structures are bonded is a series of separate assemblies comprising the core segments, ring segments, and pylons. Each framing skeleton is an open network of shaped girders making up a tension and compression grid with an average run between geometric interpenetrations of 7.25 meters. Overall, this grid is four times lighter in mass than the integumentary hull plating hung upon it, leading Starfleet engineers to believe that the skeleton acts more as an assembly template than a key load-transmitting mass. In fact, vibrational and controlled-shock analysis indicates that the joined hull bears most of the stress (see 2.2).

Upper Core

The framing exhibits essentially the same materials and fastening technology for all major assemblies. The Upper Core, Mid-Core, and Lower Core manifest materials proportions of 31 percent kelindide, 65 percent rodinium, and 4 percent toranium dicorferite. The Habitat Ring and Docking Ring materials consist of 45 percent kelindide, 43 percent rodinium, and 12 percent toranium. The Docking Pylons and crossover bridges are manufactured from 26 percent kelindide, 70 percent rodinium, and 4 percent toranium. The relative proportions suggest that the ring structures bear less of a load than either the cores or pylons, an assumption that seems to be borne out by all analytical scanning done to date.

The framing girders are all fabricated from directionally crystallized foamed metals using a combination of helium and argon as the void-producing agents. The helium and argon are delivered into the alloy furnaces as cryogenic particulate solids, which expand at a controlled rate to create the closed-cell matrix. Shaped magnetic and gravitic field generators shield the solidifying alloys from local environmental conditions, closely duplicating orbital microgravity. Six of the seven alloy furnaces assembled on Bajor were hastily dismantled during the Cardassian pullback from the system, and the remaining furnace is undergoing repairs and upgrades following Operation Return.

Fastening systems for the individual framing members included melt-patch guns, gamma-weld torches, and forced-matrix gap bonding assemblers. These last devices, also high-energy gamma EM based, involved both telerobotic and crewed frame crawlers, which "walked" along grip fixtures on the girders and performed the required welds and plate patches. Inspection runs and fixes were made with individual EVA crews in environmental suits, shuttles, and teleoperated probes. Framing maintenance on the present Deep Space 9 involves deep EM penetrant scans, electrochemical migration tests, and load cell recording. Tests confirm that the basic structure of the station is sound and has accumulated only 10 percent of its approximate operation lifetime of 230 standard years. The percentage of this lifetime will vary, depending on impact, EM, and ion damage sustained in natural celestial events and military action, and relates to established alloy fatigue indices.

Lower Core

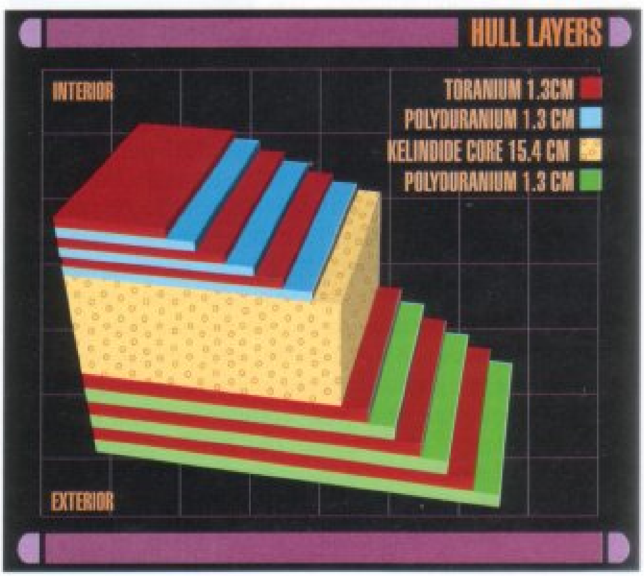
2.2 EXTERNAL STRUCTURAL SYSTEMS

The primary structural shell of Deep Space 9 varies from section to section in relative abundances of elements and physical configuration. At least thirty alloys are present in the hull plating, but by far the most common ones found are a simple mix of four: kelindide, polyduranium, rodinium, and toranium. The densest alloys, rodinium and toranium, have been applied to areas of greatest stress, particularly at major directional changes in station geometry. One example is at the interpenetration of the Docking Ring and both Upper and Lower Pylons. Tension and compression computer simulations of Deep Space 9, based on existing sensor networks and Starfleet-installed strain gauges, were conducted in mid-2370. The data analysis indicate that the "footprint" area of the pylons receives nearly 70 percent of its tensile strength from the hull plating covering the transitions from the pylons down to the crossover bridges. This effectively creates an exoskeleton, counter to most familiar construction methods. The internal skeletal structure provides only 22 percent, the remaining 8 percent being derived from the EPS conduit field effect, which acts as a crude structural integrity field (SIF) system. While some Starfleet engineers have looked upon this area as over-designed, it has worked exceedingly well for the Cardassians, especially in the pylons' ability to damp out lateral and rotational forces imparted by both docking space vessels and large moving masses within the pylons.

HULL PLATE MANUFACTURING

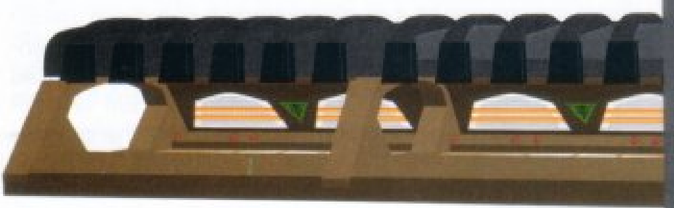
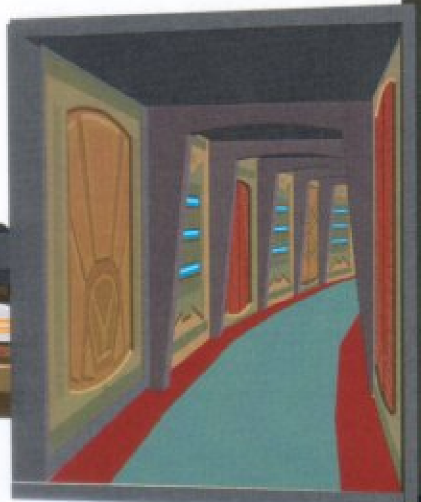
The layering process for the original Terok Nor hull plating involved the use of large-scale alloy furnaces, rapid electrohydraulic milling, and high-energy plasma coating devices. In some rare instances, focused EM field devices were employed to form complex matrices required for conformal com systems, ion-venting surfaces, defensive shield grids, and embedded utilities conduits. A typical hull plate 2.8 meters by 3.7 meters by 37 centimeters was fabricated from a directionally grown, single-crystal kelindide core 15.4 centimeters thick. Inboard, the core was built up with six alternating layers of toranium and polyduranium, each 1.3 centimeters thick. Outboard, the core was bonded with six alternating layers of rodinium and toranium, each 2.3 centimeters thick. Machining of plate joints and hull penetrations could take place either at the fabrication site or on orbit. The location depended on delivery scheduling or special configuration issues in the particular station section receiving the part. Joints were made with microexplosive cording, thermal EM or gamma welding, or a combination of the three. Certain areas, such as the Habitat Ring, received additional focused EM filleting to insure the creation of a single contiguous volume of metal.

Added to most base hull plates was a radiation attenuation layer of polycrystalline ferric diallosilicate infused with carbon-60 macrochains. Any unwanted EM or subspace radiation is temporarily trapped within the carbon-60 and then bled off into space at a known, controlled rate. The use of this type of attenuation layer is certainly unique to Cardassian building methods, though the use of the layer itself is thought to have been gleaned from Starfleet shipbuilding technology. A final micrometeoroid and thermal layer for protection in the Bajor system consisted of 1.7 centimeters of plasma-sprayed pyroceramic trianium.



2.3 INTERNAL STRUCTURAL SYSTEMS

In a comparative study of Cardassian and Starfleet engineering, one would immediately be struck by the significant differences in internal framing and partitioning over all other station elements. The Terok Nor builders have relied more heavily on the exterior hull plating to hold atmospheric pressure than the individual room modules. Few instances have been discovered of total hermetic sealing of habitable spaces, and those volumes are mainly laboratories and hazardous materials storage and use areas. The maintenance of a breathable atmosphere in the common-use areas is not, as one might assume, a Criticality-1 issue. In the case of minor hull leaks below 6.5 cm^2 (square centimeters), most welds and patches can be applied within two hours without a detectable loss


Typical corridor and access tunnels

of overall station pressure. Hull plating penetrations or linear separations larger than 6.5 cm^2 would have to be produced by weapons fire, explosive devices, or unusually energetic EM events. Specific emergency measures would be taken to counter the pressure loss, including bulkhead knife doors, force fields, and the deployment of damage control teams. The Cardassians had indeed developed these procedures, and subsequent Starfleet protocols have built upon these existing concepts.

Attached to the main skeletal framing of the station are level grids, primary and secondary bulkheads, and primary and secondary utilities conduits. At this stage, the final arrangement of work and residential spaces cannot yet be visualized by the casual observer, and the volume could be broken down in a number of different ways. Starfleet has come across only one other abandoned space station, Empok Nor, whose structure is outwardly similar to Terok Nor. It is not known whether the Cardassians had built in the options for different internal arrangements, though Starfleet Engineering believes these options exist.

The level grids were fabricated from expanded toranium foam surfaced on top and bottom with rodinium dicorferite sheeting to form lightweight intermediate stiffeners for the major core and ring assemblies. The average grid segment measures 5.3 meters by 6.1 meters by 13.5 centimeters, with conduit and turbolift penetrations cut only where needed, indicating either that precision matter-cutting gear was utilized on-orbit, or that all conduit locations were finalized prior to grid fabrication. The primary and secondary bulkheads were fabricated from toranium foam and facing sheets, but densified to carry high-amplitude vibrational loads through all core, ring, and pylon assemblies. The primary load-bearing bulkheads measure 3.3 meters by 21.1 meters by 53.2 centimeters and are penetrated by conduit, security gates and turbolift passthroughs.

Most of the visible station internal structures, starting from the top down, consist of ceiling modules, partition walls, and floor panels. These three types of surfacing segments produce the required living volumes and work areas for all station activities. The ceiling spaces include EPS user lines, induction lighting devices, com pickups, and airflow ducting. The partition walls, which blend to the level grids by removable melt patches, are by far the heaviest of the three room components and carry EPS lines, active and passive environmental control circuits, and force field emitter circuits. The floor spaces carry EPS lines, optical data network (ODN) taps, short-range force field grid for equipment lashdowns, and station gravity net. The gear lashdowns and gravity net operate through common EPS taps and control circuitry, and provide rapid hold on objects in the event of severe translational motions.

The pedestrian and crew corridor network accesses all major station assemblies. The larger cargo transfer aisles are limited to the Docking Ring and crossover bridges. All involve toranium foam and sheeting construction similar to the level grids and bulkheads, with a maximum wall thickness of 7.37 centimeters. Within the foam are molded micro-EPS conduits, com pickups, ODN lines, and security scanning pickups. Continuity between segments is provided by induction node junctions in order to route encrypted signals to their proper destinations. Corridor segments are interrupted at regular intervals by force field arches and knife doors.

Access tunnels run perpendicular to most corridors and service a variety of station systems. The typical access tunnel measures 1.3 meters by 1.4 meters in cross section, and is fabricated from toranium frames and duranium skinning panels. Records indicate that the access tunnels were produced in an automated rapid forming and welding jig on Bajor and shipped by transporter into orbit. Access tunnels are equipped with standard EPS, ODN, and com monitoring panels, plus specialized maintenance control as required for particular areas. They are effectively shielded from external EM interference as well as active scanning beams, making some security functions difficult. The tunnels, similar in function to Starfleet's Jefferies tubes, have been the focus of a uniquely Cardassian problem. Numerous gaps in wall construction have allowed some species of Cardassian vole to elude capture and disrupt EPS service, due to the voles' proclivity for gnawing through live conduits. The total run of access tunnels in the station measures some 18.1 kilometers. Most tunnel hatches are placed under restricted entry protocols, with security systems tied into the corridor ODN lines.

2.4 STATION COORDINATE SYSTEM

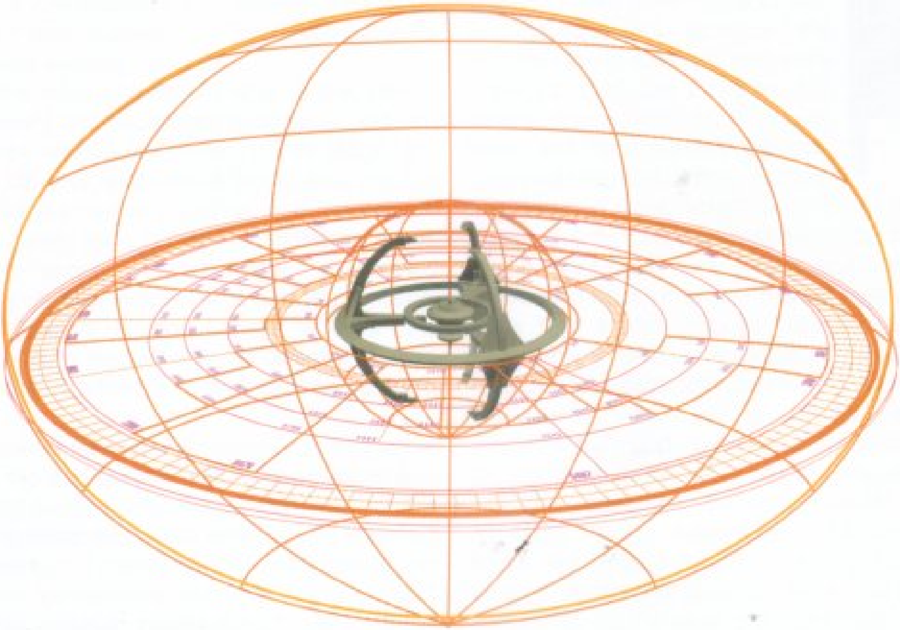
Recovered computer records dealing with the Terok Nor measurement system indicate that few specific external applications were ever necessary once the facility construction was completed. It has been assumed by Starfleet that the simplified set of coordinates and component names was sufficient for all station maintenance and repair operations. Unlike the Starfleet space vessel external reference system, which can occupy upwards of 8.65 megaquads of computer memory, the Cardassian system filled an isolinear partition barely 505.43 kiloquads long. A translated Starfleet reference system has been added to all onboard computer systems to aid in coordinate conversions. Both measurement systems are based on the station's average local gravitational vector.

The original external reference system oriented the station on a circle divided into 729.0 *tarims*, each *tarim* equivalent to 0.4938 degrees. The zero radius of the circle coincided with the central vector of the station commandant's main window, at an eye line extending outward from exactly 176 centimeters up from the floor. The circumference ticks proceeded around in a counterclockwise direction, as seen in a top plan view, and all construction numbers reflected a **subtraction** of 60.753 *tarims*, or 30 degrees, for reasons only hinted at in the Cardassian history (see 3.2). The central line coincides, after the requisite subtraction, with Docking Port 12, not Pylon 1, to the -X direction.

All station hardware coordinates, when they were given, were in a variation of standard polar mode, and quite similar to starship bearings and headings. For example, in translated Cardassian notation, the hatch seal at the top of Docking Pylon 2 was located at **<243+158.42**. The **<** (angle) symbol and first number indicated the azimuth angle reading around the circle, the **+** denoted the measurement direction above the commandant's eyeline (a **-** would indicate a negative elevation), and the last number equalled the distance from the origin point to the location desired, measured in Cardassian *korshins* (1.0 *korshins* = 2.732 meters). At least three measurement systems exist in the current Cardassian culture; the *korshinic* system is known to be used in most space-based construction. Reconstructed data alludes to extensive use of EM range finding technology to establish the coordinates, both in virtual computer-driven design and actual manufacturing.

The translated coordinate system has established a modified three-dimensional vertex and vector measuring scheme, with centimeters as its operative value. The three axes are labeled X, Y, and Z. The X axis runs through the station core to Docking Pylon 1, with -X toward the pylon. The Y axis runs dorsal-ventral, with +Y to dorsal, up from ops. The Z axis runs through the core to the Docking Ring at 90 degrees from Docking Pylon 1, with +Z to the Docking Ring. Planes passing through the station are labeled according to the station axes. The X-Y plane extends vertically and laterally toward and away from Docking Pylon 1, the X-Z plane extends laterally from the Mid-Core/Lower Core interface, and the Y-Z plane runs vertically and bisects the station into +X and -X halves.

All translated Starfleet coordinates are in standard Cartesian format and are labeled either $X_SY_SZ_S$ or simply XYZ. The origin point is different from the Cardassian, located directly on the Y axis 13,610.84 centimeters down from ops, at the interface between the Mid-Core and the Lower Core.



Deep Space 9 shown with perimeter grid

3.0 COMMAND SYSTEMS

3.1 OPERATIONS CENTER

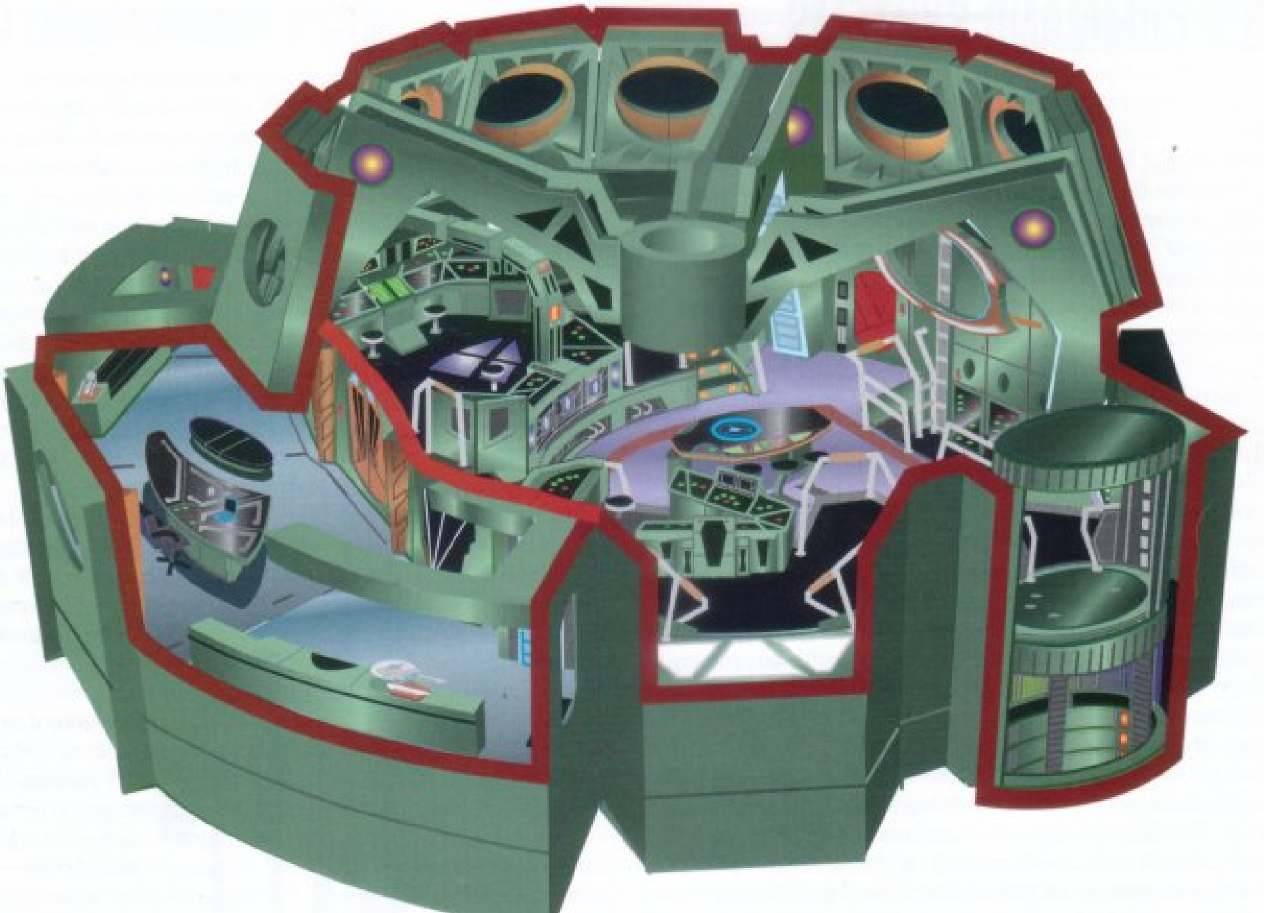
The primary control of all station activities is handled by the Operations Center, or ops, which occupies all of Level 1 of Deep Space 9. In the original Terok Nor configuration, ops was known more formally as the Command Center, owing to its more specific function as the focus of the military occupation of Bajor and the forced mining of Bajor's resources. As discussed in 1.6, the Command Center was built in orbit about Cardassia Prime and moved by warp freighter across the 5.25 light-years to Bajor. All key connections of power and consumables were made once a permanent latching was completed. Experts from Starfleet Intelligence, Corps of Engineers, and R&D moved in during the custodial handover of the station in 2369 and performed exhaustive scans and disassemblies of key portions of the "new" ops module. All systems were prioritized as to work needed to bring them back on-line and up to Starfleet Regulatory Agency (SFRA) standards.

Ops interacts with all possible systems built into the space station, arranged into defined work volumes and tied into a single, massively crosslinked computer core interface. This sunken interface section, nicknamed the "pit," controls all basic station hardware through numerous isolinear rod programming and temporary instruction storage modules. All other sections are arranged on higher levels and, according to some reconstructed records, were previously designated as labor monitoring, engineering, transporter, electromotive lift, tactical, ore processing, and commander's office. This last area aptly adheres to the Cardassian penchant for placing personages in power above all lower-ranking individuals. The base framework of the ops module could accommodate any arrangement of stations, including a single level, and ample open volume exists behind most nonstructural partitions and equipment housings. It is well known that Cardassian architecture, even in the more unconstrained, sweeping forms, plays on the stratification of rank and tasks, however subtly it may appear to do so to outsiders. Analysis of many of the interior structures indicate that many of the detailed curved building shapes are indeed practical on many levels, ranging from tension and compression regulation to EM radiation attenuation.

Ops locator

Part of the communications equipment that dominates the area over the pit is the large (2.13 by 1.25 meters) gas-suspension display screen. This technology involves a charged matrix of tolinite gas. The matrix reacts to varying plasma power levels in three dimensions, thereby altering its transmissible color (see 7.3). The display controllers are part of the engineering station.

Environmental control for the habitable ops volume is similar to that designed into other purely Cardassian seg-



Ops

ments of the station (see 11.1). The Cardassian masters of Terok Nor preferred warm, dry conditions with a slightly higher fraction of carbon dioxide. Hardware and software modifications allowed heat, humidity, light levels, gravity, and atmospheric constituents to be controllable through the patch network in the pit. Ops replicators remain Cardassian, with periodic maintenance and controller modifications made as necessary.

All of Deep Space 9 is accessed through two turbolift terminus landings, and both routine and emergency transports are possible from the transporter platform. The ops transporter remains Cardassian and has been upgraded only with Starfleet pattern buffer controllers and power conditioners (see 8.0). Access to the station is also available through a stairway to Levels 2 and 3, near the defensive shield generators, where a third vertical turbolift shaft is located. System access tunnels provide a third method of exiting ops to more of the station. The subspace communications system is physically deeply rooted in ops, as part of the structural compression bulkhead configuration. This mainly encompasses the dorsal core "roof" of the pressurized module (see 7.3).

The refurbished ops saw numerous modifications to the computer systems and interface consoles, accompanied by more appropriate section names. The present work stations include central situation table, science, engineering, systems diagnostics, and station commander's office. The physical and operational descriptions of the component ops areas follow.

Typical Cardassian interface

3.2 COMMANDER'S OFFICE

The station commander's office has most recently been occupied by Captain Benjamin Sisko, assigned to Deep Space 9 in 2369. Previously, this space above the work areas of ops was the province of Gul Dukat of the Cardassian military. In his function as officer in charge of the occupation of Bajor and the head of the uridium mining operation, Dukat towered over underlings from a raised platform. The commander's office has been studied by the various Starfleet directorates involved in the station rebuilding, as well as a handful of comparative ergonomicists, cultural anthropologists, psychologists, and neural biologists. The shapes, distances between points, and proportions of objects to spaces have led some to believe that the Cardassians, and possibly Dukat in particular, considered the divisions of areas and arrangements of structures to be of major psychological or even mystical importance. For example, a continuing topic for debate centers around the reason ops and the commander's window are aligned on a vector that seems to relate to no other symmetrical division, 30 degrees away from the ops-Pylon 3 centerline and 30 degrees away from the ops-Pylon 1 centerline. The most plausible explanation involves the mechanics of Terok Nor's synchronous orbit about Bajor and the thermal control rotation of the station. A possible correlation exists in which Cardassia Prime and its parent star would be visible through the window center at all times.

Despite these analyses and conjectures, the commander's office is well suited for the daily operations of Deep Space 9. Seating, a large desk, shelves and cabinets, replicator, a washroom, and communications equipment now grace the environment. A small Cardassian gas-suspension communicator has been supplanted by a Starfleet desktop computer, through which contact can be provided to Starfleet Command and civilian com addresses.

The systems connections to the office are made through the central ops trunks for all atmospheric, water, EPS, ODN, and replicator feeds. Airflow is provided through three combined supply/return plenum groups. Water stored in a series of nine 5.5 m^3 (cubic meter) tanks within the ops subflooring for routine and emergency use is shunted through two diverter valves to the office washroom. EPS plasma is shipped through a single stage-4 stepdown conduit. The office ODN network is configured to route encrypted com signals through Starfleet hardware in the computer cores, via the patch network, or by subspace transceiver. Replicator raw materials are fed by a single branch from the main ops replicator line.

3.3 COMMAND STATION

The primary command station on Deep Space 9 is located at the center of ops at the main situation-monitoring table. Unlike a typical frontline Starfleet vessel, with a captain's chair and seating for other officers, Deep Space 9 maintains no comparable central location for commanding the station, other than the upper level office. Orders are given by the station commander or other ranking officers from most anywhere in ops, under a variety of operational conditions.

The situation table (see illustration) is ideally located for the display of key station data and for communication by way of the overhead gas-suspension screen. Seating is available for all senior officers. During a typical duty shift, ops will be populated with the core echelon, including station commander, Bajoran military liaison, science officer, and chief of operations. The station chief of security and chief medical officer are normally located in offices off the Promenade but are required in ops for briefings, discussions, and critical events. Adjacent to the table are a series of auxiliary Cardassian displays configured to present data and subspace communications.

The default table display screen presents the real-time conditions in the space surrounding the station. Display mode changes can be made at any time and can include any required graphical information, from internal sensor tracking to defensive weapon readiness to docked ship cargo operations. The real-time external plot affords the senior staff with a picture of the strategic environment, proven especially valuable in the recent wartime actions. Starfleet and threat-force movements have been tracked, using all available intelligence and sensor assets. The display retains the original Terok Nor multilayer screen and subprocessors and is connected to the main computer cores through the Starfleet coprocessor and peripherals group (CPG), which drives the standard Starfleet visual interface. A series of fifteen primary and three backup optronic translation buffers has been built into the table to adapt it to Federation data protocols.

Central ops table

Ops table displaying local traffic

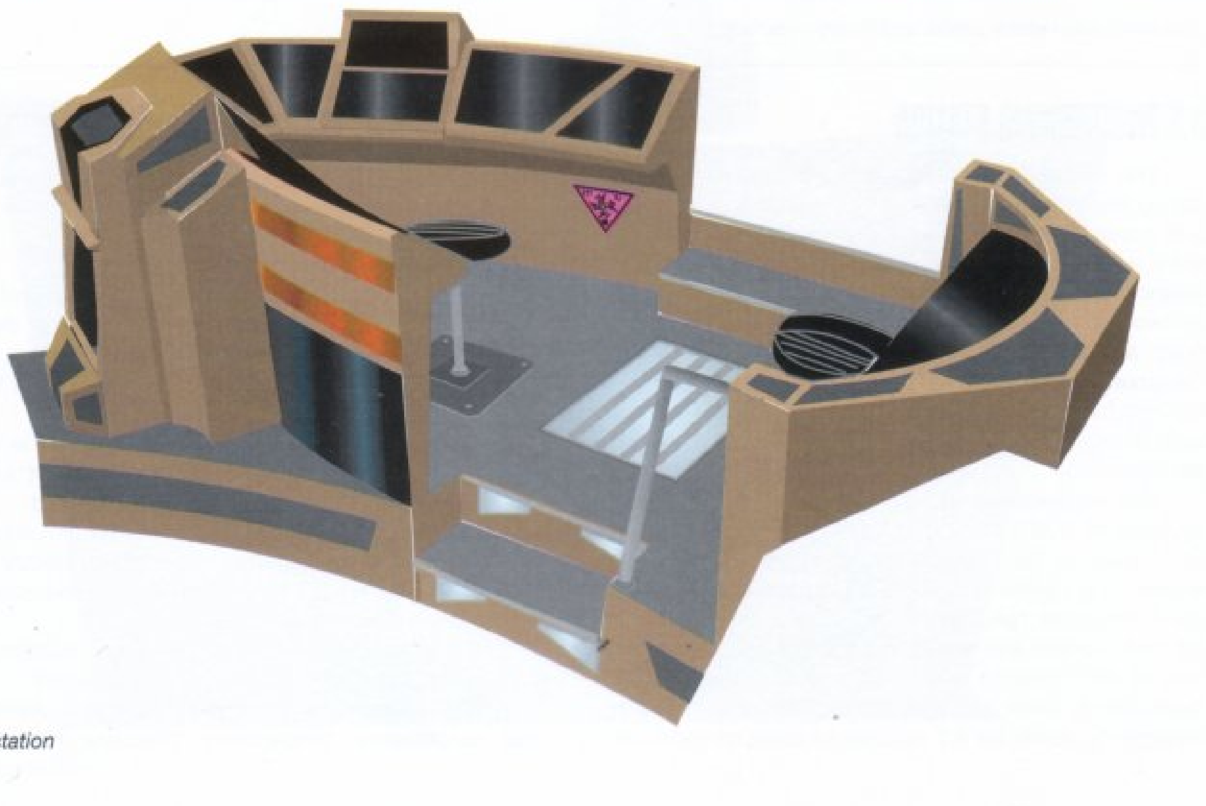
3.4 SCIENCE STATION

The present science station had previously been assigned the functions of labor monitoring and ore processing under the Cardassian authority. The station supported two system operators, each provided with multiple banks of display screens and computer capabilities second only to the ops computer "pit." Several rounds of reconfiguration work on this station have resulted in a first-class detection and analysis suite for all Deep Space 9 operational and experimental science tasks.

The science station is overseen by the senior science officer. Departmental staff will maintain continuous twenty-six-hour monitoring of all ongoing experiments throughout the station, compile all internal and external sensor data, and assist in the implementation of all known and untested high-energy procedures during crisis situations. Incidentally, human officers report needing an average of two weeks' adaptation interval to synchronize their circadian pattern period. At the ops level, system linkage is maintained between the science station and engineering station for collaborative and backup operations. The science station is hardwired into the Starfleet CPG computer head-end and the existing Cardassian computer cores for all data processing requirements. Sensor data is provided by 2,355 dedicated ODN lines from the sensor preprocessors to the computer cores. In some cases, sensor data is routed directly to the science station processors and immediate isolinear rod storage banks. The science station is also capable of directly commanding any of the Deep Space 9 particle/field generators (PFG) for experimental or defensive applications.

The science station is specially configured for correlating vast numbers of seemingly random events and sensor inputs, in order to rapidly synthesize a total picture of the station environment. Data presentation can be shifted to any console in ops or to other points around the space station, and is often routed to the main situation monitor table (see 3.3). The input data rate is variable, from 4.23 kiloquads per second to 333.65 megaquads per second with all isolinear rod banks operating to compress and transmit data to the main cores. Equally rapid is the science section's ability to act on the processed data and present recommended options for given problems. The ongoing study and sensor coverage of the wormhole occupies some 15 percent of the overall science section operational time and power allocation and makes use of quintuply redundant processor polling to insure continuous on-line operation, plus the earliest detection and confirmation of threat forces and natural celestial hazards. Another 10 percent is partitioned off to maintain constant monitoring of remote automated probes, listening for emergency burst-mode tricorder transmissions and transporter lock signals.

Distant signal intelligence is also handled through the science station by way of the CPG and encrypted Starfleet subspace channels. Deep Space 9, with its proximity to Cardassia and its communication ties to the Gamma Quadrant, gathers and analyzes all com traffic in the clear, deeply encrypted, or hidden in nonstandard waveforms (see 7.6).



Science station

Science station status panels and control interfaces

3.5 ENGINEERING STATION

The engineering station remains basically as it was during the occupation of Bajor, though the computational and control functions have been modified to allow it to work with the Starfleet computer upgrades. As with the science station, the engineering station can be attended by two departmental staff members. The two console sections are equipped with numerous display screens for maximum flexibility in monitoring engineering system status and for inputting command procedures. Every station-wide energy, mechanical, and optronic system at least in part falls under the jurisdiction of the chief of operations.

The engineering station is connected to its primary systems by 1,879 dedicated ODN lines, with 547 backup ODN lines to life support and defensive weapons. The engineering station subprocessor is hardwired to the subdeck computer "pit," which is the principal routing node for most control and sensor data. In the event of a disruption of EPS plasma to the control consoles, a backup capacitance bank set into the subdecking will provide emergency power for 6.7 minutes to allow for most critical systems to be safed, including the fusion reactors. Aside from system operation, all orders for hardware periodic maintenance (PM) and repairs originate from this station.

The primary systems monitored and controlled by this station are as follows:

•**Fusion power generation.** All aspects of energy production utilizing the six fusion reactors and deuterium fuel storage and transfer are directly controlled.

•**Electroplasma system.** Power distribution throughout the EPS network is directly controlled.

•**Computer cores and ODN network.** The optronic system health of all Cardassian and Starfleet computer hardware and optical data network is monitored.

•**Defensive weapons.** All station-mounted large phasers, photon and quantum torpedoes, tractor beams, and shield emitters are directly controlled and maintained, in concert with station security.

•**Communications.** All high-energy subspace com equipment is directly controlled and maintained.

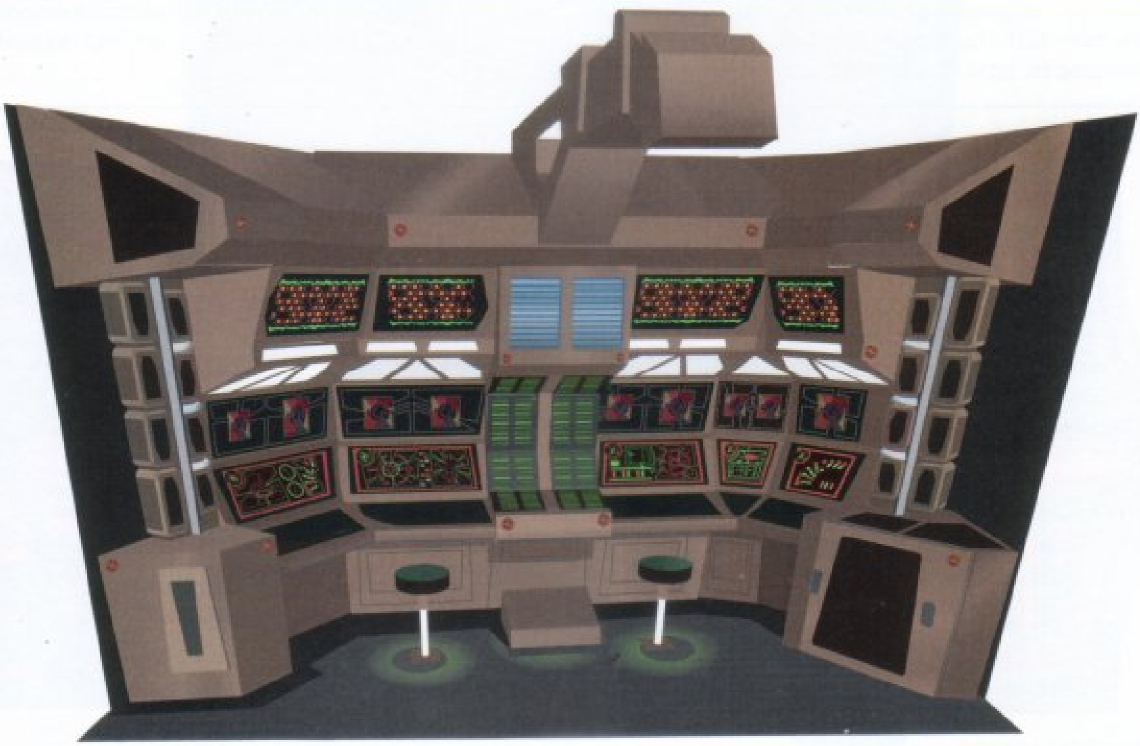
•**Life support/Environmental control.** Atmospheric gas constituents, temperature, pressure, humidity, and

Engineering station status panels

potable liquid distribution are directly controlled and maintained.

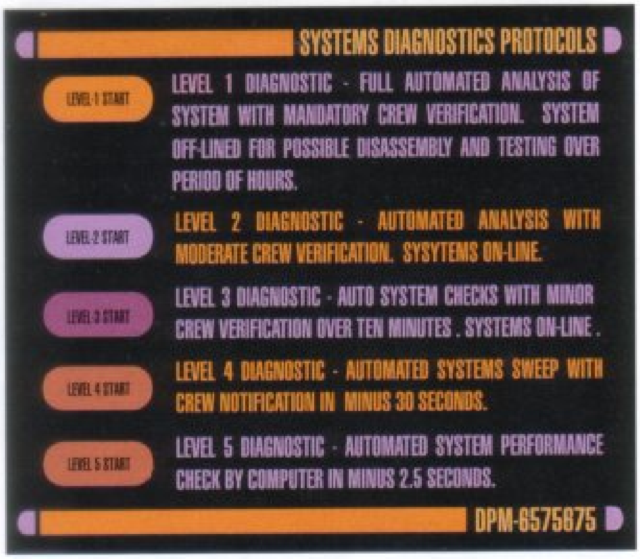
Other systems managed by the engineering station include the transporters, specialized ordnance, waste management devices, replicators, docking ports, and gravity generators. Most spacecraft readiness and maintenance tasks related to the *U.S.S. Defiant*, station-deployed runabouts and shuttles, and Work Bees can be managed here.

The entire Deep Space 9 physical structure is also maintained by the engineering department. The primary structural systems are the main skeletal framing and hull plating, and engineering monitors both for stress and radiation damage and performs all necessary repairs. All load cell and strain gauge readings are analyzed and displayed, along with nondestructive testing (NDT) results from fixed microscanners and tricorder sweeps.



Engineering station

3.6 SYSTEM DIAGNOSTICS



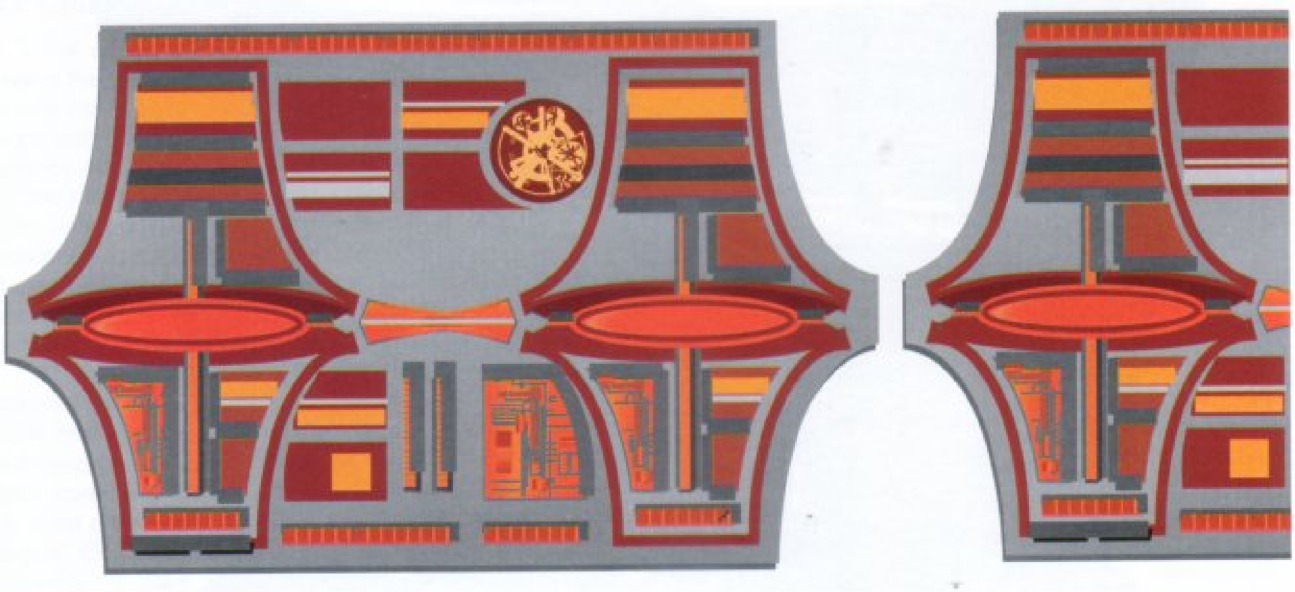
Under Cardassian control, all Terok Nor systems underwent periodic systems checks to ensure that equipment and procedures were operating as designed. The basic concept is little changed from that developed independently by most spacefaring cultures. Many of the high-energy systems, such as the fusion generators, plasma conduits, weapon systems, and defensive shields, required constant monitoring by engineering personnel and automatic systems. Other systems were checked on set schedules. Components were repaired, replaced from station stores, or replaced by new replicated hardware. Control software and procedures were rewritten as required, though not always documented.

Cardassian systems checks involved a priority scale based on the recorded history of hardware performance and predicted time to failure of a particular system, subsystem, or assembly. The scale generally ran from 1 to 12, with 1 being the lowest-attention scan and 12 requiring the involvement of a top-rated engineering crew, usually because a critical part of the station was close to being compromised. This runs counter to the Starfleet standard diagnostic scale of 1 to 5, where 1 calls for the most comprehensive examination of station or ship systems and 5 refers to a fast, automated response to a system health poll.

Following careful study by the Deep Space 9 reconstruction teams, the Starfleet scale was adapted for use on the station. However, the exact protocols and diagnostic scripting routines do not match those in place aboard Starfleet vessels. Station-specific routines have been assembled by engineering personnel with help from Starfleet's twin GZK computer cores in the Ukraine on Earth. The specific type of diagnostic and swapout schedule will continue to depend on the criticality of the situation and time available for the procedure.

Since the station handover, the systems receiving the most scrutiny by automated monitoring and repair crews are as follows:

• **Fusion power plant.** The fusion generators, EPS conduit network, and all associated control systems have undergone twenty-three rotating level-1 overhauls in six years. Periodic maintenance analysis indicates that most hardware swapouts, while somewhat cumbersome and often dangerous, are routine and are not indicative of design flaws.



Cardassian control interface

• **Weapons systems.** The nature of the ordnance and energy weapons deployed on the station requires constant twenty-six-hour monitoring at level-3, since specialists tending these Starfleet assets must make certain that the systems will work if called upon (see 10.0). Certain existing Cardassian systems, such as the defensive shields, are maintained with level-3 polling once each hour unless more frequent checks are ordered.

• **Communications.** Most monitored components of the subspace and intrastation communications systems receive continuous level-5 rapid scans, level-3 diagnostics on alternate redundant sets of transceiver equipment once per hour, and level-2 swapouts and analysis of critical components to avoid any com dropouts.

• **Environmental control.** Computer control circuitry, mechanical airflow hardware, heat transfer and water vapor loop systems, and other life support devices are polled at level-4 once each hour, and at level-3 once each day, unless circumstances warrant more detailed examination.

Circuitry junction type-1

4.0 COMPUTER SYSTEM

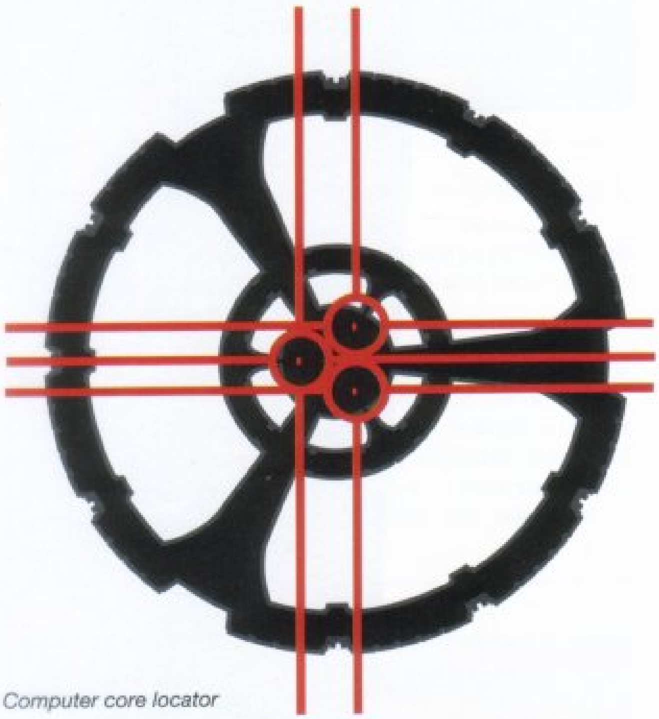
4.1 COMPUTER CORES

The current Deep Space 9 computer network, made up of the original Cardassian processors and added Starfleet hardware, continuously monitors and maintains the operating health of nearly all other station systems. It supports all primary external ties to the galactic environment through sensor data inflow and analysis, radio frequency (RF), optronic, and subspace communications, and it provides extensive command and control functions during station military operations.

The computer network consists of three main processing cores and Starfleet coprocessor and peripherals group (CPG) located between Levels 14 and 21, deep within the Mid-Core assembly of Deep Space 9. As such, the computer cores are protected from most external EM by multiple shielding layers and from transmitted physical shock through the use of electrohydraulic attenuation beds at the dorsal and ventral ends. The cores measures 15.54 meters in diameter and 45.11 meters in height and are bilaterally symmetrical in geometry and architecture across the X-Z plane. In effect, each core is two complete half-cores running in clock-sync.

The use of three main cores is consistent with the Cardassian predilection for creating structures in triplets, which affords them wide flexibility in assigning maintenance and analysis tasks. As with many Starfleet interstellar ships and starbases, a single core can perform all basic required tasks, and two cores are able to handle at least 85 percent of the computational load should one core fail. The processor architecture is so designed, however, to keep a core operating at a minimum diagnostic level and will attempt to isolate all nonfunctioning processors for failure analysis and redistribute tasks to the remaining processors.

No superluminal or FTL processing occurs in the core sections. The Cardassians have elected to remain with ruggedized isolinear processing and rod storage technology operating at subwarp speeds. No significant disadvantages have surfaced in this regard, and all computational wait times are well below critical thresholds for station operation. The Starfleet CPG does run at FTL speeds, employing two miniature subspace field generators and two backup units operating at 3594 millicochranes. The majority of FTL tasks involve translation of Cardassian datastream code and tactical analysis. Work is underway to increase the field generation to a minimum of 4325 millicochranes under a scheduled Starfleet upgrade program. Standard ultra-high density isolinear chip and data cube storage devices maintain total backups of all station data and are routinely downloaded to Starfleet Command over secured subspace channels or physically delivered by courier. Additional covert transfer paths are employed under specific security conditions. Ongoing interface modifications were temporarily halted during the Cardassian/Dominion station seizure, when the sensitive parts of the CPG were removed to Starbase 375 and all hardwired components were deliberately



Computer core locator

destroyed. The CPG was replaced during Operation Return. In a previous station takeover by the Bajoran Alliance for Global Unity, all classified equipment was briefly rendered inoperable but not extracted.

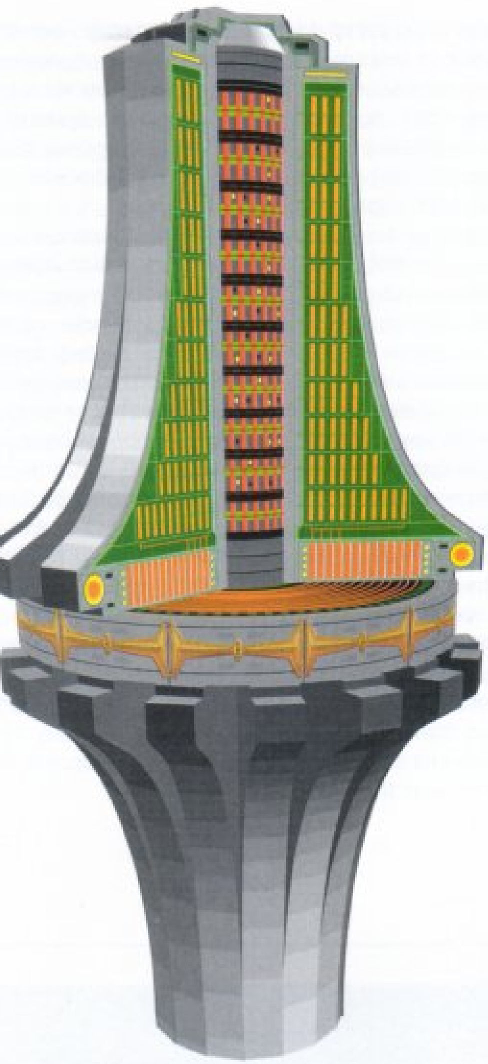
The Cardassian core elements are assembled from subwarp nanoprocessors arranged in parallel packs of 27, 81, 243, or 729 transtator clusters. These clusters are not arranged into any higher level of organization but rather are installed into the core structure with simple ODN connections. The original Terok Nor operating system software and autonomous rewrite and switching subroutines handle the real-time divisions of clusters needed for particular tasks. EPS taps are arranged around the core to power the processors, isolinear storage banks, and cooling systems. Eight hundred twenty-eight EPS microconduits emerge from thirty-six distribution blocks ringed about the equator of each core. The distribution blocks are tied in upstream to the main EPS conduits fed by the station's central fusion powerplant.

CORE DATA STORAGE

Isolinear rods are the primary data storage medium (see 4.2). Each core is equipped with 104,976 class-4 isolinear rods for primary storage, arranged in 2916 groups of thirty-six rods. Intermediate data caching is performed by 8748 class-4 rods arranged in 243 groups of thirty-six rods. The Starfleet CPG provides an additional 526 gigaquads for its operational memory functions. Memory units are encased in porous ceramic composite housings and surrounded by cryogenic helium-3 for optimal speed and nonvolatility. Data transfer has been clocked at 827 kiloquads per second in idealized heuristic processing test setups. In practice the data rate is slightly slower, at 743 kiloquads per second, owing primarily to the software switching routines. The cores are interlinked by a preliminary dedicated ODN network optimized for core data transfer, prior to connections to the station-wide ODN nodes. The chemical composition and structure of the ODN fibers is such that in-transit error checking can be accomplished within the fiber, as compared to error checking only on the processor side in Starfleet systems. Selected segments of each ODN fiber are extruded like isolinear rods, but of extremely long length, up to 322 meters with no signal degradation. The processing architecture of the fibers can handle up to 2955-bit word code and can be enabled or disabled according to specific software configurations.

DEEP DATA RECOVERY

Just as Starfleet sought to protect its computer assets in the 2373 evacuation of Deep Space 9, most of the data stored in the computers was erased when the Cardassians originally left Terok Nor. Certain banks of isolinear rods were, not surprisingly, missing altogether. However, since most data-storage technology cannot guarantee complete deletion of all quantum signatures in a particular medium, significant amounts of data were deemed recoverable. Exact numbers are classified by Starfleet Intelligence, and the extraction process is ongoing at remote Starfleet sites.



Computer core and distribution nodes

Since the core architecture is designed to work around certain types of processor failures, there are no large-scale redundant subprocessors. All ODN I/O paths are hardwired directly into the various station systems being serviced. There are, however, a limited number of backup RF links from critical systems to a set of computer core RF transceivers. Four critical systems—life support, security sensors, weapons systems, and communications—were found to be connected to the computers and dedicated backup control consoles by superconducting cable ribbons. These direct-control systems were rerouted by Starfleet to the CPG, but the CPG is not necessary for their routine operation. In the event that ODN connections are severed, the individual station systems were designed to switch to auto-safe mode until an operator could assume control. A total of 13,655 ODN bundles interconnect the computer and the various station systems, equaling an estimated 67,900 kilometers of optical fibers. The superconducting control cables are thought to total another 1300 kilometers.

Short- and medium-range RF links continue to provide data and control connections among station systems, the computers, and portable and handheld devices such as tricorders and padds. Data translation header codes from non-Cardassian devices are normally routed through the CPG, which also handles data from Bajoran devices. All other non-station-critical data from visiting or resident entities is processed through stand-alone sections of the cores, which have no direct connection—physical, optronic subspace, or RF—to the bulk of the core processors.

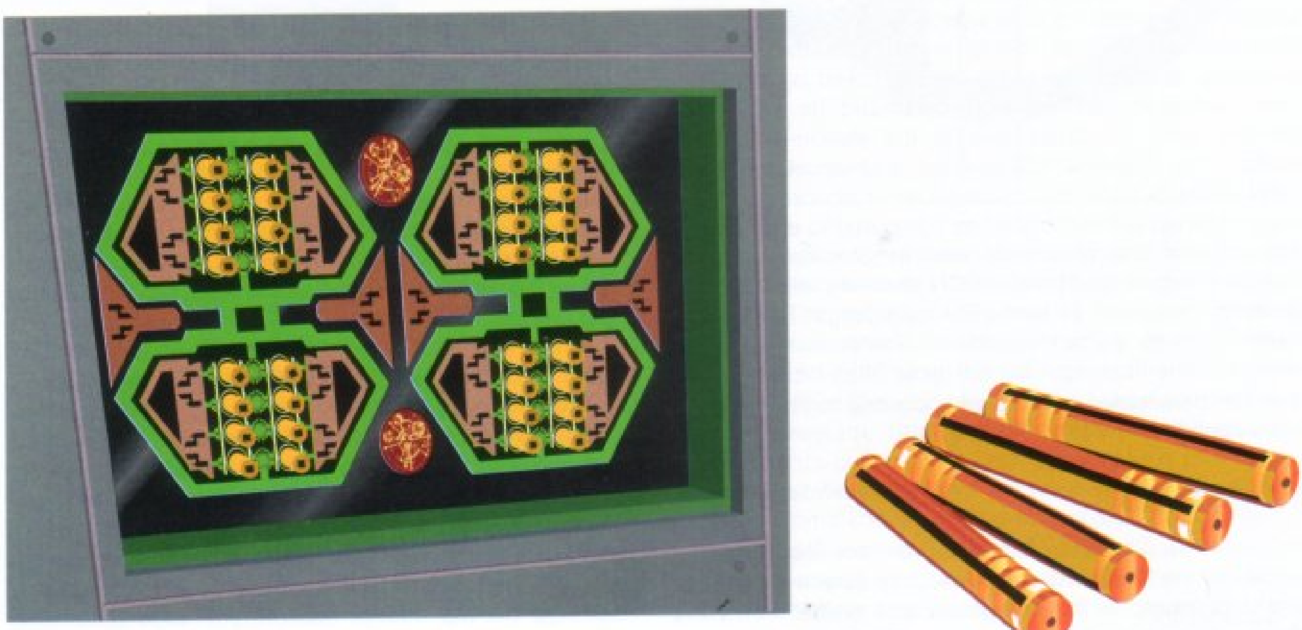
As with other station systems, control terminals located throughout the station are tied into the ODN and then to the cores. Alphanumerical, graphical, and other visual transmission data are filtered through the CPG in both directions. Terminals in all critical locations, including ops, environmental control, defensive systems, and power generation, are connected via nine redundant optical circuits so that failures or interference in as many as six circuits will still allow, from a probability standpoint, a correct signal to pass through.

4.2 ISOLINEAR STORAGE SYSTEMS

Temporary and long-term memory storage in the Cardassian cores and other computer devices are handled by various sizes of extruded isolinear rod medium. These sizes, by outside diameter and length, are as follows:

- **Class 1.** 0.43 centimeters by 3.21 centimeters for subminiature storage devices.
- **Class 2.** 1.08 centimeters by 6.26 centimeters for padd-type applications.
- **Class 3.** 1.27 centimeters by 9.52 centimeters for standard console and access tunnel applications.
- **Class 4.** 7.43 centimeters by 31.96 centimeters for computer core storage.

Rods are fabricated using multiaxis chromopolymer lithography techniques similar to those used to produce Starfleet isolinear chips. They are optimized to store and process information transmitted over a maximum of 8,357 distinct input paths positron-etched into a 1.2-millimeter photon-amplification coating on the end of the rod. Data are recorded and read from the rod using polarized light pulses at 46,238 nanometers, corresponding to orange light. Minor differences in chromopolymer chemistry separate the Cardassian and Starfleet technologies, as do slightly lower data densities available in the rods, at 5.37 kiloquads per cubic centimeter. By comparison, current high-density isolinear chips hold 6.51 kiloquads per cubic centimeter and operate on light pulses at 68,913 nanometers, more at the blue end of the spectrum.



Isolinear bank and rods

4.3 PERSONAL ACCESS DISPLAY DEVICES

The personal access display device (padd) continues to be the primary handheld tool for instruction execution and information handling aboard Deep Space 9, if not the entire Alpha Quadrant. The basic physiological characteristics of humanoids in the cultural mix of the station have shaped the similar forms of the padds encountered. Moreover, technology transfer has endowed these mechanisms with familiar functions and capabilities. All are portable and can communicate with larger computer systems, though various levels of data translation and decryption keep the majority of them operationally isolated. Security concerns will reinforce the isolation for the foreseeable future, though they will not affect the more benign display instruments in the same manner as they would affect tricorders, and particularly the smaller, more undetectable data storage media in a time of hostilities and widespread espionage. Upgrades in display and storage science of the various cultures have proved largely predictable due to the wide availability of information across territorial borders. As with other technical innovations in the galaxy, the appearance of radically new materials or hardware may be deliberately postponed, while covert applications are tested away from the main theaters of operation.

Padds of the principal cultures represented on Deep Space 9 include Starfleet, Cardassian, Klingon, and Ferengi. Bajoran personnel typically use the Starfleet type, but have been known to work with modified Cardassian units. In some instances, the displays and processors in the Bajoran tricorder perform padd functions (see 9.4). Other races have either independently developed or replicated the technology, but the core concepts are covered in these four. All are constructed from alloy or composite materials, support an isolinear or duotronic type of computer architecture, communicate by RF or subspace channels, and are powered by induction or direct energy charging.

The Starfleet padd variants include three principal hardware sizes; 10.16 by 15.24 by 0.95 centimeters, 20.32 by 25.41 by 0.95 centimeters, and 22.86 by 30.48 by 1.27 centimeters. All are now fabricated from micromilled duranium and operate on sarium-krellide power cells. Masses vary from 113.39 grams to 340.19 grams. Display screen sizes vary from 5.08 by 7.62 centimeters up to 20.32 by 27.94 centimeters, but all employ dynamic resolution switching

Starfleet padd in service configuration

Cardassian padd in service configuration created by a nanopixel molecular matrix. The matrix is the result of a fivefold improvement on previous padd, tricorder, and control panel imaging thin films. All variants contain subspace transceiver assemblies (STA) for data transmissions to larger core computers. Isolinear memory storage capacity ranges from 15.3 kiloquads to 97.5 kiloquads, depending on the variant. Development units employing encapsulated bioneural gel wafers are scheduled to be delivered shortly after the Research, Development, Testing, and Evaluation (RDT&E) cycle is complete for all data devices.

Cardassian padds appear to be hybrid products of their own materials developments and borrowed technology from other worlds. The primary model is a ruggedized unit molded from rodinium boronate, mostly from ore tailings. The housing measures 18.41 centimeters by 9.53 centimeters, with a tapered handhold, and masses 198.2 grams. The display employs a gas-field suspension screen with a standoff gap distance of 0.3 millimeters and is capable of imaging both two-dimensional and limited holostereo data. Isolinear processors and memory chips are piggyback-paired in hot-swappable modules, with two type-2 memory rods for a total capacity of 12.1 kiloquads. Controls include capacitance sliders and voice activation. Power for 29.3 hours continuous operation is provided by liquid isotolinium ampules. In the modified units aboard the station, two Starfleet-type sarium-krellide cells power the padd for 37.5 hours continuous operation.

Padds produced by the Ferengi Alliance are highlighted by the latest high-clock-rate processors optimized for financial and materiel inventory calculations. The unit measures 19.07 by 8.96 centimeters and masses 268.54 grams, and the casing is formed from relatively inexpensive sintered aluminum-lithium, typically by the lowest-bidder facilities on Ferenginar. The trilobed central processor is based on isolinear technology, but is molded in a 4-D forced-matrix process that takes seventy-three hours to cure completely. The Ferengi patience is rewarded, however, with a massively cross-linked circuit possessing a density of twenty-three hundred neurites per square millimeter. Memory storage is handled by a single 5.35-centimeter molded isolinear disk piggybacked directly to the processor, with a smaller 2.13-centimeter disk and backup processor, which maintains a limited record of only the last 358,700 transactions.

By comparison, Klingon padds are extremely limited in memory capacity and display options, though highly ruggedized for battlefield use. Each unit is fabricated from pressure-forged tritanium, as a subsidiary use of Klingon construction activity. It measures 19.10 by 6.98 by 0.99 centimeters, and masses 45.5 grams. The display screen is an irregular hexagon 8.13 by 5.71 centimeters and provides a fixed resolution of 250 discrete elements per millimeter. Data is stored in two isolinear chips for a total memory capacity of 4.32 kiloquads. Through the technology transfer agreements between the UFP and the Klingon High Council, Klingon padds are equipped with standard subspace transceiver assemblies for data transmissions. No alternate RF channels are present. The unit is powered by a single thermocouple induction loop of cesium diferrofluorite, and can run continuously for 47.5 hours.

Ferengi padd in service configuration

Klingon padd in service configuration

Typical workstation

4.4 DESKTOP AND CONSOLE COMPUTER ACCESS

Various stand-alone and networked desktop terminals, as well as console units, operate aboard Deep Space 9. Starfleet equipment larger than padd size consists of various types of ruggedized desktop terminal with augmented memory capacity and data translation programming. Cardassian equipment includes all existing control panel surfaces and fixed and movable consoles. Most resident and visiting cultures maintain separate computer systems within their workspaces or living quarters, or lease storage and processing space within firewalled areas of one of the main computer cores.

The desktop unit in general use by Starfleet personnel measures 30.43 by 25.41 by 24.10 centimeters housed in a casing fabricated from a molded duranium composite. The internal components are identical to those found in Starfleet padds, with the addition of user-configurable touchpads for more data-manipulation options. The main display screen measures 20.32 by 26.61 centimeters and employs dynamic resolution switching with its nanopixel molecular matrix. Power is provided by a sarium-krellide cell, which can be recharged either by induction loop or beamed power link when not in use. In the absence of continuous recharging, the unit will run approximately fifty-eight hours. Memory and data preprocessing is accomplished by two banks of fifteen 2.54 by 7.62 by 6.62 centimeter isolinear chips, for a total onboard storage capacity of 1.21 megaquads. Connections with external computer devices and subspace com systems are handled by the STA, which also employs backup RF com links for graphical, voice, and visual data.

The desktop unit responds to voice commands through the STA and touch commands through the screen and touchpad segments. Voice commands are filtered through the STA for comparison with stored user identification records and then routed to the graphical interface, voice response circuit, and command processor. Screen and touchpad inputs are analyzed for velocity and pressure values and routed to the graphical interface and command processor. Each desktop unit is generally configured for up to twelve different users, but can accommodate as many users as there is identification memory. This equals some 18,600 individual preference files.

Cardassian-built console units generally communicate with the station's main computer cores and retain an untranslated Cardassian user interface for graphical data and visual transmissions. Console display screens remain Cardassian, though some damaged screens have been replaced with Starfleet hardware. The original Terok Nor display surfaces were fabricated from 0.13-millimeter semirigid polycrystalline semacrylide and duvenite honeycomb films, each layer acting as a substrate for specific isolinear chromopolymers. A total of eight layers form the control surface and handle touch inputs, tactile feedback, graphical area lighting, EPS microcurrent distribution, and user configurations. The maximum dynamic resolution has been measured at 443 discrete elements per millimeter.

A variety of freestanding consoles are in use aboard Deep Space 9, using both Cardassian and Starfleet display and communcations protocols. In sensitive areas, the units typically are configured for both graphic display types, and any Starfleet data are routed through the CPG attached to the main computer cores. All Cardassian console units are equipped with isolinear rod preprocessor and memory storage banks, typically 3.65 megaquads housed in the structural base. Console units are powered by rechargeable liquid isotolinium power cells, in addition to floor-tap EPS nodes. Cardassian consoles were, not surprisingly, found to employ a passcode access scheme routinely used for any main core operations (see 4.5). Most of the lockout routines were disabled during the Starfleet reconstruction, and those consoles not responding to lockout extraction were gutted and refitted with rebuilt Cardassian components.

Freestanding console

4.5 SECURITY CONSIDERATIONS

Access to the computer system requires clearance through a series of identity confirmation firewall layers, beginning with voiceprint matching. Depending on the clearance level, additional confirmation methods involve physiognomy recognition, iris and retinal pattern matching, integumentary surface matching, and in the highest-level clearance, DNA and neuronal structural matching. Additional firewall layers are structured specifically for non–user-specific file transfers and program execution. A combination of Bajoran and Starfleet command personnel aboard the station have the authority to set user permissions, passwords, and clearance levels.

Circuitry junction type-2

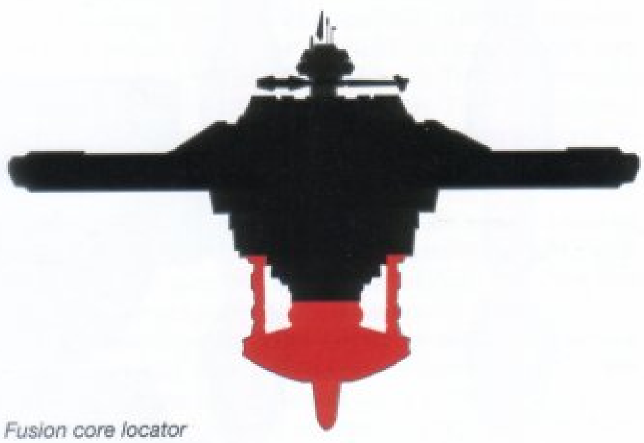
Physical access to computer hardware such as the computer cores and data pathway circuitry is nominally restricted to command and engineering personnel. Access codes and special tools are required for most tasks involving hardware repairs and installation. During heightened alert levels, all inbound and outbound equipment must be scanned and recorded at sensitive areas. Circuitry junctions using isolinear devices are key targets for threat-force sabotage and are regularly monitored (see illustration).

All security incidents involving Deep Space 9 computer systems have been logged and analyzed and have shown that many firewall schemes can be defeated. Continued vigilance and upgraded security methodology have also shown that most local and system-wide breaches have been traced and the perpetrators discovered. Frequent access key code changes and random clearance testing have been credited with maintaining a manageable level of computer security.

5.0 POWER GENERATION SYSTEMS

5.1 FUSION SYSTEM STRUCTURE AND OPERATION

Primary power for all critical station hardware is produced by the fusion generator attached to the -Y end of the Lower Core. The generator section consists of six fusion reaction chambers working in concert to supply energized plasma for distribution throughout Deep Space 9. The original Cardassian term for the EPS translates as *ion-energy network*; however, the Starfleet nomenclature is in effect for all technical discussions. The reaction chamber group is the heart of the generator, potentially capable of producing 790 terawatts of power with all six chambers running. Since the station handover, only four of the chambers have been consistently maintained, the other two of which have been rated as borderline for safety reasons by Starfleet engineers and are usually powered down.



Fusion core locator

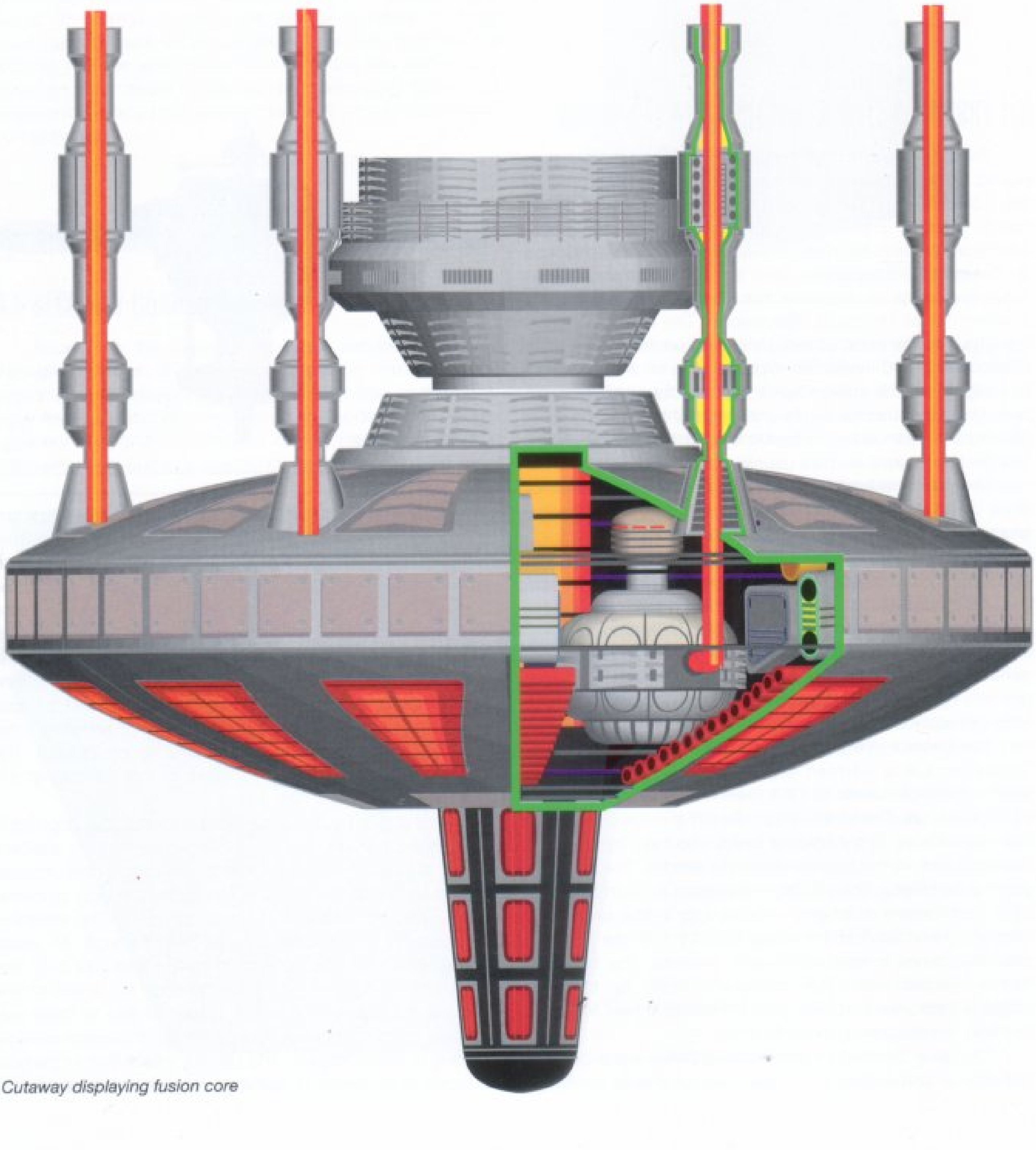
The fusion chambers are housed within the generator shell. This structure also contains the fuel conditioning blocks, fuel transfer conduits, focused nanometer laser detonators, peristaltic and electrohydraulic pump machinery, and radiator beds and coolant loops. The chambers are 25.9 meters in diameter and 30.17 meters tall, constructed of four main layers of rodinium pentacarbide alloy. Each of the wall layers is assembled from six gores that have been gamma welded under a pressure of 203,500 metric tonnes per m^2. This results in a large-volume chamber that is prestressed against high-frequency fusion pressures.

The general operation flow is identical for all reactors. Deuterium fuel is warmed slightly within its storage tanks from a semisolid state of 10.3 kelvins to a slush condition of 13.4 kelvins. The slush is transferred through the Lower Core to a series of six holding tanks and then into neoplesium cavities in the fuel-conditioning blocks. The cavities, each a narrowing cone 7.66 centimeters in diameter and 75.9 centimeters in length, with an exit orifice of 11 millimeters, form the fuel into long rods by the use of compression rams. In one continuous process, the rods are further formed into 10.3-millimeter pellets by traveling shaping mandrels and arranged in feed channels for ejection into the reaction chamber.

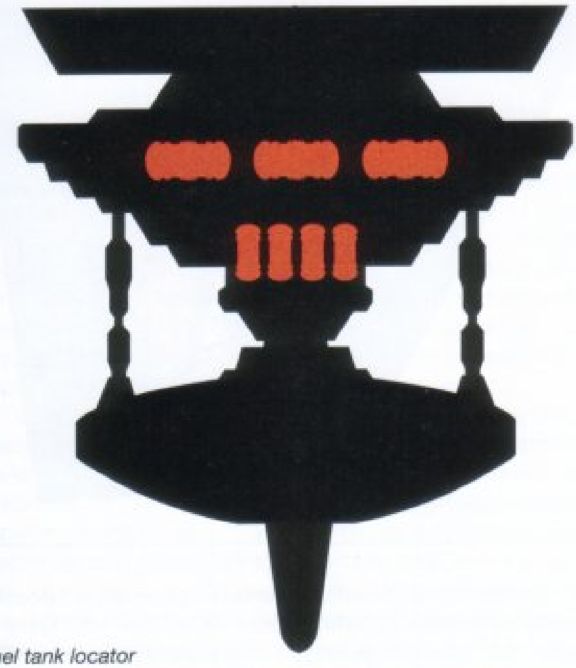
The laser detonators are focused pulse-wave devices capable of converging 26.1 gigajoules of energy on a pinpoint 9.3 millimeters wide, effectively surrounding the target fuel pellet. *V'retellium* bezenate windows for the twenty-nine detonators line the inner wall of the reaction chamber, and the pellet ejector nozzle penetrates the chamber at the +Y or top end. This opening is protected from the nuclear reactions by a cycling force field. A sustained reaction rate of twelve detonations per second is considered normal for benign-condition station operations and can be increased to eighty-three detonations per second during periods of high energy demand, particularly for EPS-intensive phaser and defensive shield operation. The ignition cycle is similar in principle to that utilized in the station RCS thrusters (see 6.6).

Initial power for the detonators is stored in a large bank of capacitance start-up cells. Once the fusion process begins and the released energy overtakes the amount needed to initiate the system, any surplus energy is immediately used to recharge the start-up cells. The chamber EPS plasma is directed magnetically through an irised exhaust port and into the station power grid (see 5.3). The exhaust iris and pellet ejector are normally set in one to one firing synchronization, although a ratio of two or three pellets detonated in rapid sequence for each plasma exhaust opening is not unknown. The danger exists that in particular types of hardware or software failures, the plasma density could increase beyond the chamber's rated structural integrity, creating an overload (see 5.5, 5.6).

When operating at normal rates, the inner chamber wall reaches instantaneous flash temperatures of 560,000 kelvins. Eighteen redundant regenerative coolant loops embedded within the three outer layers draw off excess thermal radiation at a rate of 1366 kelvins per cubic centimeter per second. Most of the thermal energy is radiated into space, though some may be reintroduced into the EPS plasma or stored in six tanks filled with polykeiyurium dichlorokine, to be converted back into EM current at a later time. When radiated into space, the thermal flow is dumped into a liquid sodium loop and circulated through downward-facing louver panels, as well as the large radiator cone at the extreme -Y end of the system. The cone also handles routine and emergency plasma and fuel venting. In emergencies, the coolant method would become exclusively evaporative.



Cutaway displaying fusion core



Fuel tank locator

5.2 FUEL STORAGE AND TRANSFER

Main power generation for Deep Space 9 relies directly on the storage of large quantities of supercold deuterium, the isotope of hydrogen that also helps power most interstellar vessels in the galaxy. Standard hydrogen atoms possess one proton in the nucleus and one electron in the first orbital shell; deuterium possesses an extra neutron in the nucleus. The form of deuterium stored at Deep Space 9 is a cryogenic semibrittle material maintained at a temperature of -262.35° Celsius, or 10.8 kelvins. The densified nature of the fuel allows for increased energy availability per cubic meter than slush deuterium carried on starships, which require some control over tankage balances in a moving structure. While the space station has made one large translational maneuver in its operational lifetime, it does not perform rapid motions with the same frequency as its mobile counterparts.

Six large deuterium tanks and six smaller surge tanks are housed within the Lower Core assembly. The large tanks, which are installed long-axis–perpendicular to the station's Y-axis in 60-degree intervals, measure 9.44 meters in diameter and 30.17 meters in length. Each rounded cylinder is triple-walled kevlinite and hafnium arkenide alternating with plasma-expanded insulating foam of polysilica boronite. The gamma-welded walls have thicknesses, from the innermost, of 3.61 centimeters, 2.81 centimeters, and 1.76 centimeters. Five hundred eighty-one structural linkages between the tank layers are fabricated from spin-cast anodium arkenide with a maximum contact area per link of 2.01 cm^2. This reduces the thermal migration to less than 0.000032 kelvins/day and is easily countered by diffusion-stage vacuum gettering pumps and embedded thermal wicking assemblies. The volume of deuterium stored in each large tank is 2,111.58 m^3, for a total of 12,669.52 m^3.

The surge tanks are also rounded cylinders, measuring 6.09 meters in diameter by 20.72 meters in length, and have an internal volume of 603.55 m^3. They possess the same structural plan as the larger ones. They are installed inboard of the large tanks in parallel with the station's Y-axis. All tank penetrations for supply, purge, vent, and sensor lines have been made by narrow-band Cardassian matter disruption tools. Doubly redundant supply conduits service the main fusion generator system as well as all smaller fusion reactors aboard the station, including the reaction control system (RCS) thrusters.

A single large spherical deuterium tank 30.63 meters in diameter had at one time been mounted partly to the outer shell of the Mid-Core and partly to Crossover Bridge 2. This tank held a total volume of 119,000 m^3 of deuterium and had suffered a major catastrophic failure prior to the station handover. Remarkably, the structure-based overpressure failure was confined to a burst area in the lower one-third of the tank, preventing the escaping fuel from impacting other station masses. The tank has not been replaced by Starfleet, and all exposed transfer and sensor conduits have been capped off. It is surmised that this large external tank was installed to relieve Cardassian tanker vehicles from having to make repeated supply runs necessary to maintain the power required for the ore processing and weapons systems. The notion that the destruction of the tank had been an act of sabotage has not escaped either Starfleet Intelligence or the Bajoran security forces, though physical evidence of tampering has yet to be found.

Large deuterium tank

Small deuterium tank

5.3 POWER DISTRIBUTION NETWORK

Fusion power produced by the large central generators is distributed through the station over a series of 651 stepped-energy EPS conduits feeding all 24 major and 53 minor subsystems. The first-stage conduits, formed from multilayer toranium-durmanite, measure 1.89 meters in diameter and 1,103.62 meters in length. They emerge from the six fusion energy chambers and are controlled by a set of five one-way plasma flow constrictors. These devices act as baffles to prevent frequent reaction surges in the fusion generators from affecting downstream segments of the system, including the final-stage user grid. By the time the plasma has reached the fifth constrictor, the temperature has been stabilized at 215,000 kelvins and remains at that level throughout the first three energy steps. Plasma flow controllers and cross-feeds link all six first-stage conduits in the event of power drains or unbalanced demand, particularly evident in weapon and shield usage.

External to the fusion generator housing, six second-stage EPS conduits carry energy outboard of the generator's structural attach point on the Lower Core. They average 1.09 meters in diameter and are 85.23 meters in length. It is known that the individual conduits were spread out in a measure to minimize damage in the event of hostile action or catastrophic failure, which might have jeopardized the entire station had the conduits been clustered together. The second-stage conduits are also fabricated from toranium-durmanite and are hardened against radiation interference and structural impacts. The main subassemblies of each conduit include an energy polarization bed, emergency venting and cooling jackets, and flow accelerator coils to maintain directional plasma pressure toward critical systems.

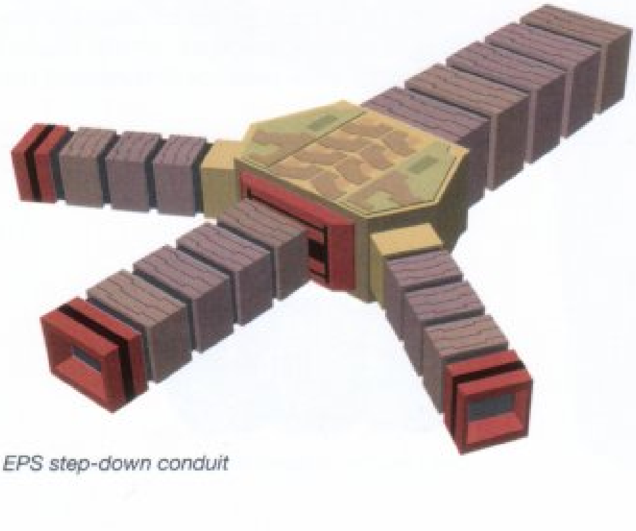
The junctions to the third-stage conduits split to form eighteen large and twenty-seven smaller branches within the Lower Core and up into the Mid-Core. Nine of the large EPS branches spread out within the Mid-Core and reconverge at the minor crossover bridges to power the weapon

Circuitry junction type-3

sail towers and defensive shield generators directly. Another nine take different paths within the Mid-Core to power the ore processing centers in the pylons. The twenty-seven smaller branches, moving lower-temperature and lower-pressure plasma, form the multiuse pregrid for the Docking Ring, Habitat Ring, Promenade, and ops. One hundred sixty-two fourth-stage conduits carry power from the pregrid to plasma circuitry junctions, through embedded wall nets and access tunnels in all areas of the station. The majority of fourth-stage conduits terminate in multiphase alternating-current taps, and are available for most medium to heavy industrial applications. Induction-type user equipment requiring up to 8,192 kelvin plasma make use of fifth-stage step-down conduits within residences, laboratories, cargo bays, commercial facilities, and offices. Holosuites are an exception, utilizing higher-energy 12,500 kelvin plasma for their operation.

Starfleet power-conditioning equipment was brought in early in the handover process to facilitate most computer, weapon, utility, and spacecraft operations, among other activities requiring stable, transformable energy. Although some 75 percent of all Starfleet conversion equipment was self-destructed prior to the retaking of Deep Space 9 by the Cardassians on Stardate 50989.42, that portion was replaced following Operation Return. During neither event were key non-Starfleet systems compromised, in order to preserve life aboard the station.

Future upgrades either in work or being considered by Starfleet Command include increased computer control of all major conduits and node branches, improved emergency detection systems applied to high-energy junctions, and increased security measures applied to all sensitive power facilities. Work in these areas is usually done in concert with strategic and tactical analysts to further examine all aspects of Cardassian materials science and technology.



EPS step-down conduit

5.4 ENGINEERING OPERATIONS AND SAFETY

Even as one Starfleet engineering team began analyzing exhaustive scans of the fusion power systems, another was compiling operational protocols and documentation on system safety. From the day the first Federation ship docked at the station, it was clear that the fusion reactors were in need of long hours of maintenance and safety checks. Two of the six reactors were completely inactive, and the load was taken up by the remaining four chambers. This is not normally a critical situation, but high-level power usage for weapons and full shields would have required at least one other reactor to be operational as backup in case one failed.

Since the power system is purely laser-induced fusion, and the multiple chambers allow for maintenance-while-active (MWA) procedures, hardware teardown and rebuilding is similar to that of ship-installed primary impulse reactors and auxiliary fusion generators. Each reactor is partitioned off into its own sealed housing so crews can, for example, replace the deuterium injector on one reactor,while the two adjacent units are providing EPS power. No starbase-class facilities are required for repairs or upgrades to this particular system. Following reactor shutdown and mandatory cold-soak thermal energy bleed-off of thirty-five minutes, a chamber is accessible for internal scans and hardware replacement through a magnetically-sealed inspection port built into the chamber equatorial band. The laser detonators and fuel pellet injector can be reached using extensible boom fixtures built into each generator outer housing. The typical inspection cycle for internal components has been set at 550 operating hours. All inner chamber wall seam melds must be inspected for stress microfractures and resurfaced when voids in the rodinium excelinate reach rates and sizes of greater than two hundred voids 0.02 millimeters in diameter. All chamber pressure surge levels greater than six hundred kilopascals/m^2 trigger automatic resurfacing at the earliest available time, since exposure to this amount of force risks multiple fractures of the interior coating.

The other components subject to inspection at 1,200-hour intervals are the fuel conditioning blocks, fuel transfer conduits, peristaltic and electrohydraulic pumps, and external radiator beds. All circulating sodium thermal transfer conduits are inspected at 1,650-hour intervals, and all liquid sodium metal is shunted to catalyst filters for contaminant removal at those times. The neoplesium cavities in the fuel conditioning blocks must be removed to the generator servicing lab and resurfaced with a new flash-evaporated neoplesium coating. This coating must be reapplied whenever the optimal surface contour is degraded by 0.31 centimeters.

Chamber power levels higher than 100 percent can be tolerated for short periods, usually less than thirty minutes. Power levels higher than 108 percent are not recommended, though this protocol is waived during crisis situations, when auto-shutdown limits can be moved as high as 112 percent, depending on the reactor. Above 108 percent, thermal stresses can be tolerated for an average of five minutes. It should be noted, however, that those five minutes may be crucial to the survival of Deep Space 9, especially during threat attacks. The operational history of the total generator system lists the following limits for each chamber:

CHAMBER	MAXIMUM	POWER STATUS
1	103%	Operational
2	106%	Operational
3	N/A	Nonfunctional
4	108%	Operational
5	82%	Backup Only
6	112%	Operational

Standard safety protocols for the handling of cryogenic fuels are observed in all storage and transfers of slush and liquid deuterium for the fusion system. All pumps and conduits are inspected by NDT means at thirty-four-hundred-hour intervals, and on a rotating basis for reactors and primary fuel tanks. Secondary tanks, vents, and purge lines are inspected every sixty-four hundred hours. Microfractures and degraded insulation are repaired as necessary.

5.5 EMERGENCY SHUTDOWN PROCEDURES

The system emergency most often predicted by engineering computer simulations is that of a fusion-reactor chamber overload. If the detonation rate of the deuterium pellet stream rises, the temperature and pressure of the contained plasma rises correspondingly and will lead to an auto-shutdown. The predicted causes include reactor isolinear processor failure, fuel flow imbalances, and sabotage. If the plasma pressure and energy density increase at a rate faster than the EPS conduit system can accept the higher pressures, one or more reaction chambers can suffer total structural failure, effectively destroying the entire fusion-generator section of the station. The current Starfleet computer control codes for the fusion system include upgraded emergency detection subroutines. The artificial intelligence (AI) algorithms monitor 3,470 separate sensor inputs for any out-of-normal values, and the computer can trigger the auto-shutdown of any reactor it deems in danger of failure.

A total of 357,540 conditional combinations have been programmed and include anomalies in temperature, pressure, fuel flow rate, laser detonation timing, EPS conduit constriction, cooling system efficiency, and possible spurious computer impulses. A separate set of 4,556 possible sabotage and external threat problems affecting reactor operation also exist in the fusion system isolinear processors, and will initiate emergency procedures should particular conditional tests prove true.

In the event of a rapid overload, the radiative cooling beds in the lower generator shell will switch to full race mode to attempt to cool the EPS plasma, simultaneously lowering the temperature and pressure. In the worst-case overload, however, the radiator surfaces could be overwhelmed and begin to fail structurally while trying to reduce a chamber temperature of 8.23×10^6 kelvins. The preferred coolant mode, as discussed previously, would be evaporative, where the superheated sodium is allowed to escape into space, followed by the controlled venting of the reactor chamber and EPS system. Magnetic iris valves would be opened and closed by the computer in an effort to retain station EPS power while releasing any overpressure. If the affected reactor can be resupplied with liquid sodium after the overload has been quenched, a restart will be attempted within eight hours of a system inspection.

The emergency detection subroutines will react to avoid a power system incident within 0.00023 seconds and will alert the command personnel and station occupants while the hardware is being safed. Evacuation protocols are invoked, and emergency engineering crews prepare for repair work in environmental suits. In the event of a catastrophic failure, a higher level of emergency response is triggered (see 5.6). A manual shutdown can be accomplished by command personnel with the proper authorization codes from nearly all Deep Space 9 control consoles or within range of most audio pickups. In a deliberate command decision to shut the system down, the normal emergency programs are placed in standby mode.

5.6 CATASTROPHIC EMERGENCY PROCEDURES

The catastrophic failure of the fusion power system is predicted to be an energetic event capable of crippling Deep Space 9. The physical effects of one or more reactor chambers explosively dissociating will include gross structural accelerations, EPS energy releases, coolant-chemical releases, and major power losses. The probability of large numbers of casualties is high, activating rapid rescue and medical response teams. Once the initial event has occurred, evacuation of all civilians will take place with all available space vehicles (see 13.0). If the severity of the failure is such that the system can be refurbished, engineering crews will perform standard damage-control tasks, including safing all affected systems, assessing any collateral structural and system damage, and sealing off station hull breaches as would be done in the case of a fusion-reactor failure aboard a starship.

The engineering teams assigned to EVA tasks would examine the affected areas in standard extravehicular work garments (SEWG) and perform repairs. In hazardous areas where pressure suits would not provide adequate protection, piloted Work Bee craft with remote manipulator arms would engage in repairs and debris clearing. All critical debris required for an incident inquiry would be gathered, stored in a cargo bay, and embargoed, where it would await Starfleet investigators.

If possible, all auxiliary power systems would be brought on-line to make up for all EPS energy lost due to a major reactor failure. In some cases, these smaller fusion devices would aid in the evacuation of Deep Space 9 and would then be shut down. The microfusion reactors powering the station RCS may also provide EPS power for a limited time. If the fusion system suffers a total loss as a result of hostile military action, and all civilians and commercial operators have already been removed to safe locations, all remaining Starfleet and Bajoran assets will depart and the station will likely be forfeit.

6.0 UTILITIES AND AUXILIARY SYSTEMS

6.1 UTILITIES

The Deep Space 9 internal utilities distribution infrastructure consists of specific parallel systems involved in channeling matter, energy, and data throughout the station.

The utilities distribution networks include the following:

•**Power.** Power for onboard systems is distributed by four stages of magnetically shielded transmission waveguides known as the electroplasma system (EPS). All power originates from the fusion reaction chambers and auxiliary fusion reactors and is moved by peristaltic field effect through step-down conduits (see 5.3).

•**Optical data network (ODN).** The Deep Space 9 ODN system consists of a combination of Cardassian and Starfleet optronic fiber runs connecting Starfleet, Cardassian, and Bajoran networked computer systems, as well as commercial subscriber optronic systems. Some 13,655 ODN bundles totaling an estimated 67,900 kilometers of fibers are distributed throughout the station, backed up by 1,300 kilometers of superconducting control cabling. The ODN network is critical to all primary station systems and is partitioned into protected security access levels.

•**Gravity generation.** The network of graviton-producing mats is spread throughout the station, with power flow provided by the EPS grid. Graviton field energy is divertable back through the power grid to even out perceived surface accelerations in areas of decreased device efficiency.

•**Atmospheric breathing gases.** Conduit bundles for breathing gases and research gas supplies are part of the overall station consumables network. In some cases, a single conduit can carry up to five related gases simultaneously, provided that condenser/separator units are installed at both ends. Dedicated lines are provided for oxygen, nitrogen, carbon dioxide, xenon, and argon, with optronically tripped diverter valves and storage-tank valves cut into the lines at regular intervals.

•**Potable fluids.** Transfer lines for most potable and research fluids follow the same general plan as those for breathing gases, given that most fluids and gases stored aboard Deep Space 9 are not corrosive beyond SFRA standard 34.2 d-g. Peristaltic mag-pumps, diverter valves, relief valves, and pressure and temperature sensors are installed at regular intervals along the network.

•**Solid waste disposal.** The original Terok Nor solids processing system consisted of individual desiccation and ultrasonic dry waste breakdown units, each connected to a return airflow network carrying powdered materials to the Lower Core for separation and recycling. This system is now supplemented by a series of six centralized liquid-assist breakdown units provided by Starfleet.

•**Replicator conduits.** Unprocessed fiber and nutrient mixtures, plus potable fluids and trace chemicals, are supplied to all station replicator intermediate step tanks through vanicrom-lined stainless steel and duranium conduits, plus stage-4 micro-EPS lines for replicator power.

•**Cryogenic fluid transfer.** Cryogenic liquids for station operations and research are transferred through short-run conduits, with optronically triggered diverter and pressure-relief valves at secured control stations. No stationwide cryogenics are available; supplies must be escorted by cargo processing staff members from storage to experiment or engineering work site.

•**Deuterium fuel transfer.** Multiple-wall insulated supply conduits provide slush deuterium to the main fusion generator system as well as all other smaller fusion reactors aboard the station, including the RCS thrusters.

•**Turbolift personnel transport system.** The personnel and cargo turbolift network runs along 9.54 kilometers of tube pathways in horizontal, vertical, and angled orientations. The turbolift paths echo many of the other utilities conduits, particularly the EPS, ODN, and atmospheric flow networks.

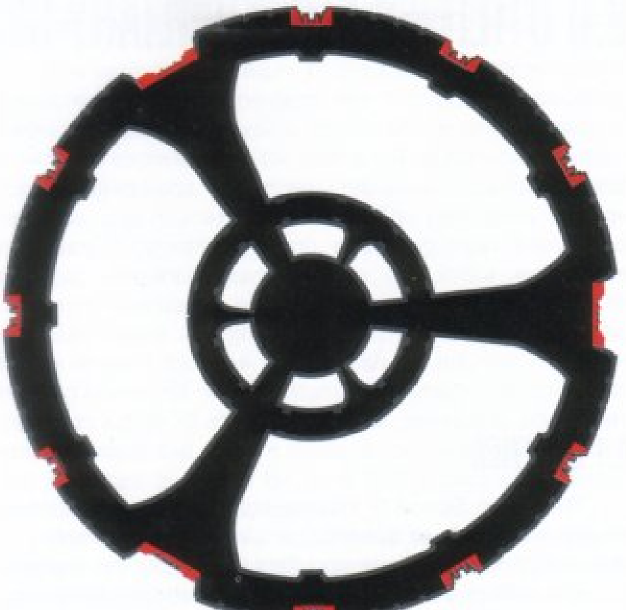
•**Access tunnels.** These service crawlways, similar in size and function to Starfleet Jefferies tubes, run perpendicular to most station corridors and run adjacent to station internal walls containing end-user resident utilities connections, as well as adjacent to deep industrial utilities junctions.

•**Auxiliary fusion generators.** The Starfleet-installed fusion generators are tied into both the primary and emergency EPS conduits and receive deuterium from the fuel transfer network. These generators are approximately one-sixth the size and power output of the standard impulse power plants found on most Starfleet vessels.

6.2 DOCKING RING CONNECTIONS

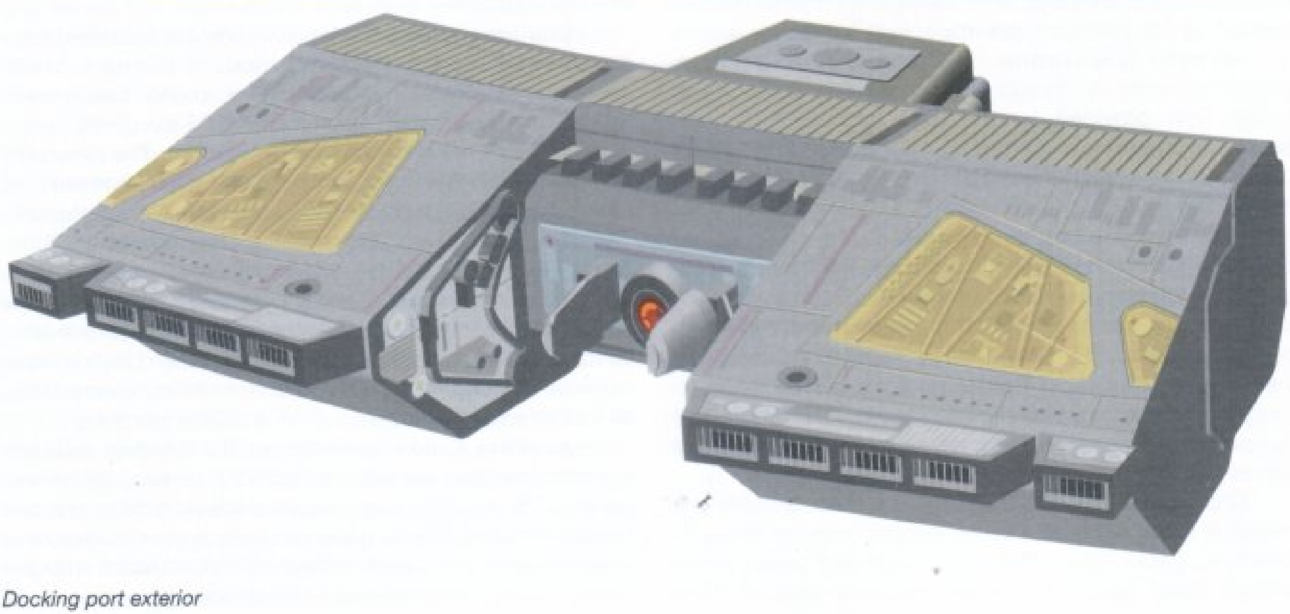
Since both the previous and current avatars of Deep Space 9 must accommodate a variety of commercial, scientific, and military space traffic, the berthing facilities have been designed to provide adaptable connections to many different personnel and cargo transfer tunnels. A range of electrohydraulic docking clamp configurations are also possible, within the physical dimensions of the three dock types.

The Docking Ring encompasses two of the three dock systems. The large primary docking ports are located at the junctions of extreme outboard ends of the crossover bridges, Docking Pylons, and Docking Ring. The inset bays describing the docking volumes can service spacecraft as large as 167 meters across where they meet the docking tunnel. This dimension equals the widest deployed jaw opening of the docking clamps. The transfer tunnel has an outside diameter of 15.24 meters and an inside of 13.71 meters, large enough to allow most containerized cargo. In certain rare instances, the central ellipse of the port, measuring 81.5 by 36.7 meters, can be swung out on booms to bring in special pods or entire small spacecraft for repair and refurbishment. In that case, the Transited Cargo Inspection station and adjacent cargo bays would be cleared and later restored.

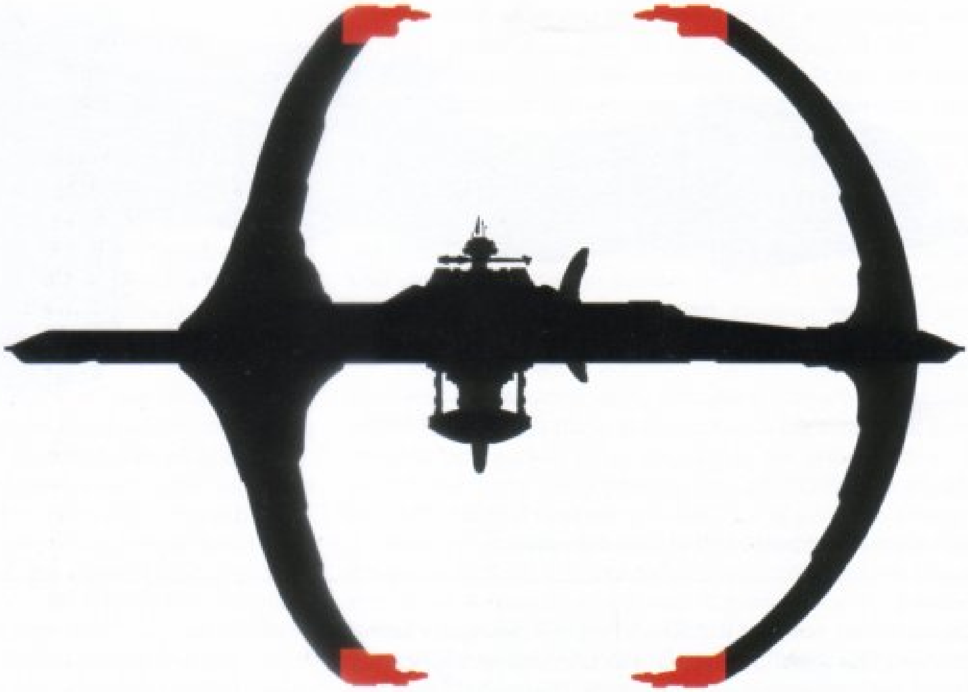


Docking port locator

The docking clamps employ a combination of electrohydraulic grab plates and short-range amplitude-pulse tractor field emitters. The grab plates, originally optimized for Cardassian freighters, have been adapted to a limited number of other spacecraft types desiring a rigidized connection more robust than that afforded by the tractor-based mooring beams. The maximum power of the tractor emitters is 30.32 megawatts, independently variable in the X- and Y-axes. Dedicated docking data channels are opened between the station and an incoming vessel when the latter enters within twenty-five hundred meters, to provide the clamp tractor subsystem with real-time feedback on structural force coupling and hull plating limitations. In the event of incompatible data handshaking, the clamps default to active structural scanning to determine acceptable hull pressures. The transfer tunnels deploy variable-morphology hull seals from their stowed positions on the cylindrical neck. Once a vessel is structurally stabilized, the seals adjust automatically with magnetic and force field latches until atmospheric integrity is established. The



Docking port exterior



Pylon docking port locator

docking clamps and transfer tunnels are computer controlled, though a set of manual override pistons is available for emergency release.

The nine secondary ports can service spacecraft up to 5.34 meters wide at the tunnel, within the widest opening of the smaller clamps. The grab plate and transfer tunnel mechanisms are nearly identical in overall concept, with the exception of the central port opening. The grab plate tractor field has a maximum power rating of 19.63 megawatts, and the maximum inner diameter of the tunnel is 7.62 meters. Manual override pitons are provided for emergencies.

Both primary and secondary docks are equipped with approach lighting systems, subspace, and RF docking aids. All visible-wavelength lighting subsystems, between forty thousand and seventy thousand nanometers, are readable by commercial freighter approach hardware, and 95 percent of the repeat-visit vessels can read the subspace beacons. Each port supports a minimum of five multifrequency subspace alignment transceivers. The remaining 5 percent of visiting vessels can read the super-high frequency (SHF) RF vector beams.

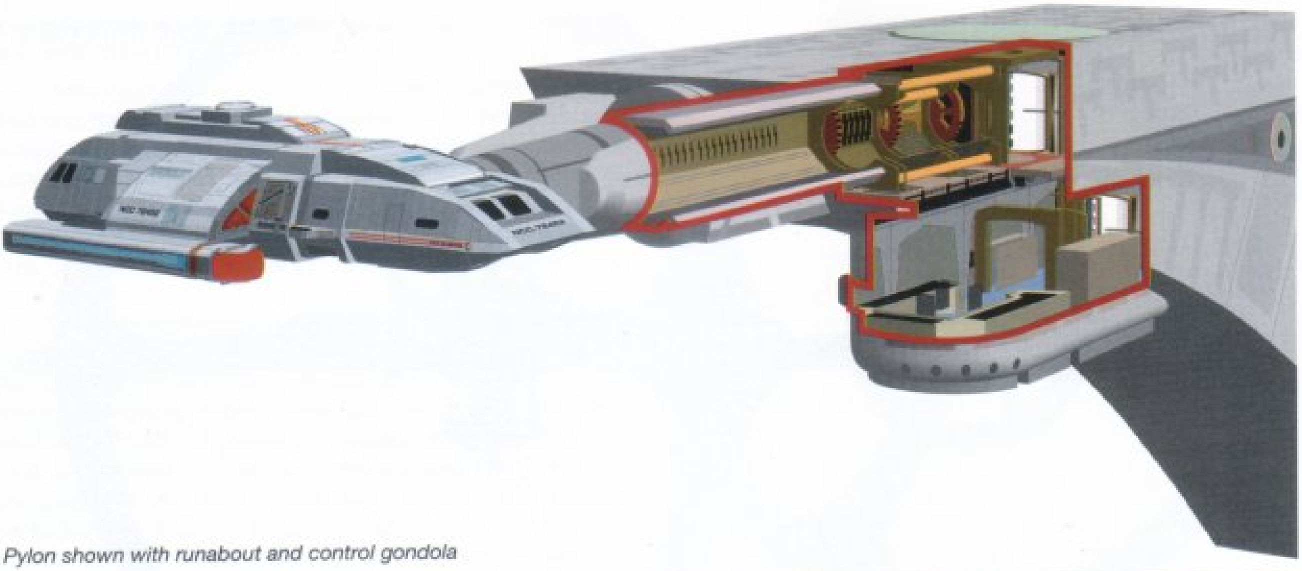
Docked vessels up to 325 meters in length will be protected to a limited degree by the defensive shield envelope. Most spacecraft are expected to be undocked and moved to safe locations, but those still attached to the clamps and transfer tunnels will be able to withstand some amount of weapons fire or natural EM if their own defensive systems are off-line. There is some mutual benefit to both ships and station if their shields are active, since some field coupling is known to occur.

6.3 DOCKING PYLON CONNECTIONS

The large sweeping pylons extending away from the Docking Ring were the centers of uridium and other types of ore processing on Terok Nor. A flow of input of ore and output of refined materials along the pylons was established early in the design of the station, and specialized docking connections were constructed to handle the mineral and alloy shipments (see 1.4).

Both Upper and Lower Pylons are equipped with the same basic type of tractor-type docking clamps as the Docking Ring connections, though the pylon versions are immovable. These clamps are embedded within the inner walls of twin material-conveyor chutes, which straddle the personnel transfer tunnel. The chute hatches match connectors on most Cardassian freighters, though some Starfleet and other vessels have been able to transfer test loads through their normal docking ports. The advantage to loading and unloading at the pylons stemmed from the ability to attach to lateral vessel hatch fittings, which cannot be done easily at the Docking Ring. This allowed large freighters to dock with a maximum 464.21 meters space abeam before reaching the tip of a neighboring pylon. While the pylon tips appear from the outside to limit simultaneous docking of two or more freighters, the Cardassian ore operations were conducted in sequence. One Upper Pylon would be occupied with a docked freighter transferring its load, another pylon would be processing a load, and a third would be performing conveyor purges and periodic maintenance (PM) and awaiting the next freighter.

The Lower Pylons operated in similar fashion. One



Pylon shown with runabout and control gondola

pylon would support a docked freighter taking on refined uridium, the same pylon as in the previous example would be in the processing stage, and the third would be in the purge/PM stage. The scheme worked remarkably well, given the availability of spares and laborers to maintain the equipment.

The freighters usually provided the initial thrust of the ore grindings through the chutes with the help of antigrav-field tunnels. The antigravs were employed more as a stabilizing and lateral motive force than a purely lifting one, to overcome any synchronization lags in the gravity mat fields between the station and docked freighter. Once through the chutes, force field partitioning of the ore stream and station gravity helped lower the ore to the processors. In the case of gravity-mat failures, the force fields would continue moving the ore, though at a slower rate (see 11.3)

The personnel transfer tunnels provided the same adaptable atmospheric seals as those in the Docking Ring, indicating that Cardassian freighters were not the only ships to use the tunnels. A minimum of 2160 man-hours of Starfleet re-engineering was required to ensure complete compatibility in all subsystems and allow *Galaxy*- and *Sovereign*-class ships to dock and transfer crew and supplies.

Visual, subspace, and RF docking aids are present in all six pylons. An additional five backup subspace beacons were installed in each pylon dock area to provide long-range 4-D location assistance to incoming and outgoing vessels. As with the Docking Ring connections, defensive shield envelope coverage of the pylon connections offers limited protection. Special caution must be taken by ships docked at the Upper Pylons, as they are in closer proximity to the shield generators and must have their own shields inactivated or set to free-sync with the station's shield frequencies.

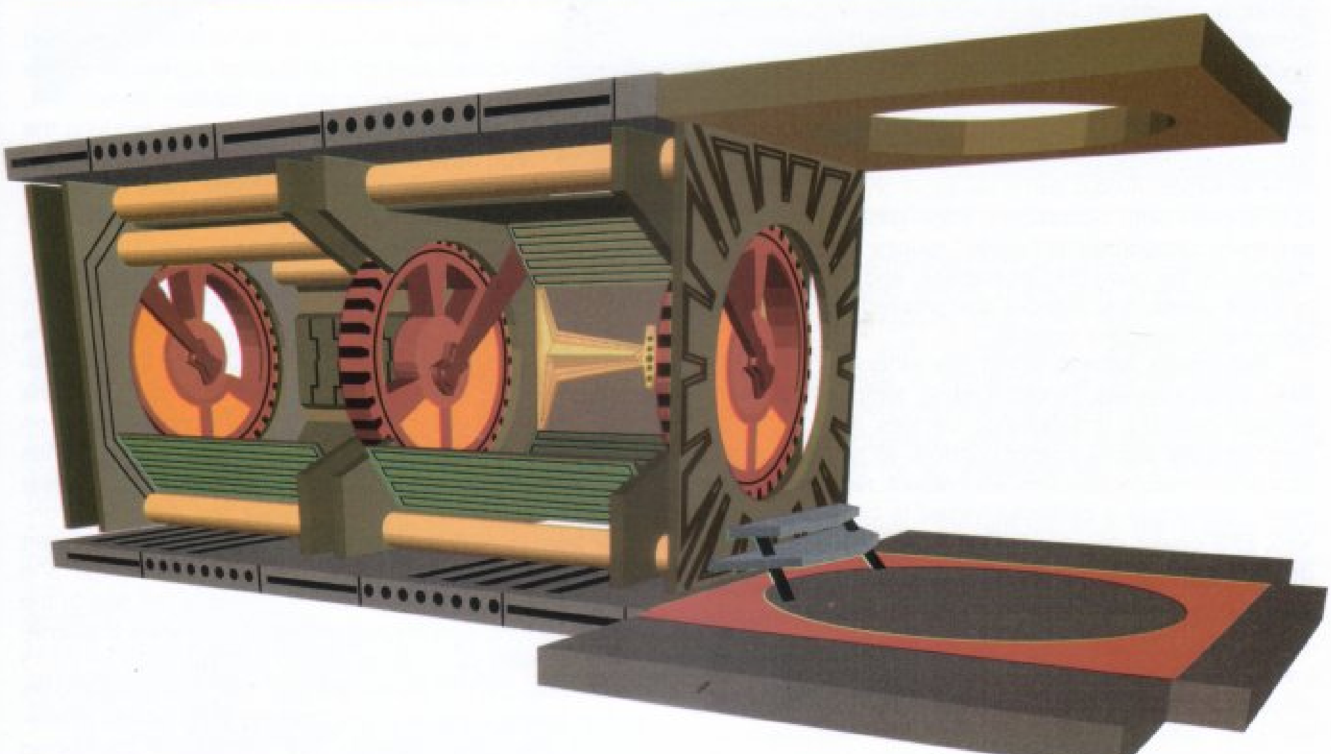
6.4 AIRLOCKS AND SECURITY GATES

The primary pressure isolation structures on Deep Space 9 are doubly compartmentalized airlocks. These structures were prefabricated as complete installable units, built from modular components. Because of the construction sequence followed by the Cardassians, three of the Promenade airlocks originally exposed to space were retained as security gates once the reactive shield wall was completed. A total of twenty-one airlocks are present on the station, consisting of twelve Docking Ring locks, six Docking Pylon locks, and three Promenade security gates.

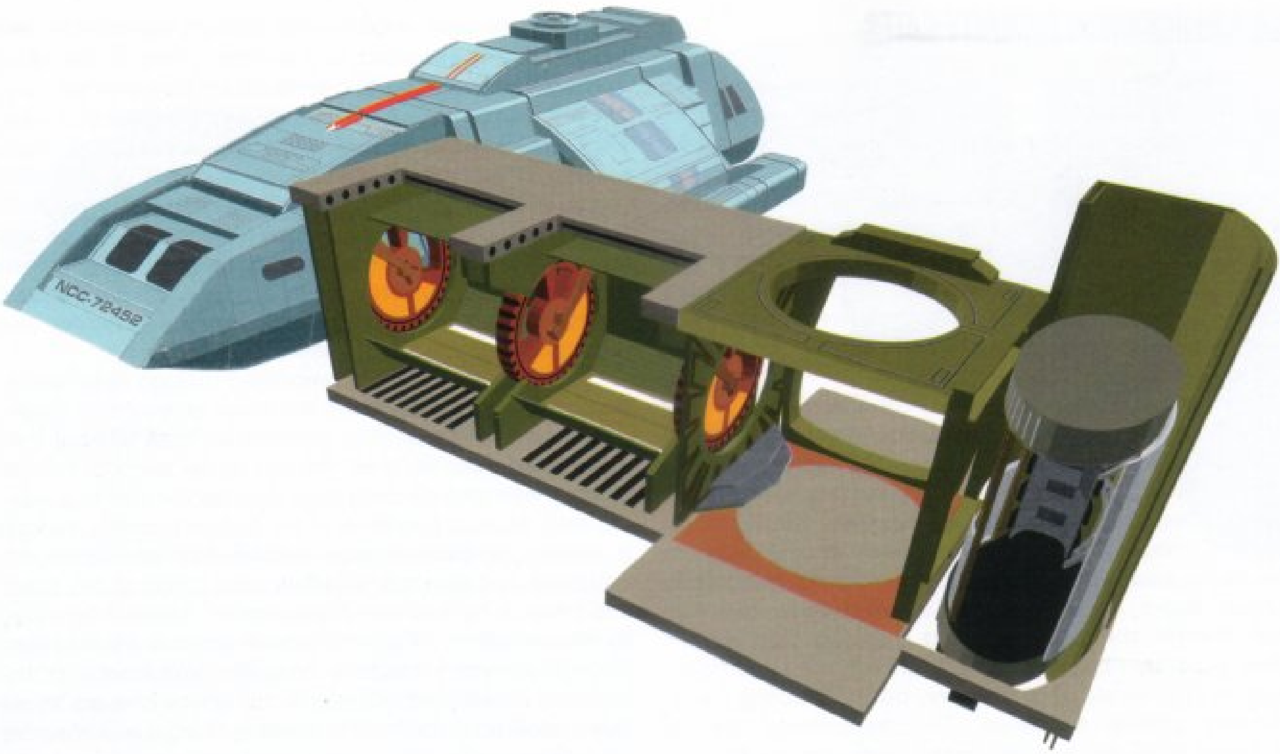
The most prominent feature of the airlock is the three distinctive geared pressure doors, each measuring 2.32 meters in diameter and massing 544.68 kilograms. The doors are fabricated from toranium and kelindide composites, with transparent toranium viewing windows. Curiously, not all airlocks were constructed from the same materials; eight of the twelve Docking Ring airlock doors are made from at least 20% rodinium monocrystal sheets, suggesting that the Cardassians were experimenting with radiation hardening the doors against high levels of phaser fire, possibly during hand-to-hand combat scenarios. The surrounding framing and wall modules are fabricated from gamma-bonded toranium honeycombs and duranium surface sheeting. Integral utilities conduits have been molded into the box structure of the lock.

Pressure seals are achieved through expandable delcromin toroids mounted to the inner sides of the door channel. Backup force field emitters are built into the inner rim of the circular passageway, though the maximum useful lifetime of the backup capacitance bank has been clocked at only 5.21 minutes, should the normal EPS power flow fail. The toroid seals are pressurized with a 72 to 28 percent mixture of gaseous nitrogen and helium, and the mean time between failures (MTBF) of the combined seal and pressurization system is 11,300 hours. Periodic maintenance on the seal system involves recycling and replication of fatigued delcromin.

Door movement is accomplished through three redundant sets of electrohydraulic actuators, powered by stage-3 EPS feeds and a backup capacitance bank rated at 5.45 minutes operational time, thought to be enough time to send at least one hundred crew through the lock to a waiting ship. Manual operation of the lock is possible through a release/recapture linkage system that uncouples the actuators and allows counterbalanced rolling of the doors into place. A backup seal pressurization device is operated by manual pump. All primary airlock systems are accessed through standard interface controls. Additionally, in the eighteen docking port locations, the airlock interiors house the manual backups for the mooring clamps and adaptive docking tunnels. The clamp overrides consist of two backup sets of electrohydraulic cylinders and decoupling linkages to switch activation authority from the twin primary cylinders.



Typical airlock and security gate



Landing bay airlock with runabout docked

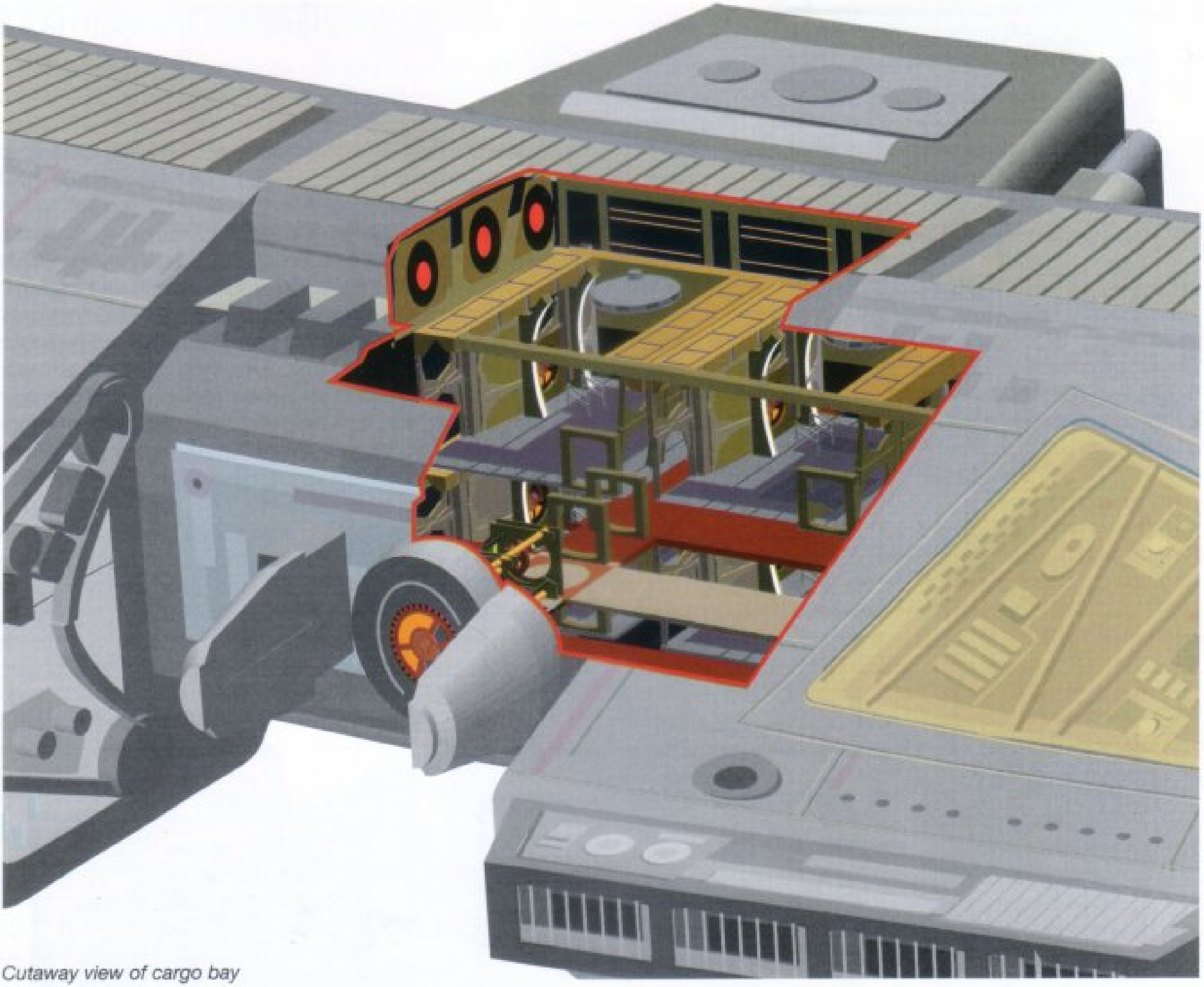
Atmospheric gas equalization for docked spacecraft operations is handled by the airlock systems subprocessor optronics. If the type of arriving spacecraft is known prior to docking, the subprocessor opens a data channel to the vessel and programs a variable gas mixture and pressure equalization schedule. Specialized programs are available in the airlock database for some 560 environment types, most of which involve some variation on oxygen/nitrogen atmospheres with nonreactive trace gases. All breathing gas types categorized as "exotic" require automatic safety reviews by the computer, operations, and station security. In these cases, the airlocks are pressed into service as temporary quarantine facilities.

Subsystem access within the airlock is through all inner surface panels. Power, lighting, temperature, humidity, and pressure maintenance devices are controllable. Paralleling the airlock interior controls, all types of docked-spacecraft transfer conduits are present, regardless of how many connectors a particular vessel is capable of mating with. EPS power, gases, solids, and fluid transfer are standard.

6.5 CARGO PROCESSING AND STORAGE

The flow of goods on and off the station is governed by protocols established by the statutes agreed to by the United Federation of Planets and the Bajoran government, and handled logistically by specialized crews working the 253 large cargo bays located in the Docking Ring, Docking Pylons, and crossover bridges. Smaller bays to which restricted station material is assigned are located in the Mid-Core and Lower Core assemblies.

Since the movement and storage of cargo takes both commercial and military forms, separated processing is in effect. Commercial goods are handled primarily in the Docking Ring by civilian crews from Bajor and a loose affiliation of trading star systems. Seventy-five percent of the physical storage volume is assigned for incoming cargo on a first-come, first-served basis; the other 25 percent has been reserved for established customers moving at least 3,000 m^3 of cargo per twenty-six-hour day. Antigravs, container frames, and security are provided for the equivalent of twenty-five hundred credits per day for storage and security inspections. Cargo size is limited to the size of the largest docking-port transfer tunnel, 3.23 meters in diameter. Removable cargo pods up to 11.21 by 12.35 by 20.13 meters may be transferred through four limited-use locks on the ventral surface of the Docking Ring, at the discretion of the cargo master. The containers transferred through the normal docking ports, through either contigu-



Cutaway view of cargo bay

ous atmosphere tunnels or intermediate vacuum, arrive at the Transited Cargo Inspection station transfer aisle, where all documentation is verified and scans are taken to eliminate any and all possible contraband or hazardous materials that exceed the station's ability to handle safely.

All station consumables, such as breathing gases, foodstuffs, and potable liquids are routed to special holding and distribution areas and kept separate from bulk hardware items (see 11.3). All other raw materials are stored according to type, with automatic proximity-caution protocols in place to prevent unwanted interactions. Like the biofilter functions present in transporter devices, the proximity-caution database is constantly updated with known and predicted hazards. Finished goods are also arranged according to type and are subject to the same proximity cautions.

All cargo containers not equipped with built-in antigravs will be moved with station antigrav lifters according to availability. The three major Docking Ring ports are equipped with large industrial antigravs capable of supporting 9.75 metric tonnes in the local gravitational environment. Cargo massing over 9.75 metric tonnes can be accommodated with a temporary gravity mat power reduction for ease of handling. The normal gravitational level in the Docking Ring is 0.85*g* and can be lowered to nearly 0.15*g*. However, extra load manipulation booms must be utilized for an additional fee of 870 credits per boom per hour.

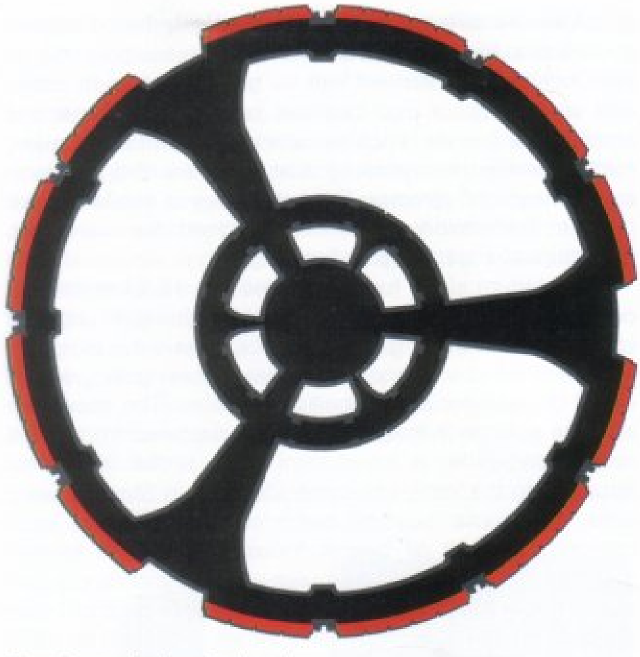
Cargo scheduled for removal from the storage bays within two standard weeks is kept within the Docking Ring. Longer-term storage is provided in the three major crossover bridges in 108 insulated and EM-shielded modules. The station engineering stores and fabrication facilities maintained in the Mid-Core and Lower Core house a total of 3,920.87 m^3 in spares, raw alloys, chemicals, tools, and specialized construction gear. These vital resources are protected by Starfleet and Bajoran security teams. In addition, in the event of combat hostilities or natural disas-

Sample of cargo labels

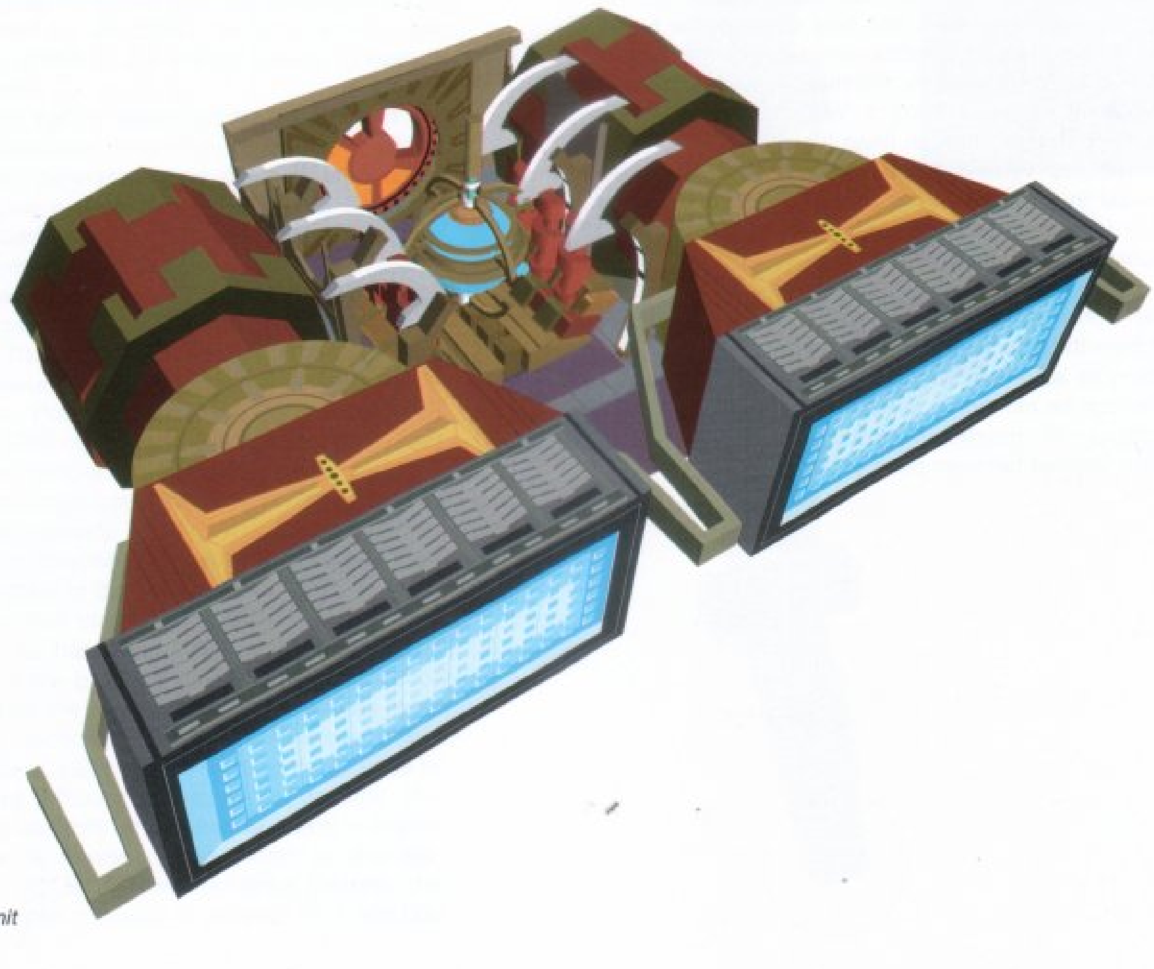
ter, all cargo left aboard Deep Space 9 may be considered available to aid in station survival under the revised 2372/SD49538.51 Sector Trade Contract. Every effort would be made to restore, replace, and return any material commandeered after the end of the crisis.

6.6 ATTITUDE AND TRANSLATIONAL CONTROL

The primary system once used to keep the space station in a stable synchronous orbit around Bajor, and now in planar stabilization in the Denorios Belt, is the RCS. The original Cardassian term was *axial vector stabilization system*; the more familiar Starfleet term has been adopted in all technical documentation. In the synchronous-orbit mode, the RCS thrusters were used to maintain station orientation with respect to the Bajoran polar axis. The Y-axis through the station core was kept in parallel with the pole for maximum thermal equilibrium, planetary magnetic-field alignment, and radiation exposure symmetry. In its revised role, the RCS thrusters have successfully moved the station some two hundred million kilometers to the Denorios Belt around the Bajor sun and now maintain the station's central axis perpendicular to the plane of the belt. A significant orbital-plane change was effected in the process of the move, since Bajor's equatorial plane is tilted some thirty-eight degrees to that of the belt. The long translational maneuver out to the belt was accomplished with the help of the station's defensive shield generators, which temporarily lowered Deep Space 9's inertial mass and allowed six of the thruster modules to push the station out of orbit.



Reaction control system locator



RCS unit

A single circumferential series of fifty-four Protean-cycle fusion thrusters is built into the extreme periphery of the Docking Ring, divided into six groups of four thrusters and six groups of five thrusters between the large and small docking ports. Each thruster consists of a fuel manifold assembly, hexagonal ignition chamber and accelerator, and exhaust director. The technology is similar to that used in Federation equipment designed for low-thrust, low-residual-impact applications.

Deuterium slush fuel, maintained at 13.8 kelvins and pumped through anti-backflow transfer piping, is supplied to the manifold assembly and control pulse-valve blocks. It is then divided into six convergent micronozzles ranged about the equator of the ignition chamber. The micronozzles are notable in having been manufactured from 9-5-3 azurine-cortenide, a transparent alloy similar in atomic structure to the verterium-cortenide used in Starfleet warp coils. An annular positron beam emitter surrounds each micronozzle, with all beams focusing upon the ignition chamber central axis. The pulse-valves synchronize and create the required firing cycle 0.05 seconds prior to beam energizing. The pulse duration varies from 12 to 1674 pulses per second, equivalent to a measurable delta-*v* between 0.03 meters per second and 1.21 meters per second. Adaptive subroutines in the thruster control processors work to smooth out adverse harmonic amplification in the chamber-firing sequence. The final stage for the fusion reaction is the exhaust director, where each thruster is divided into six independently throttleable vents for maximum flexibility in vector control. Vents can be infinitely ramped from straight-through firing (unidirectional propulsive) to diffused venting (omnidirectional nonpropulsive), most useful in rapid control of structural, rotational, and translational oscillations.

Excess power generated by the fusion process is cycled back into the RCS system for pump, positron beam, and other system needs. Initial starting energies are tapped from the onboard station plasma conduit network. In addition to automatic sensor network polling, thruster operation can be monitored directly by visual and tricorder examinations of magneto-hydrodynamic (MHD) shunt chambers, located between pairs of thrusters.

6.7 TRACTOR BEAMS

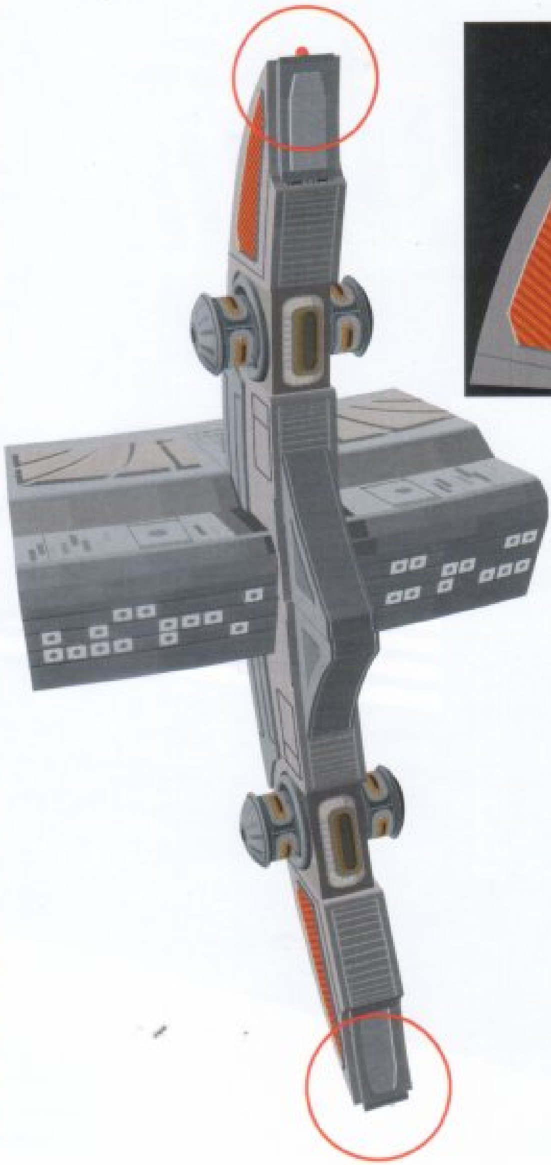
In their standard role under benign conditions, the Deep Space 9 tractor beam emitters are called upon to maneuver large masses in the space surrounding the station, including ships and cargo. The standard role must give way to one of defensive operation in crisis situations, when tractor beams are required to draw in, hold, or repulse threat vessels or other hardware. Six primary emitters are located within the defensive weapon sail towers, and six lower-power secondaries are embedded within the hull skins of the Docking Pylons.

The primary tractor beam devices installed on the station are partial rebuilds of Terok Nor hardware. They operate on conventional subspace/graviton principles involving the manipulation of force-beam interference patterns. Energies and subspace pinch values imparted to the released gravitons determine the specific vector along which the tractored object will be moved. The two projected fields producing the interference pattern will be of opposite pinch types, and the relative energies in each type can cause a higher motive force to be applied in one direction than in the other. A balanced energy spread will cause the object to be held immobile, and any propulsive force produced by an object, such as a ship, will require a shift in the energy spread to keep it immobile.

The tractor beam system consists of six variable-phase thirty-four–megawatt polarized graviton generators, two per emitter section. Each pair runs in reflected graviton mode as described. A single subspace field amplifier has been cut into the flow path for each of the three sections, deemed necessary by Starfleet for accurate control of the interference patterns. The end emitter blocks are composed of mononkium-himenite and measure 6.1 by 21.3 meters. Power is provided by the second-stage EPS conduits in the weapon sails, and can be temporarily stored in the event of a plasma disruption within a capacitance bank in the sail midbody.

The structural connections from the tractor emitters to the station are primarily made to the sail hull plating near the Starfleet phaser strips. As has been noted, the plating bears most of the potential load. It has been calculated that the 10.12 million metric tonnes mass of the station is such that few vessels below the size of a *Galor*-class warship could hope to pull free without major structural damage. The motive capacity of the tractor beam in metric tonnes is inversely proportional to the distance. At twenty-five hundred meters, the emitter can manage a payload of 2,300,000 metric tonnes; one metric tonne can be affected at a range of fifteen thousand kilometers. Both examples involve a direct constant delta-*v* of four meters per second. The emitters themselves are isolated from the plating by kettenite monomer gaskets to avoid unwanted interference from the phasers or torpedo launchers. Interference from the defensive shield envelope presents its own unique problems, reducing the effectiveness of both when running simultaneously and requiring a complex set of sequencing algorithms to prevent field fratricide.

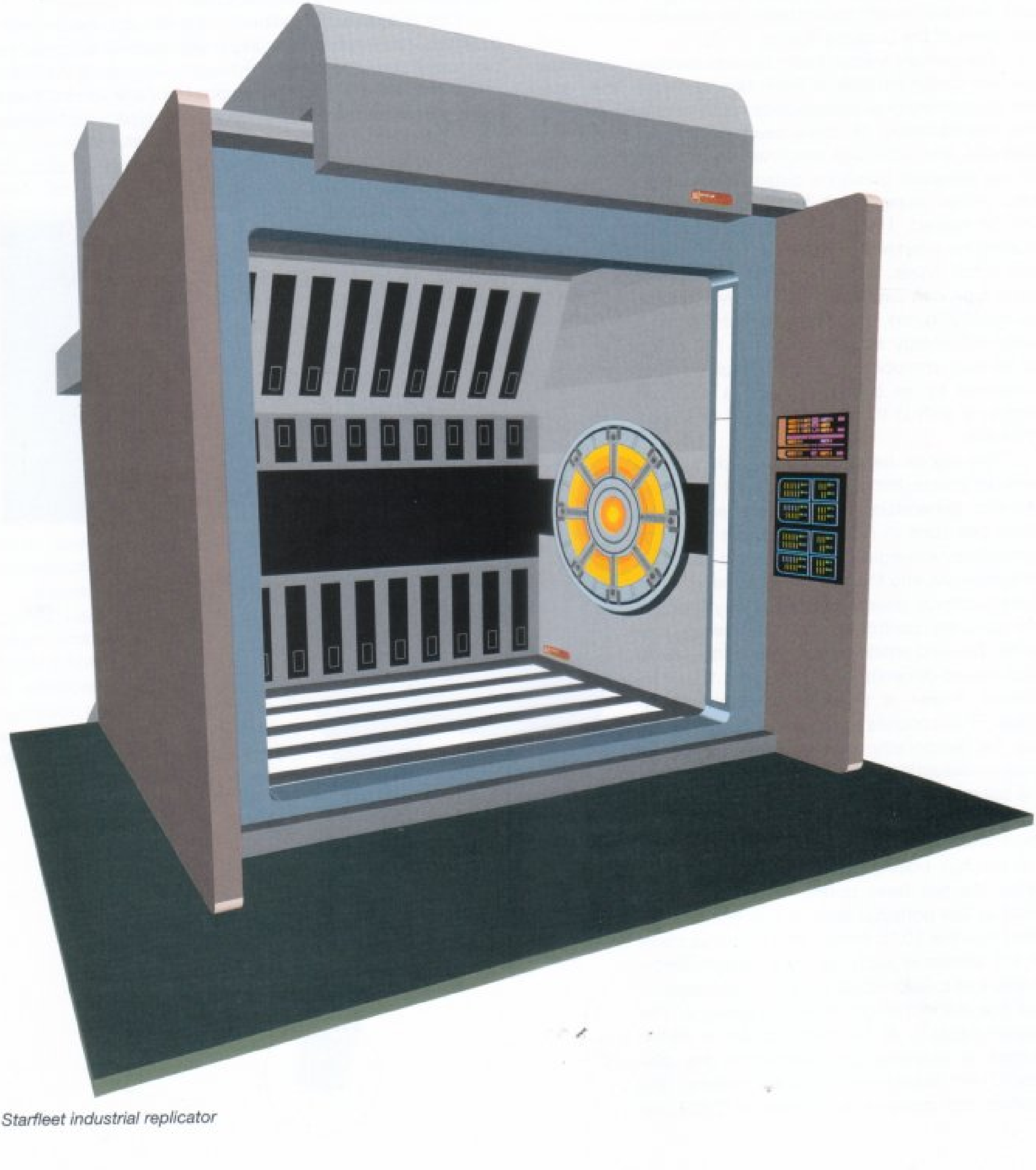
The secondary emitters appear to have been designed to simply guide incoming vessels to both the Docking Ring and Docking Pylons, and none of the 1.03-megawatt devices seem to be powerful enough by themselves to maneuver even a runabout-type ship without some field drift.



6.8 REPLICATOR SYSTEMS

The systems required to reproduce various amounts and combinations of matter aboard Deep Space 9 are the industrial and food replicators. The industrial systems are of Starfleet origin and are optimized for most inorganic substances, though organic analogs are used in some optronic devices, insulating materials, and clothing, to name a few. The food replicators are almost exclusively Cardassian and are located in most residential quarters and specialized commercial areas. These crew support replicators are discussed in section 12.5.

Industrial replicators are constructed in a variety of sizes, depending on the specific application. The largest Starfleet unit to date is undergoing systems checkouts at the Utopia Planitia Fleet Yards on Mars and has an emitter



Starfleet industrial replicator

delivery pad measuring 50.3 meters by 72.6 meters. The device is being considered to produce large starship framing assemblies. Smaller, transportable units have been installed on starbases and fleet vessels and are used mainly to produce original and replacement hardware for space and planetary operations.

Two industrial replicators have been handed over to the Bajoran government to aid in the planet's reconstruction following the Cardassian retreat. The units were supplied with an extensive built-in database of materials and structures and enough programmable isolinear memory for all possible near-term Bajoran requirements. Four additional industrial replicators were given to the Cardassian Union as a goodwill gesture, in 2372.

Each unit measures 2.3 by 4.7 by 6.1 meters and masses 12.4 metric tonnes. The complete assembly includes two matter-input conditioners, a molecular-matrix algorithm processor, matter-assembly field manipulator, matrix-beam emitter, central memory-storage bank, and power supply. The matter conditioners accept material in all states, and sensors within these sections detect and analyze the elements and compounds being received. A comparison between the input and output matter as to atomic weights and numbers will determine the power requirements for the particular transformations requested. Substances closely related on the periodic scale (Standard, Extended 1, and Extended 2) will require less raw power than those which are not. Some materials included in the Extended 3 and 4 scales, including latinum ditensenide, will not replicate due to their high false-vacuum energy potential. No replication technology either existing or predicted is able to detect the exact proportion of matter in latinum existing in present four-space.

The matrix algorithm processor prepares the mathematical template of quantum states of the atoms in the item to be replicated and reads this template off in real-time to the matter assembly field manipulator. If the template exists in the database, it is read from isolinear storage. The field manipulator uses the allocated power determined by the processor to alternately break and recombine the molecular and atomic bonds of the input matter into the final replicated forms. The quantum resolution is variable; most inorganic objects require a less precise reconstruction than that required for edible foodstuffs. Structural density is also variable and is useful in research or test replications.

The field manipulator works in concert with the beam emitter to perform the final molecular assembly on the delivery pad. Once the basic form of the object is locked, the transformed elements and compounds are added until the correct density is reached. The early stages of the assembly are conducted in a localized subspace domain, which is ramped down to a final emergence into normal four-space.

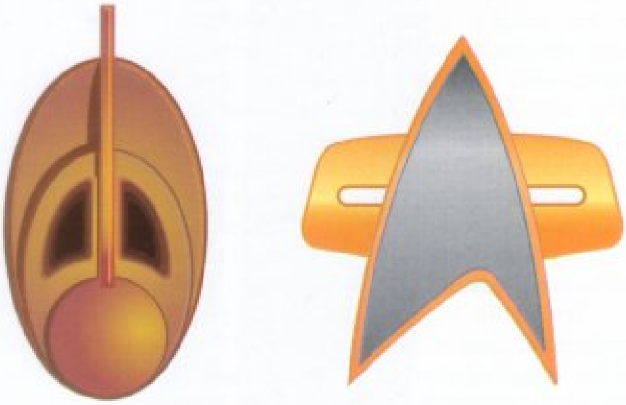
The units supplied to the Bajorans consume an average of 3.41 kilograms of deuterium per minute operating time. The system is primarily self-maintained by onboard diagnostic and test gear. Major hardware alignments and replacements can be accomplished by Bajoran engineers, with yearly checks by Starfleet personnel. The arrival of the replicators has not significantly altered the Bajoran industrial base and has not produced a cascade of replicated products, including the often-assumed prospect for additional replicators. The total energy budget required for operation is high enough to offset the continuous use of the mechanisms and, in most cases, traditional fabrication methods prove more economically viable.

7.0 COMMUNICATIONS

Communications in the Deep Space 9 environment involve many of the same types of systems and links as those required for mobile platforms such as starships. For the most part, the station can be considered in the same category as a planetside outpost, in which the effects of high warp velocities and numbers of embedded hull antennae are not important considerations. Intrastation voice and data traffic, station-to-ship, ship-to-ship, and distant subspace packet transmissions com are all vital to the daily operation of the station, if not its very survival in the current threat climate. It must be noted that while all discrete com hardware paths have been mapped and hardened against security penetrations, cautions must still be taken with all operations-critical information (see 7.6).

7.1 INTRASTATION COMMUNICATIONS

Communications routed within Deep Space 9 are divided into two primary systems, one for commercial traffic and one for Starfleet operations. The commercial system is handled by a stand-alone isolinear processor/switcher and cannot be cross-linked to the Starfleet system unless the latter initiates secured channels. The Starfleet system can, however, monitor and regulate the commercial net and shut it down should RF and subspace silence be necessary. All Starfleet com is handled by the central computer cores through the CPG. Both systems have received periodic upgrades to ensure that signals are rapidly and reliably handled.

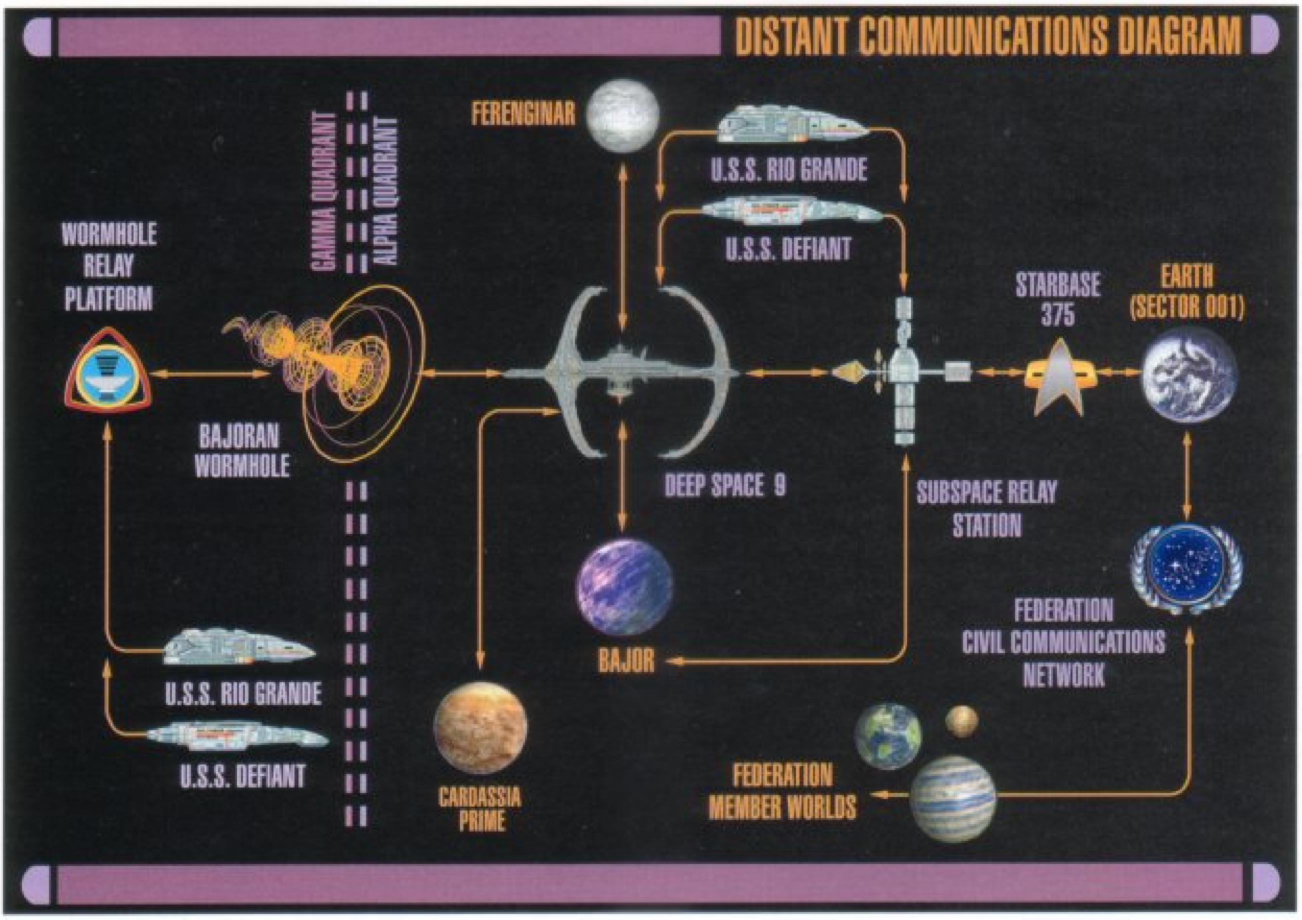


Bajoran and Starfleet communicators

SYSTEM CONFIGURATION

The hardware configuration for dedicated intrastation communications consists of 4,750 dedicated ODN data lines and terminal nodes distributed throughout the station. These are 43 percent Cardassian from Terok Nor, and 57 percent are Starfleet enhancements, with minor data translations from one type of extruded ODN fiber to the other. The commercial net uses the Cardassian nodes almost exclusively. A set of RF lines do provide a backup, but these are limited to 395 slower data-signal paths and audio pickups in ops, weapon sail towers, Habitat Ring, fusion power plant, and ore processing areas. No second layer of backup superconducting ribbons have yet been adapted for use on the station.

The Cardassian terminal node device left in place is a hexagonal wafer measuring 6.23 centimeters across the vertices and 1.31 centimeters thick. The casing is multilayered copper boroferrenite with a combined voice and data circuit of copper-uridinide-astatinate. The combined section contains familiar architecture for atmospheric transmissions, with some differences. The analog-to-digital voice pickup/speaker wafer, optical fiber modulation input/output subcircuit, and digital-to-analog return processor are little different from Starfleet technology. A single subspace transceiver and continuous-stage amplifier are significant in that the first Cardassians rely on one robust STA-type device for subspace data streams and second, boost the signal where necessary along the entire circuit, requiring lower levels of applied power for the com network than comparable Starfleet gear. Handheld and transportable devices not hardwired to the original fiber network would send and receive data via the terminal nodes. Power for the node circuitry is transmitted as an optical flash pulse at 78.5-minute intervals and stored in a ring-field capacitance film.



The Starfleet terminal node modification is an upgraded disk device reduced to 7.53 centimeters in diameter and 1.2 centimeters thick. The casing remains molded polykeiyurium, and the internal arrangement continues with separate voice and data section architecture. The data relay section now contains three nested circuits within a standard STA for increased capacity and transmission speed.

OPERATION

Voice operations employ Starfleet's standard verbal com protocols, consisting of variations on the sequence of the calling crew member's name and the recipient's name or a departmental location. The AI algorithms in the CPG route the call either to the exact location desired, normally based on combadge coordinates, or perform a general station-wide sounding. Station-wide audio alert coverage for individuals is limited to Starfleet and Bajoran officers and crews unless ordered for other visitors or residents. Special audio alerts for the commercial trade, diplomatic personnel, and science mission personnel are activated as necessary prior to all preparations for military action, followed by burst-mode data transmissions to all docked vessels with information such as evacuation routes within the station and along emergency spacelanes, and subspace frequencies for maintaining contact with Starfleet or quadrant governments during the crisis periods.

Data transmissions sent along the commercial net are normally encrypted to protect the proprietary information of trading entities, and normally no data is stored during terminal-to-terminal movements. However, as discussed previously, computer core storage space is available to trading entities (see 4.4). Starfleet data transmitted between combadges, terminal nodes, handheld devices, or desktop units are encrypted through each user device and routed through the CPG. All onboard operational transmissions are stored for a minimum of six months, compressed and downloaded to isolinear blocks, and transferred to Starfleet Command, either physically or by subspace radio.

System outages are dealt with by either the commercial net processors or Starfleet CPG to maintain prioritized channels for continued station operation. Verbal or automatic options can reconfigure both systems. The commercial net is normally monitored by a Deep Space 9 Trade Association cargo or dock master, in cooperation with the Starfleet and Bajoran authorities. The Starfleet net can be commanded by the ranking ops officers down to either Starfleet lieutenant or Bajoran lieutenant (j.g.).

7.2 PERSONAL COMMUNICATORS

Miniaturized subspace and RF communications devices are used by almost every culture operating on or near Deep Space 9. The principal Alpha Quadrant races or authorities who apply personal communicator badges to their onboard clothing and EVA garments are Starfleet crew, Bajorans, Klingons, and Romulans. Other species have adopted core devices similar to the STA for use in other hardware for voice and data transmissions.

The current Starfleet-issued communicator retains its primary role in maintaining voice contact between crew members aboard ship and during away missions and to provide a lock-on contact for transporter operations. Voice contact with the Deep Space 9 computers and that of other spacecraft, such as the *Starship Defiant* or *Runabout Rio Grande*, is also designed into the system. The casing is micromilled duranium with new proportions of plasma-bonded gold and silver alloys and reflects the latest Starfleet emblem.

The STA used in the combadge, padd, and tricorder has been upgraded in range, voice-encoding circuitry, and power-usage efficiency. Voice inputs detected by the monofilm pickup are improved in audio quality due to added vibrational conduits molded into the casing. The voice processor has additional hardwired AI algorithms in place for improved phoneme separation and passes the phoneme impulses through a set of user-definable filters to control word and phrase validation. These AI circuits also work directly with the integral universal translator section, a limited version of the normal large handheld device. The combadge universal translator (UT) circuit is equipped with the basic conversational libraries of 253 galactic civilizations plus the linguistic analysis routines for basic translations.

Combadge subspace radio range has been increased to 1200 kilometers in line-of-sight mode, and to 780 kilometers through geologic materials with a mean density of 7.54 grams per cubic centimeter. Command coupling with more powerful communication devices, such as emergency subspace beacons, allow combadges to make contact with each other over distances approaching 60,000 kilometers. In relay mode, beacons can allow the STA to transmit and receive voice and data over distances of up to 3.72 light-years.

Transporter lock using the combadge is always affected by interfering fields and particles, though the STA circuitry continuously attempts to bounce a clean transponder pulse back to the polling unit. Adaptive waveform algorithms in the STA automatically filter the subspace signal, even in fluctuating field conditions. If the threshold for a safe transport has been tripped, the combadge chirps a negative tone.

Power is supplied by a densified sarium-krellide cell with a continuous operating time of three weeks. Recharging is accomplished through a standard induction loop. Audible crystal oscillation indicates when the unit is close to depletion.

BAJORAN COMMUNICATOR

The Bajoran combadge mirrors the insignia of the Bajoran planetary defense forces and is worn on both military uniforms and civilian clothing. The forced-matrix circuit technology is hybridized between Bajoran and Starfleet, the latter mainly providing connection to and control of a more compact version of the sarium-krellide power cell than is used in the Starfleet communicator. The Bajoran unit is normally configured to Starfleet com frequencies and operates on the same voice and data transmission protocols.

The casing is fabricated from a 2.43-millimeter shell of pressure-molded hafnium-beritite, a variant of the alloy used in Bajoran jewelry. The alloy itself is colorless, but exhibits a reddish hue from the molding process; a stabilized microfracture layer changes the wavelength of the reflected light. The Bajoran type of STA incorporates the necessary audio pickup/speaker, voice and data processor circuitry, and universal translator component. The UT is slightly more limited than the Starfleet version, with only 198 available linguistic libraries, but the real-time translator AI is 155 percent faster. The densified sarium-krellide power cell can run the unit continuously for 2.3 weeks and is induction-loop rechargeable.

KLINGON COMMUNICATOR

The current standard-issue communicator badge of the Klingon Defense Forces is provided to all KDF crews, including the troops assigned to Deep Space 9 beginning in 2374. The casing is polyduranium and layered in tempered *baakonite* and is emblazoned with the insignia of the particular Klingon military division to which it is issued. The subspace transceiver is similar to those discussed, with significant control of distant transporter systems. The unit-to-unit range is rated at 960 kilometers. The UT library is even more limited than the Bajoran unit, but the real-time translator is comparable in speed. Power is provided by a miniature sintered therminium cell, which produces current from controlled radioisotope decay. A new cell can run continuously for 4.65 weeks.

ROMULAN COMMUNICATOR

The Romulan communicator is most typically incorporated into the military uniform in the form of the bird-of-prey symbol. This communicator does not normally possess a dermal sensor. As such, once activated, the communicator remains on power until cell exhaustion. It is assumed, though not confirmed by either the Romulans or Starfleet Intelligence, that the units are rotated during a mission conducted from a warbird, scout, or other vessel. The casing is carved from a single metallic crystal of *s'ephelnium*-calmecite, an alloy known for its hardness and resistance to brittle fracture. The subspace transceiver specifications are not included in any declassified database, and it is not generally known if any units have been acquired for analysis.

FERENGI TRANSLATOR IMPLANT

The Ferengi have produced a small implantable universal translator which can aid in negotiations, although it does not have any subspace or RF functions. The unit measures 2.3 centimeters in diameter by 2.54 centimeters high and runs continuously on an integral sarium-krellide cell for two weeks. Muscle impulses in the lobe area control the activation of the implant. Some well-known problems exist, including EM interference, data dropouts, and intermittent operation caused by uncontrolled nerve firings due to illness or overstimulation. The unit maintains an updatable file of 756 linguistic libraries and as many currency conversion tables.

OTHER COMMUNICATION DEVICES

Most com devices not worn as part of a garment are sized as handheld equipment for 50-percentile humanoids. They vary in range, bandwidth, power consumption, and translator options. Aside from the Ferengi translator, most subdermal implants and smaller STA components are not common for everyday applications and fit more into covert activity gear than routine communicators. Pack-mounted and larger transportable units are also seen, but here, too, are categorized as specialized systems for voice and data.

7.3 STATION-TO-GROUND COMMUNICATIONS

Communications traffic flowing between Deep Space 9 and Bajor is considered station-to-ground. All other traffic between the station and mobile entities is considered under ship-to-ship, and transmissions to distant planetside or orbital bases is part of the deep subspace network (see 7.4, 7.5). All forms are handled by subspace and more limited RF systems of both Cardassian and Starfleet design. The principal differences between the two systems are range and speed.

Subspace remains the primary high-speed carrier environment and RF continues as the short-range backup transmission mode, followed by modulated versions of standard phaser, X-ray laser, and infrared (IR) emitters. Most subspace radio propagates at warp 9.9997, and all RF energy is limited to light-speed velocity (c). New methodologies are being explored for increasing the warp-equivalent velocities of modulated subspace energy waves. These include the adaptation of helical verteron membranes akin to that found at the wormhole interface, essentially creating a microwormhole jacketed around the com stream, as well as a variant on the soliton wave phenomenon. Soliton-based communications may take advantage of the self-sustaining nature of the wave energy fields, possibly extending the range of intelligible messages beyond the 22.65 light-year limit for standard subspace.

INSTALLED HARDWARE

The total space station external communications hardware consists of twenty-one RF and twenty-four subspace transceiver assemblies as original Cardassian installs, plus Starfleet upgrades incorporating twelve RF and six subspace transceivers. Power for all transceivers is supplied through stage-3 EPS conduits, with multiple backups provided by stage-3 conduits normally allocated for turbolift use.

Each Cardassian RF unit is a flat, elongated double trapezoid measuring 0.45 by 1.27 meters by 0.31 meters thick. Each contains a soft-partitioned voice and data subprocessor section, three amplification-type frequency-spread analyzers, two variable signal compression isolinear banks, and three cross-linked hardware-level encryption subprocessors. Prior to the reinitialization of the RF nodes in 2369, all of the encryption devices were severed from the main signal paths, deep purged, and returned to service with new cross-links to the Starfleet computer CPG (see 7.6). Though all unmodified RF equipment is limited to light-speed transmissions, Starfleet and Bajoran com specialists have recommended that the units be kept operational. The key point involves subspace instabilities that can occur in the station environment due to wormhole energy fluctuations, active jamming by threat forces, or other battle-related com problems. The useful transmission distance has been extended from 778 million kilometers to

1.6 billion kilometers at moderate power, and up to 3.4 billion kilometers at high power. This greater distance represents some three hours one-way light time, but is deemed acceptable for distress calls, transfer of sensitive data, or other crisis traffic.

The typical Cardassian subspace transceiver is a vertical trumpet-shaped solid related in X-Y symmetry to the computer core housings, and directly connected to conductive areas of the exterior hull plating by integral waveguides. The device measures 0.98 meters in diameter and 2.41 meters in height. It contains voice and data processors, EPS power conditioners, and two separate subspace field generator/modulators for omnidirectional and focused antenna arrays. All noise elimination in audio and visual data streams is done by the com system ODN input subprocessors prior to passage of the signal through the transceiver. The effective radiated power at the antenna plate is 15.3 megawatts, with a total load across all twenty-four nodes of 367.2 megawatts, though the load was not normally driven at this level except in extreme crisis situations. Most high-power transmissions usually involved only three transceivers aimed back toward Cardassia Prime. A suite of subspace EM sensors is incorporated into each antenna to aid in commanding optimum coverage.

Attached to the same CPG signal-switching blocks as the Cardassian transceivers are the Starfleet RF and subspace upgrades. Both types of units are salvaged components from normal starship hardware rotations, still within their MTBF periods. All hardware refurbishments have been certified as spaceworthy for nonwarp installations, since they will not fatigue as rapidly in the Bajor orbital environment. The RF units are small standard hexagonal solids, 1.1 meters across the faces and 0.23 meter in thickness. In the Deep Space 9 installation, most of the RF units are mounted within station access tunnels, close to the hull surfaces, with doubly redundant waveguides leading to the exterior antennae. Three are installed in the ops antenna farm.

The Starfleet subspace transceivers are all taken from *Soyuz*-class starships nearing the end of the vessels' primary operational lifetimes. Each triply redundant device is housed within an octagonal solid measuring 1.33 meters across the faces and 0.56 meters in thickness. Since the most recent swapout of subspace equipment from the *Soyuz* class was performed only eight years earlier, the predicted nonwarp MTBF will carry them another twenty-five years with periodic maintenance. The internal components available to the engineering staff include familiar voice and data processors, EPS power conditioners, subspace field coils, and optronically steerable focusing arrays. One unit is mounted with the Lower Core, two are mounted in the ops antennae farm, and the other three are installed at 120-degree intervals along the Docking Ring, equidistant between the pylons. As with the RF units, the subspace devices are protected within the Docking Ring hull and connected to the surface plates via jacketed waveguides.

The subspace and RF antennae farm present on the roof of the ops module dates back to the Terok Nor construction and remains in serviceable condition. The two RF antennae are elongated tetrahedrons of niobium-copper-disellenide over a duranium substrate. The subspace antennae involve two related types. The first is a cylindrical omnidirectional emitter fabricated from niobium-yttrium-toranite and mounted atop a duranium-kelindide composite mast. The second is a large, bladed high-gain steerable emitter/receiver, a build-up of seven layers of copper-borokine field elements encased in a toranium-graphite housing. The 32,673 individual energized elements are steerable by computer command, allowing for multiple transmissions in different directions. A fifth mast contains an emergency subspace beacon and distress transmission receiver set.

APPLICATIONS

The original station-to-ground communications linked Terok Nor with the Cardassian operations on the surface of Bajor. Once the station had been relocated, all low-power com devices on the planet could no longer reach Deep Space 9 and, at the very least, dedicated high-power RF transceivers were required by the Bajoran provisional government to maintain contact with the station. Subspace relays were eventually set up on Bajor, allowing networked voice and data traffic from combadges, padds, tricorders, and visiting spacecraft to pass to the station.

As with most communications and other optronic systems on Deep Space 9, frequency and hardware usage is split between the Starfleet-Bajoran administration and the commercial sector. Power allocations and transceiver amortization related to transmissions to Bajor are calculated and charged to residential and commercial hailing accounts. Commercial customers may use their own encryption schemes, restricted only by a maximum of 1.25×10^9 digits in either public or private encryption keys. Emergency com from either Bajor or the station will be routed by the computer without delay to the appropriate recipients, given the proper com access codes. All Starfleet military communications with Bajor are conducted according to strict security protocols and filtered through the CPG (see 7.6). All routine traffic between Starfleet personnel and Bajor is also channeled through the CPG and logged for compression and transfer to Starfleet Headquarters.

Any nonstandard com signals or modulated EM detected between Bajor and Deep Space 9 is recorded and analyzed for possible distress hails or other significance. At the time of custodial handover, all signal and linguistic translation routines between Starfleet and Bajoran equipment had been established, with algorithm patches made to the com protocols as needed. Most unknown signals encountered in recent years have originated with newcomer cultures, refugees, and threat forces, including those from the mirror universe incursions. Those EM signatures have been catalogued and analyzed, and added to the overall com database.

7.4 SHIP-TO-SHIP COMMUNICATIONS

Distant communications among most starships, starbases, and planetary systems continue to be made through ultrahigh-power subspace transceivers of various origins and capabilities. Voice and data transmissions between Deep Space 9 and starships are entered in the overall category of ship-to-ship com, since the station is considered in some instances to be a mobile platform.

The subspace radio hardware installed on the station is more than adequate to maintain contact with distant ships, since the Cardassian units communicated with their home world, and the Starfleet units came from operational starships. Ships attached to Deep Space 9, including the *U.S.S. Defiant*, *Runabouts Rio Grande* and *Rubicon*, and Klingon Defense Forces ships such as the *I.K.S. Rotaran*, maintain contact with one another and the station over their primary subspace systems, with lower-power RF transceivers as backups. All communications data is currently transferred at a maximum rate of 53.45 kiloquads per second, owing to compression algorithms and higher frequency subspace energy. The higher frequency equates to a deeper "layer" of subspace along which the transmission waves travel before surfacing to become slower, degraded EM radiation.

As with station-to-ground com, ship-to-ship traffic involves the Starfleet-Bajoran administration as well as commercial voice and data. During benign situations, both types typically begin with the standard hailing packet for computer routing and universal translator initiation. Starfleet communications between ships and stations are handled by secure channels and flight-logging protocols. Commercial traffic may or may not require similar measures.

Antennae farm locator

7.5 SUBSPACE COMMUNICATIONS NETWORK

Despite Starfleet's best efforts to expand the subspace communications envelope, no single technology experiment program currently under way has demonstrated the capability to drive an energetic signal beyond the "97/22" limit, the equivalent Warp Factor 9.9997 carrier speed and 22.65 light-year distance traveled by the signal prior to unsalvagable data loss. The need for uncrewed subspace relay stations remains.

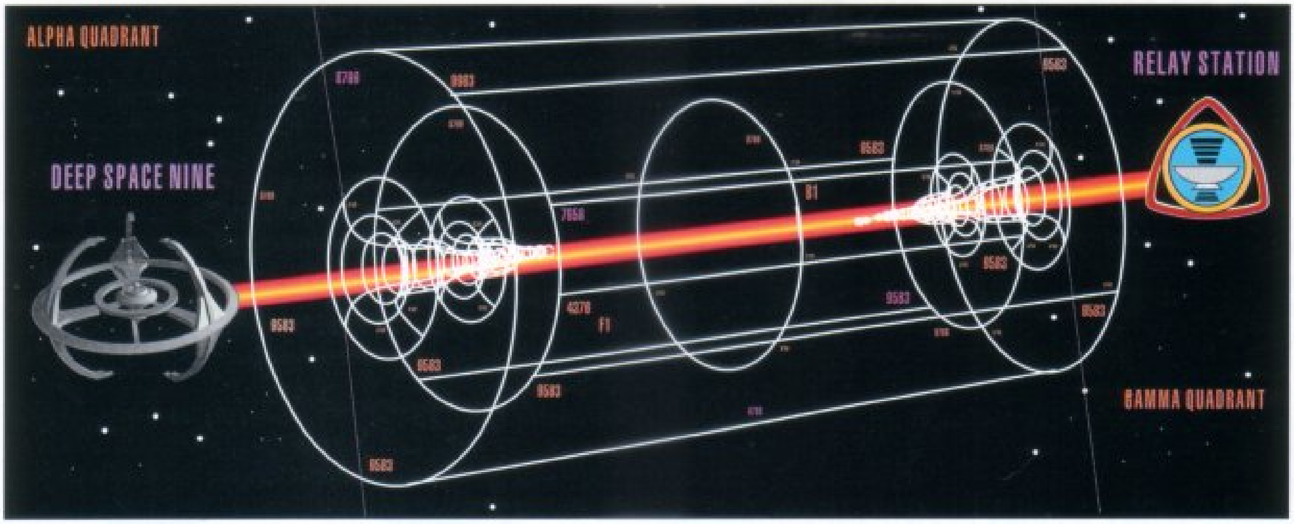
Ongoing dangers exist to the current relay system, however. Starfleet had seen an increase of 250 percent in the deployment rate, from 500 new beacons per year to 1,250 beginning in 2370. The rise in the deployment rate was initially due to normal expanded subspace coverage, but within two years the primary cause became the replacement of units destroyed by hostile actions in the Alpha Quadrant. The subspace communications network was particularly vulnerable, since the Cardassians and later the Jem'Hadar knew from basic subspace physics that there had to be another relay within 22.65 light-years of any unit they encountered. All vital com links between Starfleet assets could be severed. To prevent Cardassian forces from using the relays that they had established during the occupation, Starfleet embarked on its own campaign to make certain that Cardassian devices within thirty light-years of Bajor, primarily in the direction of Sol Sector, were found and either destroyed or captured.

Starfleet realized that a vast multiplication of relay numbers or decoys could confuse and bog down a threat effort to cut Deep Space 9's ties to Sol Sector. However, a pullback of most surviving booster beacons and crew-tended relay stations was deemed strategically more practical. In 2371, 80 percent of the units were retrieved for ready storage within Sector 001, and another 10 percent were deliberately destroyed to prevent them from falling into threat force hands. The remaining 10 percent were pulled into random string formations, away from supply convoy lanes, and maintained by well-armed Starfleet defensive forces. Access to the network in contested areas is tightly controlled (see 7.6). Other strings of subspace relays, established by resident cultures aboard the station or by their agents, exist throughout the Bajor Sector and can be accessed by their controlling organizations. In some sectors, coverage is spotty, and hails must often be circuitously routed to achieve loop closure to distant star systems, particularly those near Klingon and Romulan territories.

WORMHOLE RELAY SYSTEM

In 2371 a boosted subspace relay platform was established at the Idran terminus of the wormhole. This combined Bajoran, Cardassian, and Federation project was based on the spaceframe of a standard stellar observatory and outfitted with specialized high-energy transceivers and power systems. A suite of verteron and neutrino sensors and field-generation devices helped enable the relay station to send and receive data streams through the wormhole. The outbreak of Dominion hostilities brought about the destruction of the relay and the end of hardware-based communications between both sides of the wormhole. In certain circumstances, silithium infusions into the wormhole opening can still afford temporary contact through the tunneling verteron core of the wormhole by creating a subspace filament.

Antennae farm



7.6 SECURITY CONSIDERATIONS

All communication devices and organizational systems related to Deep Space 9, especially those dedicated to Starfleet operations, must be maintained under strict security protocols. The smallest combadge can become a danger to Federation policy and the continued survival of the Bajor Sector. The Deep Space 9 internal communications systems are configured for secure operations by the use of rotating access codes for combadges, padds, tricorders, consoles, or other datastream devices. As previously discussed, the Starfleet and commercial systems codes are separate and can be independently set. All hardware tied into the Starfleet side can be sent code updates remotely or through their respective induction charging bases. Other commercial com gear may be restricted using similar methods, depending on the specific trade agreements and hardware leases involved.

Starfleet and Bajoran communications off-station are secured by way of a series of deeper-level encryption codes and nonradiative hardware protection devices. These codes are routinely, though randomly, changed to confound and confuse threat forces hoping to glean something from the subspace traffic. Distant threat antenna arrays have monitored com energy and starship movements, but for the most part, highly encrypted data has proven extremely difficult to decode. Starfleet private-private encryption keys typically present 2.38×10^{12} digit numerical operators for all FTL and sublight speed decryptions, with interlaced changes in the exact numerical arguments to be performed folded into the sequence. Starfleet Command issues all new encryption sequences in the form of subspace transmissions or isolinear stacks carried by courier. In the case of the transmitted codes, the new sequences are automatically encrypted by the previous set of codes. The isolinear stacks are protected from usefulness by theft by splitting the shipments into six or more parts. More often than not, a complete set of codes will be shipped partly as subspace transmissions and partly as physical stacks. Bio-neural gel packs are currently undergoing experimental trials in memory reliability for nonfuzzy logic retention of code data.

It has long been understood that even the best security can be defeated by a determined force. Computer analysis of com system usage, code type usage, and access frequency can be used to track suspicious voice and data activity in and around Deep Space 9. Following any penetration of the communications and computer system, all user files are scanned, and the system firewalls are tested and reinforced if necessary with additional layers of encryption. All current codes are replaced with either the next set of codes or a temporary backup code series generated by the Starfleet CPG.

Personnel may be randomly selected for com device purges and reconfiguration. This applies to both Starfleet and Bajoran officers and technical staff and resident and commercial vendors. Internal scans for intelligence-gathering devices and optronic fiber taps occur on a random basis. Scans for numerous other threat devices and sabotage vectors are handled in similar fashion (see 12.3). External scans of station structures and docked vessels are also conducted on a random schedules. For both environments, all found devices are neutralized and traced, if possible, back to their sources by security personnel.

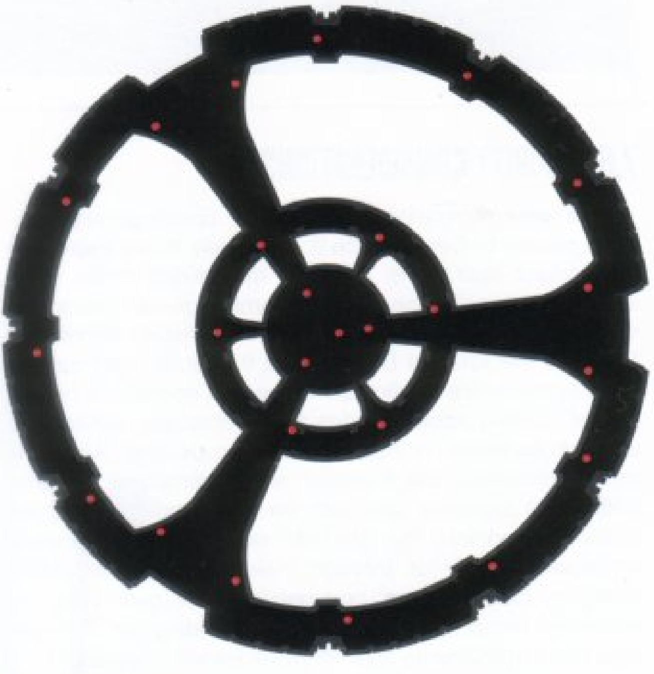
8.0 TRANSPORTER SYSTEMS

8.1 TRANSPORTER SYSTEMS INTRODUCTION

The primary subspace-type transporter mechanism installed aboard Deep Space 9 is the Cardassian system left in place in 2369. As with other transporter technology from the known Alpha and Beta Quadrant races, the range of the subspace matter transmission is limited to little better than forty thousand kilometers. Various experimental programs have been conducted to increase the range and add to the pattern-buffer sustain time, and many theoretical gains have begun the slow process of transitioning into practical benefits.

Transport for all Deep Space 9 staff and residents may be accomplished through twenty-five personnel and cargo transporters distributed throughout the station. Ten transporter locations clustered in ops, central core, and the Habitat Ring are for personnel only; the other fifteen units are contained within the Docking Ring and can accommodate personnel and cargo. The ops transporter normally handles three people at a time, though six can be safely transported if the system is able to consider two people as a single mass interval for the purpose of matter-stream breakdown. Three units are located on the Promenade at 120-degree spacing. The Habitat Ring units are divided into three pairs spaced out at 180-degree intervals, with one pair on Level 12, another pair 60 degrees away on Level 13, and the third pair 60 degrees further away on Level 14. The Docking Ring transporters are located either in line with the transfer tunnels or just adjacent to each docking port's primary cargo bay.

Both the personnel and cargo transporters run at a default high quantum resolution for life-forms. Starfleet analysts suggest that the cargo transporters doubled as troop transporters during the occupation, since the station's orbit about Bajor was always well within the range limit. The resolution is switchable, but subject to well-understood mass limitations and commensurate higher power requirements for the higher-resolution settings. Each personnel unit can transport 1894.5 kilograms, and each cargo unit can move a total mass of 1.23 metric tonnes. The cargo operations are now limited to station-to-ship transports, as the primary planetary destination is no longer within range.



Transporter locator

Emergency evacuation was also affected by the station move, so that any transport in a crisis situation would now be handled as station-to-ship. A single Starfleet vessel with a crew compliment of less than five hundred and a minimum of two working transporters can accept the entire Deep Space 9 population of nearly seven thousand within a forty-five–minute period. None of the Cardassian units is equipped to perform dedicated high-volume/high-speed beam-outs, though they can be overdriven to 104 percent scan velocity using specially modified computer control programs. Additional capacity and transfer options exist in the starship-installed transporters, particularly in the *Defiant*, the runabouts, and any Starfleet or allied vessel docked during the required times.

Most performance values are for the Cardassian unit as the active device for subjects located directly on the transport platform. Performance is somewhat degraded if the unit must target the subject off-platform, especially in widely separated areas of the station. The most efficient transports occur between platforms of like design, and even between platforms of dissimilar design, as in a beam-out from the ops platform to one aboard the *Defiant*. Since all transports involving living entities are zero fault-tolerant, degraded system performance is related only to a decreased amount of mass delivered per unit time. Transports employing lower resolution scans of nonbiologics may tolerate nanometer-scale voids and 0.001 percent molecular recombination errors.

8.2 TRANSPORTER SYSTEMS OPERATION

All transport operations are performed with clearance from the Starfleet and Bajoran security staff, for both official personnel movements and commercial cargo transfers. All twenty-five transporter stations are controlled by the Starfleet CPG attached to the Cardassian computer core and can be commanded from the individual stations or from ops. Commercial cargo transmissions are charged according to mass and total EPS energy expended. Since some substances and living entities, such as antideuterium and shape-shifters, respectively, cannot usually be safely transported, alternate methods must be used.

SYSTEM COMPONENTS

The Cardassian transporter system differs from familiar Starfleet hardware in some significant respects, though both achieve the same goal of breaking down matter and transmitting it to a remote site for reintegration. The following key Cardassian components comprise a typical personnel transporter, with comparisons to Starfleet equipment:

•**Transport chamber.** The enclosed volume is bounded by faceted field energy sustainer grids and accessed by three or four short steps. Inboard of the platform handrails, all annular confinement beam (ACB) energy is constrained to the chamber.

•**Operator's console.** All standard controls are available for targeting, energizing, destination input, pattern-buffer preferences, and emergency abort options.

•**Transporter controller.** No dedicated computer controller is used as part of the transporter unit. All command signals are routed through the CPG.

•**Molecular imaging scanners.** A single set of three 0.0009-micrometer scanners is set into the ceiling of the transport chamber. Quantum-state information is derived for the molecular structure of living entities and passed along to the energizing coils. No data storage of the quantum states is possible for more than 0.17 cubic centimeters of biological matter, and the scanners are tied to the energizing coils by the shortest microwaveguides possible for nearly instantaneous response.

•**Primary energizing coils.** Located at the top of the transport chamber. One of the chief differences lies in the ACB coils, which produce a single-stage traveling spiral wave to aid in fixing the three-dimensional position of the subject. Starfleet coils emit a two-stage unidirectional spatial matrix wave, which requires a minimum 1.21 seconds to allow dematerialization to begin. The spiral wave can begin matter-stream dissociation within 0.94 seconds.

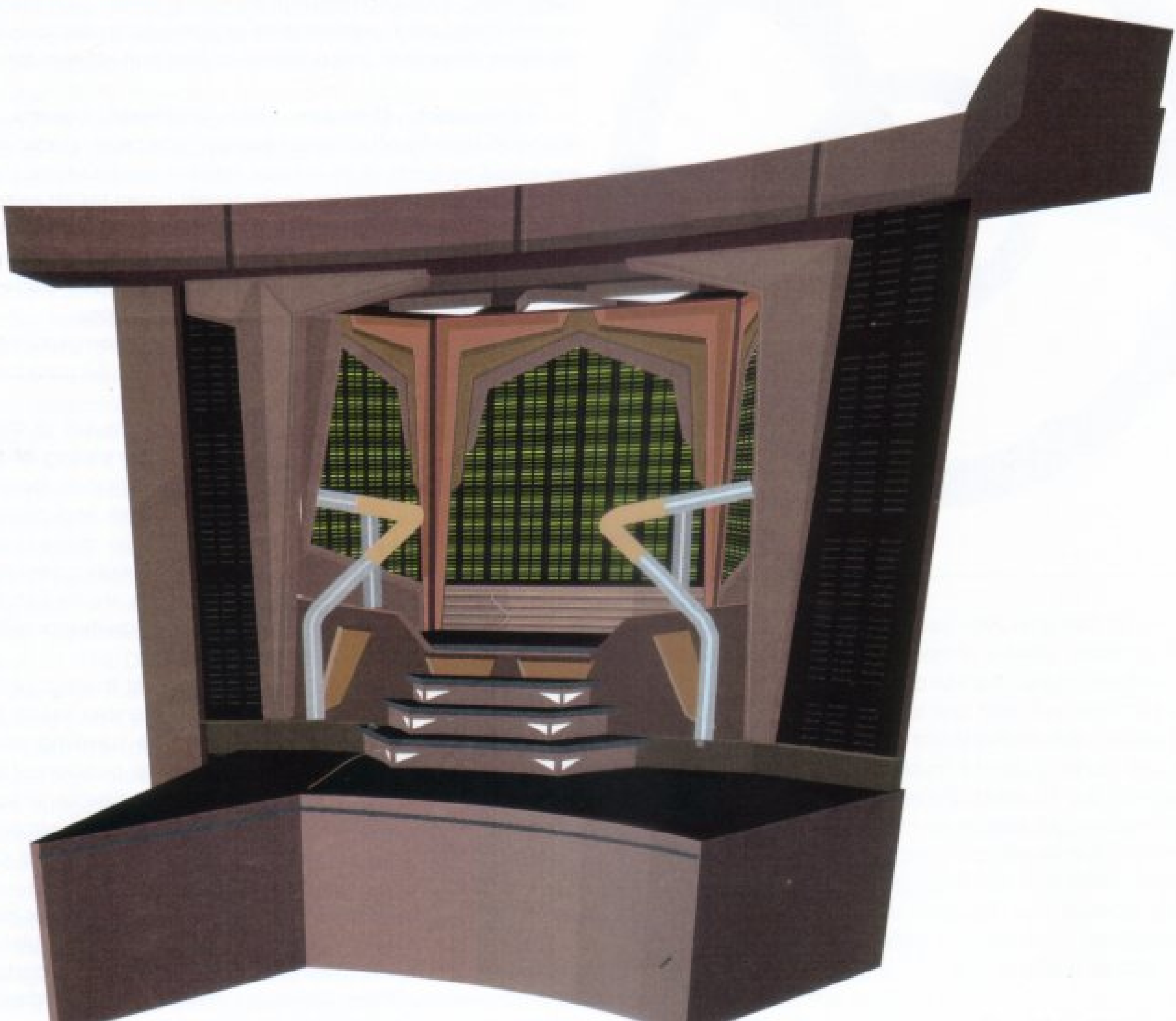
•**Phase transition coils.** Located in the chamber platform. The system utilizes narrow-focus quark manipulation field devices to selectively decouple subatomic-particle binding energy. These coils also reorient the particles to form a continuous string, the matter stream, which can be spun up within the pattern buffer.

•**Pattern buffer.** The unit is composed of six small interconnected superconducting buffer tanks, each with a capacity of 4.13 m^3. As with the Starfleet units, the Cardassian pattern buffer holds the racing matter stream for a limited but known period of time, more than adequate to allow the Doppler and Heisenberg compensators to perform quantum corrections to the matter stream. The maximum storage time for an intact biological stream has not been tested, but computer simulations indicate the outer safety margin should be set to 285 seconds. Magnetic irises can be commanded to move the matter streams from one tank to another, though the exact design rationale for this is not clear.

•**Biofilter.** A rudimentary biofilter system was in place at station handover, but contained roughly 52 percent of the known biohostile organisms and contraband devices in its database. Additional bioscanners and CPG ties were made before wide-scale use of the transporters began.

•**Targeting scanners.** Two distinct sensor systems were used to derive target information for bidirectional transport, one connected to the Terok Nor internal scanners, and one tied into the orbital environment sensors once used around Bajor. Since the internal scanners are the province of the chief of security, it is presumed that they allowed the transport of Cardassian personnel to anywhere within the habitable volume of the station, or were used to detect and detain troublesome workers. The external sensors, which now maintain watch in the Denorios Belt for ships and wormhole activity, were able to pinpoint beam-down coordinates on Bajor and locate personnel awaiting beam-up.

•**Emitter pads.** The matter-stream waveguides, powered by stage-2 and stage-3 EPS conduits, terminate in electroporous accelerator pads built into the +Y and -Y surface hull plates of the Habitat Ring and Docking Ring. The remnants of an emitter pad exists in the antenna farm above ops, though the waveguides were never connected.



Cardassian transporter

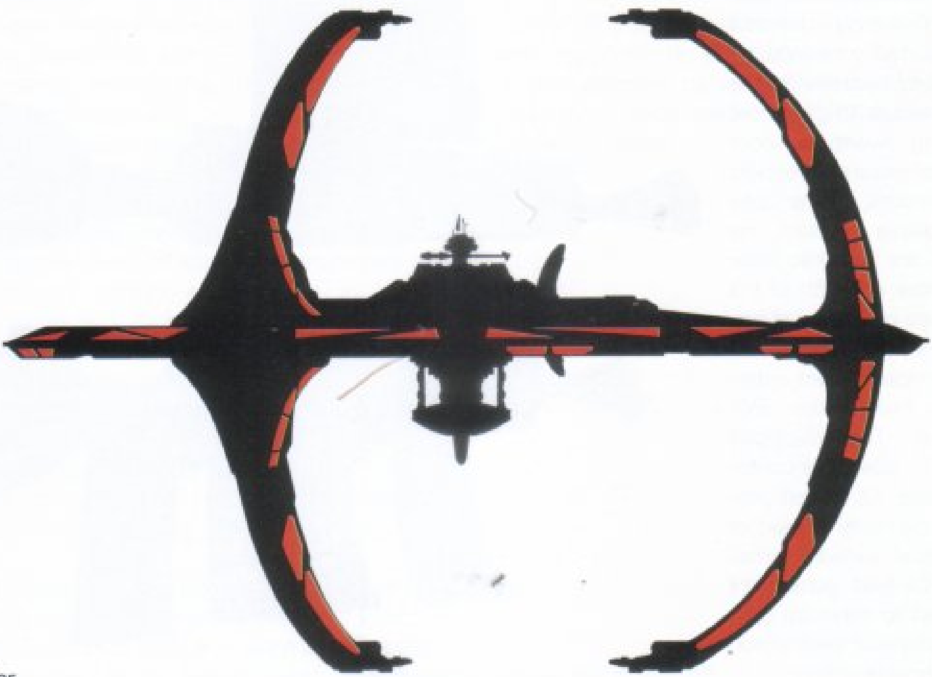
9.0 SCIENCE AND REMOTE SENSING SYSTEMS

9.1 SENSOR SYSTEMS

The numbers and types of external sensors installed on Deep Space 9 have varied radically over its long history. Relatively little scientific research had been accommodated on Terok Nor, and most sensor systems were designed to deal with the Bajor orbital environment and spacecraft operations. High-resolution sensor systems devoted to the planetary mining operations were typically installed on shuttlecraft or commandeered Bajoran impulse vessels and given the task of scanning Bajor and its neighboring planets for extractable resources.

All primary sensors on Terok Nor were arranged into irregular pallets and placed within shallow insets in the hull plating. These areas were typically protected from the space environment by a yellow ochre or reddish brown hafnium-duranide antiradiation coating. The sensors shared the inset structures with numerous utility ports and purge vents. Other sensing gear installed around the ops module and weapon sail towers was directly involved with station defense, and most of these devices remain in use with reconfigured connections to the CPG.

Many of the Starfleet and Bajoran modifications to the science and sensor systems were either removed or recalibrated for studying different phenomena following the station relocation. Once it was determined that the wormhole was a major element for scientific research, and that the station was going to remain at the Denorios Belt site for the foreseeable future, all science and engineering tasks were shifted to maximize results in the altered situation. Since the outbreak of the Cardassian and Dominion hostilities, a significant fraction of the science and sensor assets have been further shifted to support Deep Space 9 defense and reconnaissance of threat force developments.



Sensor pallet locator

9.2 LONG-RANGE SENSORS

The current inventory of active and passive long-range sensors comprises 473 Cardassian subspace scanners and 109 Starfleet and Bajoran instruments of various types. Most are high FTL devices that operate at warp 9.9997 in active scan mode, and operate in passive detection mode at a somewhat lower warp-equivalent velocity coupled to distance and emitted-signal strength. Broad-beam active scans are authorized only during specific crisis situations, in order to deny signal intelligence to threat detectors either on Cardassia or in the surrounding space (see 10.8, 10.9). It must be continually emphasized that Cardassia is close by, at 5.25 light-years. Narrow-beam active scans emitted from the station are configured with look angles designed to avoid most threat territories. All other study targets are first filtered through the strategic and tactical processors to perform a standard risk-versus-gain assessment; this is a requirement even for those targets chosen for purely scientific reasons.

Primary long-range instruments include the following:

- Broad-beam active subspace scanner
- Narrow-beam active subspace scanner
- All-sky passive subspace interferometer network
- Tunneling neutrino-emission detector network
- Warp-to-sublight ion deceleration detector
- Low-frequency subspace seismicity sensor
- Warp activity detector/threat analysis preprocessor

All devices operate using stage-3 and stage-4 EPS taps and are controlled by the ops science station. Most defense-related sensors, particularly the warp-activity detector and subspace seismicity sensor, are triply redundant and operate on the SOP rotating schedule of "two on, one off," ensuring twenty-six–hour coverage and the required periodic maintenance downtime. In the case of networked multiple sensors, the specific networks are split into rotations of fifths, where one-fifth of the operational units are on-power at any one time. Most of the networked sensors are in semipermanent external installations that make EVA swapouts difficult. The fractional rotation insures that adequate coverage will be available. As added protection to all cryogenically cooled or rare surface material sensors, small EPS-powered force-field generators have been installed to minimize sensor blinding and physical destruction during periods of hostile action.

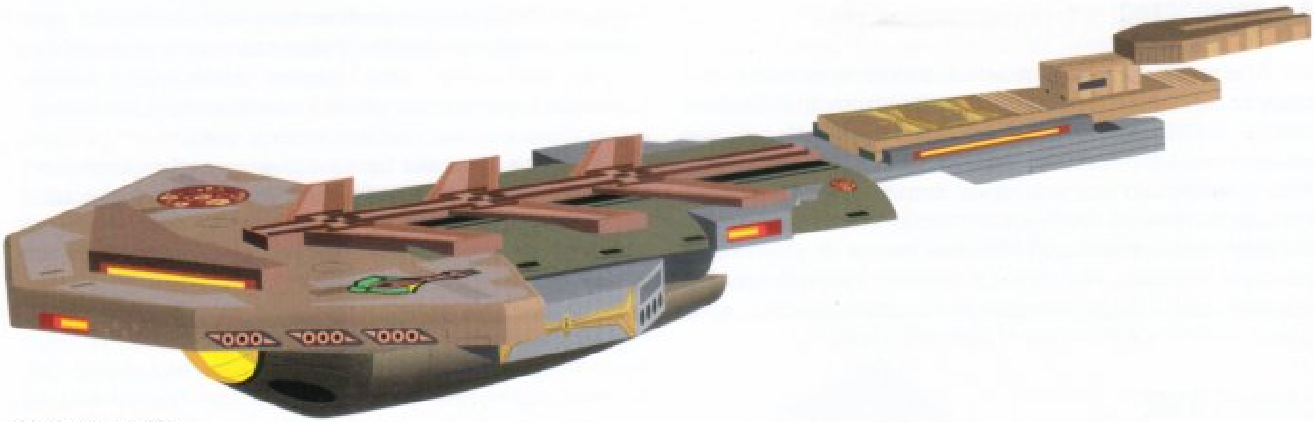
9.3 INSTRUMENTED PROBES

The normal inventory of instrumented probes carried aboard Deep Space 9 includes class-1, class-4, and class-5 spacecraft. In addition, enough device stores and spares are maintained to fabricate class-8 and class-9 probes, which are based on the standard photon-torpedo casing (see 10.2). Experimental versions of class-8a and class-9a probes have undergone trials by Starfleet and have been declared provisionally operational. These are based on the quantum torpedo casing and take advantage of a higher delta-*v* sustainer engine rating (see 10.3).

All probe classes have received periodic upgrades by Starfleet's Defensive Weapons Development Laboratory. Systems allocations to Deep Space 9 have been delivered in either completed physical form or encrypted fabrication instruction form, for on-site manufacture at the station. Complete probes are off-loaded by starship or commercial freighter. Instructions for fabrication include onboard computer programming, numerical machining algorithms, and replicator formulae, and all data are transmitted over secure channels or delivered as protected isolinear memory blocks.

The current class-1 probe is the most commonly used device for studying interplanetary and interstellar phenomena (see illustration). It is equipped with a suite of RF, subspace, chemical, biological, and astrophysical sensors. These are coupled to a high-speed, 24.3-kiloquad isolinear preprocessing core for data analysis and a multichannel subspace telemetry system for transmitting data and receiving tasking instructions.

Starfleet probe, service configuration



Cardassian probe

Propulsion is provided by a vectored deuterium microfusion thruster and is able to run on cryogenic fuels stored at the station or aboard attached Starfleet vessels. Attitude and translational control are accomplished through the thruster nozzle, which can be exhausted in 360 degrees in the X-Y plane, 180 degrees in the Y-Z plane (-Z), and 180 degrees in the X-Z plane (-Z). This essentially allows for all +Z thrusting with total radial thrust control. Reaction control at the +Z end of the probe is handled by four cold-gas nitrogen thrusters near the sensor head connector.

The effective range of the class-1 is 3.2×10^7 kilometers, and the total delta-*v* is 0.6*c*. The operational philosophy is to get the device on-site as quickly as possible, take full readings, and transmit telemetry. The effective transceiver power is rated at 15.7 megawatts over 18,650 channels. Full control is available for deployment programming, including data storage and probe return for later downloading, in situations where subspace silence is required. The class-1 casing is available with low-observability coatings and hull materials, though the standard model is a duranium and tritanium composite.

The class-4 and class-5 upgrades have been combined into a single new class-5-type hull casing. The previous primary mission for the class-4 involved close stellar contact at medium impulse velocities only. This has been altered to high-impulse study of subspace anomalies and other phenomena not usually encountered in normal space. Effective range is 7.23×10^7 and total delta-*v* is 0.98*c*. The power plant remains a vectored microfusion engine with a near-warp sustainer coil. Sensors include full subspace EM and seismicity detectors, zero-point vacuum energy detector, and protected temporal distortion sensors. Onboard data preprocessing is handled by a 15.9-kiloquad isolinear computer, and telemetry is transmitted over a ruggedized STA radiating 20.6 megawatts over 14,776 channels.

The class-5 probe retains its warp sustainer and its role as a stealthy reconnaissance spacecraft. Effective range is 8.42×10^{10} and total delta-*v* is warp 2.6. The dual-mode matter-antimatter (M/A) power plant has been replaced by a direct M/A coil reactor, bypassing the need for an intermediate EPS power transfer conduit (PTC). Sensors include full passive signal intelligence pallet, autonomous deep-sky astrophysical detectors, and subspace wave analysis suite. Data-gathering and recording capabilities are handled by a 54.7-kiloquad isolinear computer. Anticapture and EM-tamper detector subroutines will cause immediate detonation of onboard M/A fuel supplies. Encrypted telemetry is triggered only within secured territory, at 3.4 megawatts over 5,482 channels.

The class-8 and -9 warp probes and their quantum torpedo casing variants continue within their existing mission capabilities as regards range and total velocities in the one hundred to nine hundred light-year and warp 9+ flight regime. All four types can be assembled from existing components within a fifteen-minute window, and all are multimission-capable. Standard torpedo launchers are utilized for all probes, with minor variations in initial accelerations, depending on payload type.

Comparisons between Starfleet and Cardassian technology have been made through the study of a captured Cardassian probe.

9.4 TRICORDERS

The continuing evolution of handheld sensing and analysis equipment has led to the deployment of Starfleet R&D's TR-590 tricorder X for all senior officers and attached personnel aboard Deep Space 9. Bajoran authorities have issued an analogous sensing device to their security forces and science staff, and a Cardassian version has also been introduced into the theater of operations. Klingon, Romulan, and Ferengi sensing systems are distributed over a larger number of handheld devices, each configured for a narrow set of scientific tasks.

STARFLEET DEVICE

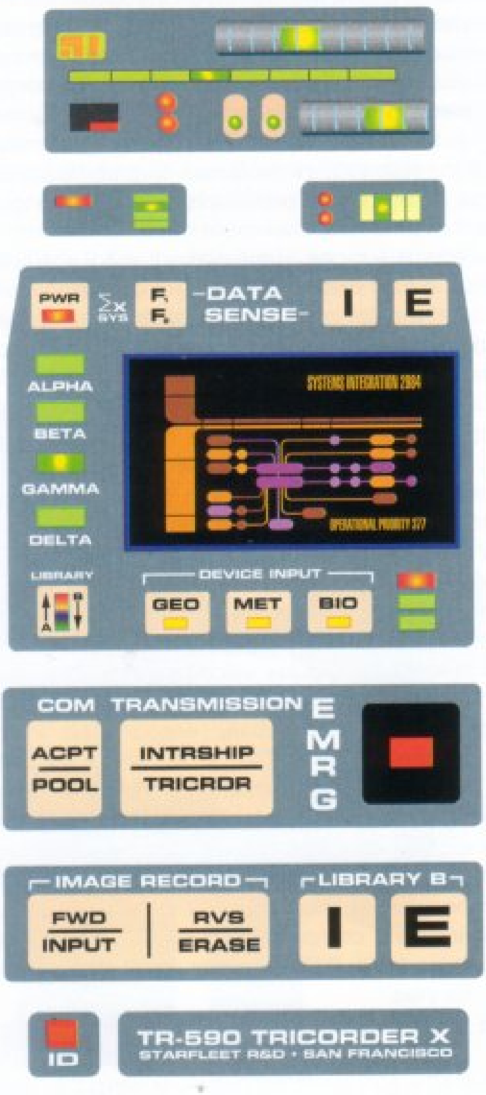
The standard tricorder remains the primary portable sensing, computing, and data-communications device incorporating miniaturized versions of standard scientific instruments. Touch controls or voice commands provide operational access. The medical tricorder consists of a standard tricorder plus the medical peripheral add-on (see 12.2, 13.3).

The upgraded device measures 15.81 by 7.62 by 2.84 centimeters and masses 298.3 grams. The casing is gamma-strengthened polyduranide. The control surfaces retain the familiar operator interface and 3.5 by 2.4 centimeter display screen. The major optronic subassemblies include the power loop, sensor assemblies, primary processors, control and display interface, subspace transceiver assembly, and memory storage units.

Power is provided by an induction-rechargeable sarium-krellide energy cell rated for thirty-six hours of continuous use with all subsystems active. This value will increase with fewer active subsystems. The typical power level is 16.4 watts.

The available sensor assemblies have been increased to 315 mechanical, EM, and subspace devices mounted about the internal frame and embedded in the casing. One hundred eighty-nine are clustered in the forward end for directional readings, with a field-of-view (FOV) lower limit of 52.3 arc-seconds. The other 126 omnidirectional devices make measurements of the surrounding space. The previ-

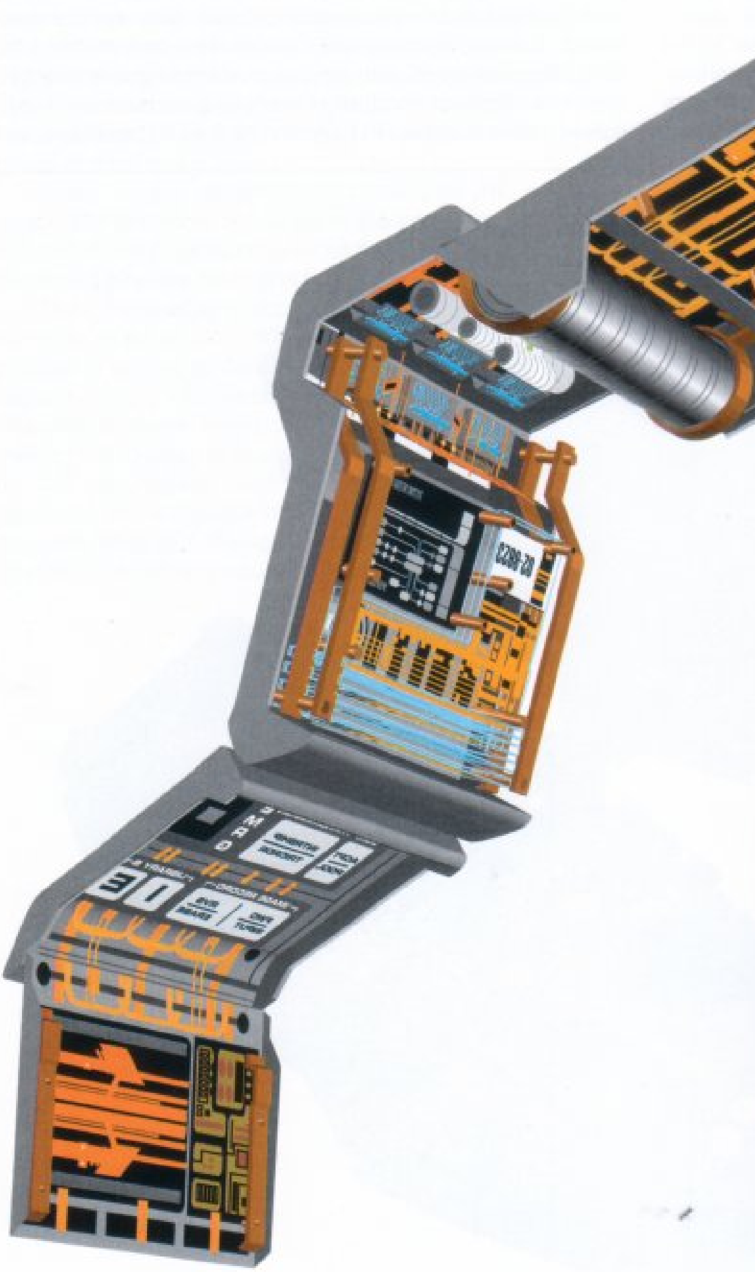
Starfleet tricorder



Typical tricorder control interface

ously available deployable hand sensor on the standard tricorder has been eliminated, made obsolete by the increased resolution of the main unit.

The TR-590 polled main computing segments (PMCS), the primary data processors, are divided among the five inner casing surfaces and are rated at 275 giga-floating point (GFP) calculations per second (see illustration). The data-storage sections include eight wafers of densified chromopolymer isolinear crystal for a total capacity of 9.12 kiloquads. The control and display interface (CDI) routes commands from the panel buttons and display screen to the PMCS for execution of tricorder functions (see illustration). The opaque control surfaces are fabricated from thin-film copper dilefinate infused with metallic dyes to fix the graphical content. The display screen incorporates a standard nanopixel matrix similar to that used in padds and consoles. Communications with other data units is performed by the STA, with range limited to forty thousand kilometers, similar to the communicator badge.



Tricorder in service configuration

Tricorder profile

BAJORAN DEVICE

The Bajoran tricorder has been optimized for detecting and analyzing a smaller number of physical phenomena than its Starfleet counterpart. As deployed on Deep Space 9, the unit is primarily tasked with forensic procedures, tracing anomalous energy fields and particles, identifying and tracking residual weapons signatures, and uncovering contraband materials within the station cargo bays and docked vessels.

The unit measures 15.23 by 8.28 by 5.33 centimeters and masses 262.1 grams. The case is molded toranium tetraborate and consists of a single unarticulated object. The optronic subassemblies are similar to those in the Starfleet version. Power is provided by either a sarium-krellide cell or replaceable isotolinium ampule; both provide approximately twenty-three hours of continuous use.

The 154 sensor assemblies include wide-band RF and subspace EM detectors, atmospheric, and vaporized-solids analyzers, all mounted within the casing on replaceable cards. Ninety are focused through the forward end, with an average FOV of three minutes of arc. Six are focused laterally, and the remaining forty-nine are omnidirectional.

The computational section consists of a block of six stacked isolinear processors of Starfleet-type chromopolymer and rated at 230 GFP calculations per second. Data storage is handled by ten densified isolinear wafers with a total capacity of 12.1 kiloquads. The controls are hardwired raised buttons combining push and slide movements. The display screen is a single nanopixel matrix 1.10 by 6.79 centimeters, with limited touch or stylus activation. The basic Bajoran combadge subspace transceiver, minus power cell, is installed to handle data flow to base devices.

Bajoran tricorder in service configuration

CARDASSIAN DEVICE

The Cardassian tricorder has been analyzed from captured units and units obtained through undisclosed means. In contrast to both the Starfleet and Bajoran devices, the Cardassian version is much more limited in function, and has been characterized more as an emergency or battle-ready scanner. One of the study units was rigged with an antitamper charge of trilithium explosive. The charge, discovered during the initial high-resolution deep structural scan, was disarmed prior to disassembly.

The unit measures 15.876 by 10.16 by 5.71 centimeters and masses 248.34 grams. The casing is partially refined toranium boronate and is a single handheld object. The optronic subassemblies are similar in technology to the Bajoran device. Power is provided by a single rechargeable isotolinium ampule with approximately twelve hours of continuous use.

Forty sensor assemblies include only RF and subspace EM detectors mounted in the head end. Thirty-one forward-looking sensors have an FOV of 2.3 degrees. The remaining nine are omnidirectional.

Data processing is accomplished by two type-1 isolinear rods rated at 121 GFP calculations per second. Data storage is limited to four type-1 memory rods with a total capacity of 2.5 kiloquads. The controls are primarily electrosensitive pads incorporating touch and slide movements. The display screen is a single nanopixel matrix 3.2 by 2.3 centimeters, with no apparent touch or stylus response. No subspace or RF transceiver was present in the units analyzed, though small voids in the casing suggest that a small unit could be installed.

Cardassian tricorder

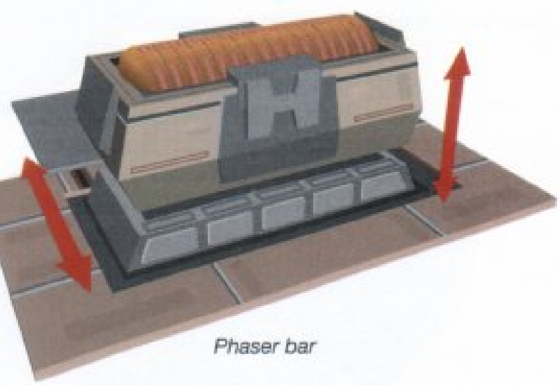
10.0 TACTICAL SYSTEMS

10.1 PHASERS AND OPERATIONS

At the end of 2369, after Deep Space 9 had been officially established as a Starfleet-administered orbital facility, only 25 percent of the planned defensive weapons upgrades had been completed. Spares shortages, limited processed materials allocations, and long fabrication lead times all contributed to the stretchout of the upgrade program. The priority systems, the defensive shields and initial sail tower phaser packs, were installed and brought on-line in time to protect the Bajoran wormhole terminus. Luckily for Starfleet and Bajor, the Cardassians were unaware that the total weapons installation was still some time in the future. Tactical analysis indicates that the station could not have withstood a sustained direct assault by as few as ten *Galor*-class warships.

Rotary phasers and microtorpedo launcher

The current total phaser system maintained aboard Deep Space 9 consists of two main types, the standard linked type-10 emitter segments normally seen on starship hulls, and a newer version of the type-11 planetary defense emitter. The basic phaser mechanism remains the strong nuclear force liberation method found in the rapid nadion effect (RNE). Recent laboratory developments at Starfleet's Tokyo R&D facility have increased the nadion-particle production rate by 8.35 percent, the primary advantage of which is the easing of surge power requirements for the emitter EPS trunks, and subsequent periodic maintenance demands.



Starfleet phaser pack strap-ons

The standard type-9 emitters were originally installed on the outward faces of the sail towers, in exactly the same locations previously occupied by the tetrahedral Cardassian phaser emitters. The six main tetrahedrons had been hastily removed and their stage-1 EPS conduits destroyed. The sky coverage from all three sail towers is almost a full 360-degree sphere, only partially shadowed by the Docking Ring and pylons at ranges closer than one hundred meters. The EPS lines were restored and relocated, allowing room for new photon and later quantum torpedo launchers and loader elevators above the +Y and below the -Y phaser emitters (see 10.2). The type-10 emitter segments each direct 4.8 megawatts, and updated fire-control algorithms allow multiple segments to combine the beam energies of up to six segments. This results in a multiplied force coupling at the target, which can be effective in reducing the in-theater time of a threat force vessel due to shield withering, independent of any spacecraft destruction that might occur.

The standard units were aft-firing phaser strips obtained from *Soyuz*-class starships nearing the end of their operational lifetimes. None had been subjected to high MTBF surge-power conditions and were suitable for mounting in the sail towers. An acceptable amount of alloy matrix adaptation was necessary to seal the duranium phaser frames to the Cardassian rodinium hull plating, since almost no inner skeletal beams exist in the towers to provide a deeper structural bonding. Cooling is provided by a modified liquid helium loop, which transfers thermal energy to the existing tower radiator beds as well as to the fusion generator radiators during peak load periods.

The stage-1 EPS conduits are routed directly from the fusion generator cross-feeds, through Level 15 in the Habitat Ring, and into the towers. They end at the prephaser power conditioners and fire control magnetic iris valves, which adjust the power levels and plasma frequencies. Plasma contact with the emitter crystal occurs after all safety interlocks and fire control codes are authorized and transmitted to the iris valves. All targeting and fire signals must come from senior officers and are handled by the computer CPG to perform the actual directional and sequence calculations.

The original Cardassian weapon monitoring rooms were converted in 2372 into large rotary phaser cannons and microtorpedo launchers and were instrumental in the station's defense during the short-lived Klingon-led actions against the Federation. The rotary units are composed of type-9 emitter segments taken from *Ambassador*-class starships with similar MTBF ratings to the stationary sail emitters. EPS connections are made through sonodanite and rabium-tritonide rotary conduit joints. Plasma pressure variations are smoothed out through a set of four surge tanks set into the rotary cannon housing. Cooling is accomplished by a standard supersonic regenerative liquid nitrogen system, and excess thermal energy is shunted to the sail tower radiator bed.

The latest upgrade involves the adaptation of the planetary phasers. The type-11 segments were designed to minimize atmospheric blooming of the beam; in space, the antiblooming energizing sequence has been altered within the CPG and assists in keeping the beam focused. Three of the new units are currently in operation. In each, sixteen densely packed type-11 emitters are mounted on a movable carriage that is raised and lowered by electrohydraulic rams. The entire assembly emerges from its stowed position in the Habitat Ring and is protected within one side of the enlarged runabout maintenance bay. EPS plasma is routed through six jointed stage-2 conduits to a capacitance bank within the carriage. Stage-1 level power is available after a two-minute charging period. Cooling is provided by a flexible regenerative liquid nitrogen loop, with excess thermal energy routed to the fusion generator radiators. All firing commands are handled by the CPG.

PHASER OPERATIONS

Station-based phasers present a particularly difficult set of challenges compared to their mobile counterparts installed aboard frontline starships. While it may be argued that the relative velocities of the station and any threat vessel can be averaged out to give the appearance of two moving objects, the station is at a disadvantage in not being able to perform a pursuit maneuver, and must await possible repeated attack runs. The nearly motionless nature of Deep Space 9, as compared to a high-impulse threat, is analogous to the situation faced by the classic Earth-based aircraft carrier vessel, which was finally phased out in 2051, a victim of the resurgence of manned bombers and ballistic missiles.

Threats are targeted by subspace and light-speed sensors and tracked by defensive measures subsystems within the station computer cores. As with ship-to-ship phaser targeting, multiple targets are locked, prioritized, and fired upon in order. Station-specific programming takes obscuring structures into account and performs handoffs from one emitter to another to maintain maximum phaser energy-dwell time on the target. The defensive shield envelope, once running at high power, may exert a 1 percent drain on the outgoing phaser beam, but wave synchronization can be used to reduce this drag force by one-half.

With the addition of the planetary phaser arrays, as well as the mobile weapons platform provided by the *U.S.S. Defiant*, it is no longer possible to overwhelm even a single one-third wedge of the Deep Space 9 defensive perimeter with ship numbers below fifteen *Galor*-class vessels. Additionally, with recent Starfleet responses to crisis situations in the Bajor Sector, all known numbers of Jem'Hadar fighters and larger warships may be repulsed by the current ordnance deployment for the foreseeable future.

Deep Space 9 defense sail

10.2 PHOTON TORPEDOES AND OPERATIONS

It has been generally accepted that the photon torpedo is the weapon of choice for warp velocity ship-to-ship conflict, as well as the delivery system for nonstandard warhead packages. Ship-mounted phasers have traditionally been of little use during warp flight, due to the light-speed (c) barrier for EM energy. Recent developments in subspace technology have pushed the phaser into the FTL arena, notably the ACB-jacketed beam device (see 14.1). The photon torpedo has been pressed into service as a small multirole spacecraft, followed on by the higher-energy quantum torpedo (see 10.3).

The basic external configuration of the photon torpedo carried onboard Deep Space 9 and its attached starships has changed little from 2271 to 2375. The body is an elongated elliptical tube fabricated from molded gamma-expanded duranium and a plasma-bonded tritanium outer skin. The current casing measures 2.1 by 0.76 by 0.45 meters and masses 186.7 kilograms dry weight, slightly less than the previous design. Penetrations by phaser cutter are still provided for warhead reactant loading, hardline ODN connections, and propulsion-system exhaust grills. The standard internal components include deuterium and antideuterium supply tanks, central combiner tank, and their respective magnetic suspension components; target acquisition, guidance, and detonation assemblies; and warp sustainer engine. The hafnium-titanide supply and combiner tank shells have an increased capacity of 5 percent, resulting in a slightly higher explosive yield, now rated at 18.5 isotons. Reduced optronics component complexity had driven the tankage increase.

Photon torpedo

The warp sustainer engine benefits somewhat from the increased tankage in the form of increased range, to an upper limit of 4,050,000 kilometers, depending on maneuvering capability balanced against sustained powered flight time. This is only applicable to firings from starships at warp. In launches from Deep Space 9, the initial velocity remains at high sublight and will never reach warp 1. This does not imply that the torpedo is impractical for station defense; it has been shown that even at low impulse, the standard photon torpedo is effective against close-in threat vessels.

PHOTON TORPEDO OPERATIONS

Photon torpedoes are fired from twin launcher tubes in each half of each weapon sail tower, for a total of twelve launchers. Matter and antimatter reactant loading takes place prior to locking the tube breech and after carriage of the prepared casings from the protected magazine. The magazine is situated on the sail tower midline, inboard of the present weapons control room. Deuterium and antideuterium supplies for the torpedoes are held in storage tanks above and below the magazine. The matter tanks are fed from the general station fusion tankage; the antimatter is held in magnetic suspension and fed from Starfleet antimatter pods.

Command authorization and targeting data from the CPG tactical processors is handed off to the torpedo and launcher. Depending on the volley quantities, the reactant loader and casing elevator will be set to hot standby, ready to accept updates and sequential firing instructions. Reactants can be loaded into four torpedoes simultaneously, as in standard starship applications, and effective volleys of six torpedoes can be dispatched within 2.3 seconds. Reload times can be as short as 15.3 seconds.

All sublight firings from the station can continue to utilize subspace links to the torpedo guidance system to place the device on the selected target. In the case of loss of the command link, the torpedo will continue to the locked target under autonomous control. Various factors can interfere with targeting, including active shield energy, subspace seismicity, and sensor blinding by threat devices. In the case of loss of target lock, the torpedo will attempt to reacquire a lock based on the last known conditions and target flight and physical characteristics. If certain AI criteria are not met for reacquisition, the torpedo will temporarily safe its systems, exit the conflict area, and then self-destruct to avoid falling into threat hands.

Standard spacecraft combat maneuvers (SCM) do not apply for stationary launch platforms. Deep Space 9 has been supplied with specially modified defensive subroutines originally created for close-in starbase combat with both torpedoes and phasers.

10.3 QUANTUM TORPEDOES AND OPERATIONS

The quantum torpedo is the first Starfleet follow-on weapon to replace the standard photon torpedo first developed in 2268. During upgrade testing of the Mark-IX warhead, it was determined that the theoretical maximum explosive yield of 25 isotons had finally been reached for a matter-antimatter reaction. Existing and future threat force conflicts drove the development of a new defensive stand-off weapon that could be deployed on specially equipped starships, starbases, and planetary-surface fortifications. Advances in rapid energy extraction from the space-time domain known as the zero-point vacuum eventually led the Starfleet R&D facility on Groombridge 273-2A to test a prototype continuum-twist device with a calculated potential of 52.3 isotons.

As in the history of laser-induced fusion, zero-point energy generation began with a negative energy balance, requiring a greater input of high-temperature EPS plasma to initiate the reaction than what was actually produced by the zero-point field device. The basic mechanism, first operated experimentally in 2236, involved the formation of an eleven-dimensional space-time membrane. A cousin of the superstring, the membrane was twisted into a string with a topology of Genus 1 and pinched off from the background vacuum, calling into existence a new particle. The process of creating large numbers of new subatomic particles liberated correspondingly large amounts of energy. Calculations quickly showed that a relatively small volume of ultraclean vacuum carried aboard a torpedo warhead could place a highly explosive energy release on a target. A similar, albeit larger, event created most of the mass of the universe in the big bang. The pinch does not, as some researchers initially believed, occur at the same interface between this universe and the big bang's remnant domain, though such a continuum pinch may lead to even greater energy releases.

The testing of the prototype zero-point warhead occurred on Groombridge 273-2A, an uninhabited gas-giant moon, in 2355, following six years of theoretical research and experimental hardware development. Various types of EM emitters were successful at producing energy bursts, and one was chosen for a detonation test 285 kilometers beneath the surface. Security measures had already been heightened for the entire program when tensions spiked dramatically one hour before the test. One researcher produced a computer simulation that indicated a possible rapid and total annihilation of the moon at the moment of detonation. Unfortunately, one calculation variable dealing with hypothetical runaway vacuum pinching had not been deleted, and another last-minute simulation predicted a detonation confined to a nine-hundred–meter diameter sphere. The test was successful, the Groombridge site was abandoned and restored to its original state, and Starfleet defensive weapon facilities continued with fabrication.

TORPEDO CONFIGURATION

The quantum torpedo consists of a pressure-molded shell of densified tritanium and duranium foam, trapezoidal in cross section and tapered at the forward end for atmospheric applications. A 7-millimeter layer of plasma-bonded terminium ceramic forms an ablative armor skin for the foam hull, over which is bonded a 0.12-millimeter coating of silicon-copper-yttrium rigid polymer as an antiradiation coating. Beyond the necessary cuts and welds for propulsion and warhead hardware installation, minimal penetrations are made by phaser cutters, so that the hull may be rendered as near to EM-silent as is technologically possible. All seals around extended components are treated with a suspension of forced-matrix ferrenimide, which establishes a minute amount of duonetic field activity, effectively blocking EM leakage. All active and passive sensor pulses are channeled through machined cavities in the inner hull at approximately twenty-six–centimeter intervals in all three axes.

The heart of the current system is the zero-point field reaction chamber, a teardrop-shaped enclosure fabricated from a single crystal of directionally strengthened rodinium-ditellenite. The chamber measures 0.76 meters in diameter by 1.38 meters in length and 2.3 centimeters in average thickness. The assembly is penetrated by a single opening in the tapered end, cut by a nanometer phaser in an inert atmosphere of argon and neon. Two jacketing layers, one of synthetic neutronium and another of dilithium, control the upper and lower extremes of the energy-field contours. Attached to the taper opening is a zero-point initiator consisting of an EM rectifier, waveguide bundle, subspace field amplifier, and continuum distortion emitter. The emitter creates the actual pinch field from a conical spike 10^{-16} meters across at the tip.

The zero-point initiator is powered by the detonation of an uprated photon torpedo warhead with a yield of 21.8 isotons, achieved through increased matter-antimatter surface area contact and introduction of fluoronetic vapor. The M/A reaction occurs at four times the rate of a standard warhead. The detonation energy is channeled through the initiator within 10^{-7} seconds and energizes the emitter, which imparts a tension force upon the vacuum domain. As the vacuum membrane expands, over a period of 10^{-4} seconds, an energy potential equivalent to at least fifty isotons is created. This energy is held by the chamber for 10^{-8} seconds and is then released by the controlled failure of the chamber wall.

FLIGHT SYSTEMS

Propulsion for the quantum torpedo is handled by four microfusion thrusters working in concert with standard warp field sustainer coils. Propellant supply valves, cross-feeds to the photon detonator, and M/A tankage are housed in the aft compartment. Guidance, navigation, and fusing of the

Quantum torpedo

torpedo is controlled by the onboard computer and sensor array. The main processor for the computer is a bio-neural gel cylinder surrounded by a low-level inboard warp field for FTL computations and a low-level outboard thoron web to block threat force countermeasure radiation.

A total of fifty-three safety interlocks are distributed across all systems. Since the zero-point vacuum initiator contains numerous rare alloys and elements and cannot be replicated, fabrication has proven a long and painstaking process, requiring the enforcement of stricter safety protocol levels for the program and forcing difficult allocation decisions for available torpedo inventories. As the current Alpha Quadrant conflict warrants the in-theater storage of high-readiness assets, Deep Space 9 and the *U.S.S Defiant* have been allocated 50 percent of the current production run of quantum torpedoes. While both platforms will receive periodic torpedo upgrades, the *Defiant*, in its continuing role as testbed starship, will be closely monitored on reliability, efficiency, and security fronts. While the torpedo structure remains robust during manufacture, transit, storage, and ultimately launching, special handling and loading precautions must be taken to insure warhead survival. Nominal procedures includes antigravs, telerobotic servicing, and use of protective buffer fields.

OPERATIONS

Launch and maneuvering at impulse velocities up to 0.993c may be accomplished with onboard M/A reactant consumption of no more than 23 percent; launch at warp will decrease reactant use to 15 percent due to the launcher hand-off warp field. If the torpedo is moving at warp and its target drops to impulse, the torpedo will not make a commensurate drop to impulse, since it cannot reestablish its warp sustainer field. In this case it would detonate on impact or at closest approach, using data from the proximity sensors and three-axis relative velocity algorithms. If the torpedo and the target are both at high impulse, and the target ramps up to warp, the torpedo will still have sufficient velocity to reach an effective destruct radius.

10.4 PERSONAL PHASERS, DISRUPTORS, AND BLADE WEAPONS

Carrying out Starfleet directives to protect Deep Space 9 and the interests of the Federation often requires its officers, and attached and allied personnel, to defend themselves with energy weapons and other close-quarters bladed weapons. All currently known threat forces are armed with similar devices. Most hand-carried energy weapons from all involved cultures fall into the Starfleet categories of types-1, -2, and -3; clearly, quantum physics has constrained the upper energy density of these armaments so that neither side seems to have a technological advantage at the present time.

The bladed weapons are unique to the Klingon forces. A Klingon warrior prefers the more aggressive hand-to-hand fight, but does not hesitate to use his—or her—disruptor if the situation requires it.

The basic mechanisms and operations of most phased energy rectification (phaser) defensive weapons have been described in detail in other databases. Where the physics of the beam type differ substantially from the standard-issue phaser, it will be noted.

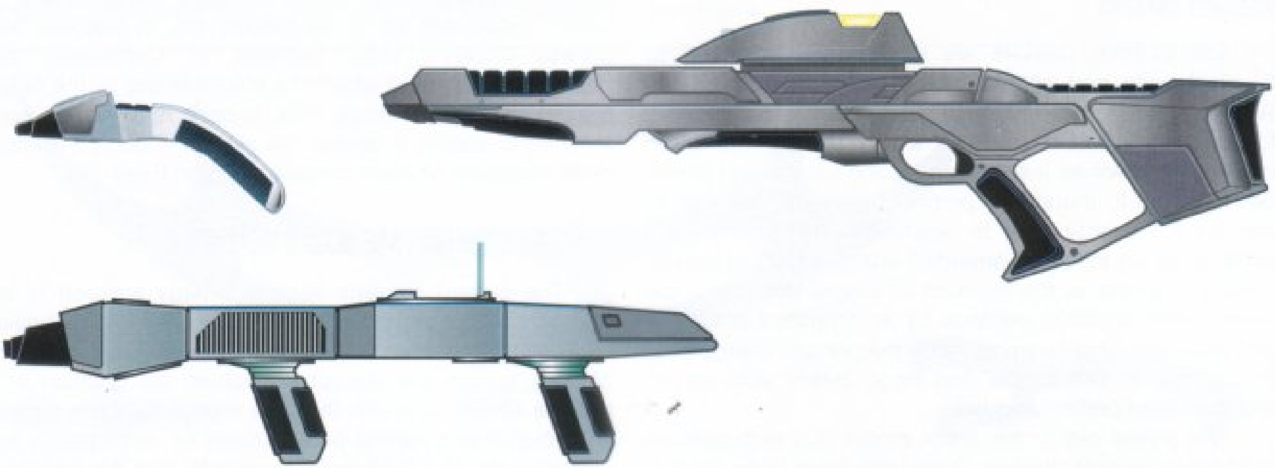
STARFLEET PHASERS

Sidearm and rifle units continue in the Starfleet inventory, with some ergonomic and energy system alterations. The type-1 hand phaser is currently issued as a backup weapon to supplement the type-2 holstered phaser. Two different type-3 rifle phasers are maintained in the Deep Space 9 armory; an older model shares a number of technological innovations with the type-2, and a recent type-3b assault rifle delivers on theoretical research connected to the equipment requirements of the *Sovereign*-class starship. The type-3b incorporates the first true transitional-phase pulse accelerator.

The type-2 phaser modifications include an improved sarium-krellide power cell, curved grip, and reinforced prefire chamber, among others. The power cell is hot-swappable in the field and holds a total energy charge of 8.79×10^7 megajoules. The power cell is now housed within a 45-degree curved grip for improved targeting and handling. Within the optronics and energy-manipulation section, the lithium-copper prefire chamber has been strengthened with the addition of a wound hafnium tritonide fiber layer, which allows a prefire chamber energy density and plasma pressure 15 percent higher than that of the previous type-2 unit. Control surfaces, response, and operation remain unchanged.

The earlier type-3 rifle phaser remains in Starfleet's fabrication database, though no new production copies have been produced in six years. Minor retrofits to the deployed units on Deep Space 9 include densified sarium-krellide cells, upgraded targeting scanners and isolinear processor, and prefire chamber reinforcement similar to that of the type-2 unit. The latest type-3b rifle unit supports a hot-swappable power cell with a total energy charge of 3.45×10^8 megajoules, a field-replaceable deuterium plasma generator, twelve-stage plasma accelerator, and five-stage cascading prefire chamber. At the terminus of the energy flow is the emitter crystal, also a lithium-copper superconductor like the prefire chamber. The plasma accelerator is critical to pumping the prefire chamber to the proper energy level for controllable nuclear disruption forces (NDF). Almost no classical thermal or other unwanted EM effects are present in the discharge beam. The superheated, rarefied plasma is exhausted past the emitter crystal in a focused stream. The plasma helps ensure that the crystal does not cool too quickly during firing.

The type-3b also boasts a new seeker/tracker, possessing both passive and active EM and subspace detectors. Like other phaser types, the tracking processor is coupled by STA to the onboard station safety system to constrain the rifle to setting 3, unless authorized by senior officer command override.



Starfleet side arms

Starfleet phaser in service configuration

Phaser rifle, type-3a

The type-3a compression phaser rifle is not currently deployed aboard Deep Space 9 due to limited Starfleet allocations, but is in use on certain frontline starships. The differences distinguishing the 3a from the base 3 unit are twin hot-swappable power cells, each holding 3.4 x 10^8 megajoules, and a split emitter resonator designed to tune and focus the outgoing beam.

BAJORAN PHASERS

The Bajoran phasers are technologically similar to Starfleet units and appear in the inventory of both the Bajoran station security crew and planetside defensive forces as a pistol model and a rifle model. The basic mechanism involves a superconducting crystal and power cell to pump it, though no prefire chamber is required to contain the energy prior to discharge. The Bajoran unit establishes an initial six-stranded energy beam at a relatively low power at the moment of trigger activation, followed within 0.00001 seconds by an amplified discharge that uses the initial beam to focus the primary energy onto the target. In effect, the first-stage beam acts as an energy-based prefire chamber.

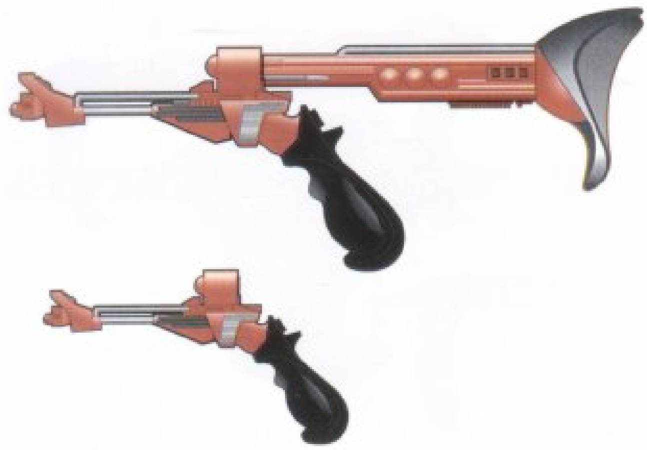
The power cell in the pistol model is a rechargeable isotolinium ampule, though some units have been retrofitted or sarium-krellide cells. The total energy charge is rated at 1.2 x 10^6 megajoules. Pistol units used aboard Deep Space 9 have been modified with partial STA components to conform to the Starfleet setting-3 limits.

The rifle model is a ruggedized and enlarged version of the pistol and supports a larger power cell. The rifle also contains a seeker/tracker, which operates primarily on IR and amplified biogenic fields. During the occupation, some early rifle units were outfitted with target discriminators; Bajoran fighters using coded biogenic transponders, in theory, would not be hit by friendly fire. In practice, few mêlées involving large numbers of Cardassian and Bajorans occurred in which the effectiveness of the target system could be proven. The current rifle is also constrained to setting 3 aboard the station, though it is more often deployed on away missions and on Bajor.

KLINGON DISRUPTORS AND BLADED WEAPONS

The current frontline Klingon energy weapon is the disruptor, which doubles as a rifle unit. The rifle extension includes a shoulder stock, as in the Bajoran rifle. The physics behind the disruptor involves the creation of a particle stream in which the total energy field per particle is so high that it cannot be contained for more than a few milliseconds. The field rapidly unwinds, and the instability releases the contained energy, disrupting any matter the

Bajoran side arms



Klingon side arms

beam contacts. The main components include a long-term capacitance power cell, forced-energy particle generator, triply redundant waveguide and accelerator stage, and beam emitter. The rifle components add an extended-charge capacitance cell, augmented accelerator for higher energy particle production, and induction coil assembly, necessary both for recharging the unit and powering the accelerator. The total measurable charge in the pistol is 1.2×10^7 megajoules, and 6.5×10^7 megajoules for the rifle.

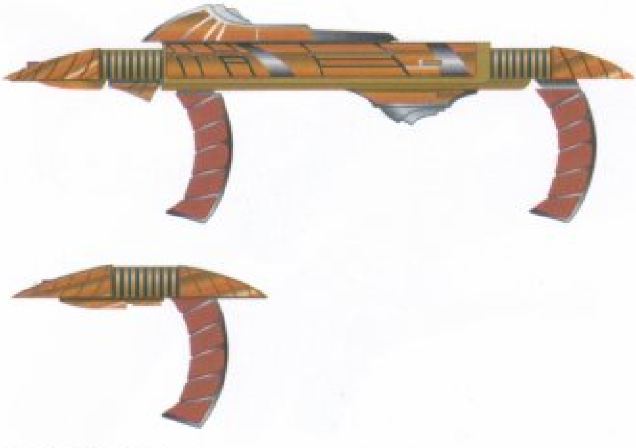
The principal Klingon bladed weapons include the *bat'leth*, *mek'leth*, and *d'k tahg*. A wide variety of other ceremonial knives and daggers fill the typical Klingon warrior's collection, but these three appear to be chosen most often for personal combat outside of the technological domain. The *bat'leth*, whose original design has long been attributed to the warrior Kahless the Unforgettable, is today a robust, multigripped main battle weapon constructed from *baakonite*, a metal similar in ductility and specific gravity to tritanium. The *mek'leth*, approximately half the length of the *bat'leth*, is equipped with one long and one short blade, and a single grip. *Mek'leth* fabrication is also from *baakonite*, though some units have been successfully made from dikeiferate, which has a density 1.18 times that of *baakonite*. As in most weapons designed for rapid, highly controlled maneuvers, a critical balance must be maintained between the overall mass required for striking inertia and the ability to move that mass by the person wielding it.

By far the most prevalent weapon to be carried by a warrior alongside the disruptor pistol is the *d'k tahg*. At least four variations of the three-bladed dagger have existed in the Klingon arsenal over the past century. Two types of *d'k tahg* have included articulated side blades and fit within a narrow sheath, and two have been constructed with fixed blades, housed within a somewhat wider sheath. Most are equipped with the familiar spiked grip end for downward or backward crushing movements. The present *d'k tahg* is typically fabricated from two alloys: *urs'ga rakch*, a dark metallic compound that strengthens with age and is used to form the handle; and *kar'kethet*, a naturally malleable alloy that converts to a single inelastic metal crystal with the application of 6,590° Celsius for seventy-two hours.

bat'leth

d'k tahg

mek'leth



Cardassian side arms

Jem'Hadar sidearms

CARDASSIAN PHASERS

The pistol and rifle units issued to soldiers of the Cardassian Union operate much as Bajoran phasers do, relying on a set of tightened focusing beams to carry the total weapon discharge. The emitter crystal is reinforced in a rodinium collar and is held by a split waveguide which performs the beam width and intensity adjustments commanded through the weapon controls. Aft of the emitter are the accelerator, beam generator, and power cell. The energy contained in the isotolinium ampule is rated at 3.2×10^7 megajoules in the pistol and 9.8×10^7 megajoules with added cells in the rifle. The only danger inherent in isotolinium for weapons use is that the charged liquid, if released in a single burst, can vaporize an unshielded mass equivalent to four cubic meters of tritanium. No recorded accidental detonations of a Cardassian weapon are present in any Starfleet database. Starfleet analysts continue to test captured specimens and research the reasons why no isotolinium-based explosives have ever been introduced into the Bajor theater.

JEM'HADAR WEAPONS

Starfleet engineers and weapons experts are also continuing to study captured Jem'Hadar energy weapons. Pistol and rifle disruptors exist in the arsenal of these genetically engineered soldiers. Neither unit possesses configurable energy settings; only a killing discharge level is emitted from the weapons. The mechanism used by the Jem'Hadar appears to center on a pulsed polaron beam generator, though a surrounding burst of high-energy gamma radiation often accompanies the polaron discharge. The gamma EM may be a result of fluctuations in the delivered power from the energy cells. Power is generated by a tritium microfusion reaction along the discharge centerline, and the energy is channeled into a phased polaron source, which holds an accumulated charge, in similar fashion to the Starfleet phaser prefire chamber. The process is automatic; by manufacture, the pent-up polaron charge tunnels through the emitter, a precisely shaped parabola of solid arkenium.

In certain instances, chemical enhancements can be added to the particle stream, including nerve agents, anticoagulants, and osteosolvents. In the event that an energy shot does not immediately cause death, the chemical agents may weaken or kill the target. This classic tactic of diminishing an opponent's forces by causing them to attend to their wounded appears to be well known to the Jem'Hadar. The total charge contained in the pistol is approximately 5.4×10^8 megajoules, and 1.54×10^9 megajoules in the rifle. Of particular importance is the ongoing effort to protect Starfleet and Bajoran assets against attacks using energetic polaron beams, which have historically defeated various defensive shield configurations.

10.5 DEFENSIVE SHIELDS

Deflector shield emitter locator

In their normal operating mode, the Deep Space 9 defensive shields are energized to repulse a wide range of natural and artificial dangers. The primary system involves three large shield generators mounted at the ends of horizontal boom arms just below ops. A secondary system of short-range shield emitters is installed at regular intervals around the outer edge of the Docking Ring. Both systems make use of original Terok Nor equipment with Starfleet power supply upgrades.

Unlike most starship defensive-field grids, the station fields are created by three overlapping polarized graviton emissions from highly localized discharge waveguides. The field energy alternates in upper and lower discharge vector extremes, providing coverage from the +Y to -Y poles at an average frequency of 4.54 megahertz. The EM and mass deflections occur when a wave or particle intersects two alternating emissions, creating repeated pulses of electromotive force perpendicular to the defensive shield "surface." The amount of electromotive rebound is inversely proportional to a tensor product involving the mass, energy potential, and velocity of the impacting force or object. Because most impacting events will have a dwell time at the shield surface of nearly 1.32 milliseconds, graviton force coupling causes the rebounding energy to concentrate on the event rather than become spread out over the entire shield. Starfleet R&D and Intelligence are confident, based on historical sensor data analysis, that the generators are almost identical to those installed aboard the *Galor*-class warships.

Three polarized graviton generators are housed within the ops/Upper Core interface connector at Levels 2 and 3. The dedicated EPS power supply conduits from the Upper Core deliver energized plasma to the generators through nine conduit branches for redundancy in the event of conduit failure due to mechanical problems or combat damage. In the latter category, the most common impediment to EPS power is a phenomenon known as EM backflash, which creates a traveling wave opposite to that of the plasma flow, effectively reducing necessary power to the graviton generators. As power is applied to the generators, they create streams of gravitons from regenerative beds of duralumin-gesselium ayanaminide, in similar fashion to the graviton releases from the environmental gravity net (see 11.3). The instantaneous power release at the generators is 450.5 megawatts, with shunts to nine phase-locked capacitance banks to boost the amplified power to 2,579.3 megawatts for durations of up to thirty-two seconds. Since no true subspace field distortion amplifiers are employed, the higher power levels normally desirable for short-period burst deflections are not controllable.

For most combat applications, Starfleet has improved on the computer control routines used to allocate shield energies according to incoming threat vectors. Large-scale celestial phenomena require switching to other "best-guess" probability trees in the predictive-adaptive control routines. Combat situations require that at least two of the three graviton generators be operational, with real-time graviton shunts around the nonoperational unit to ensure full shield bubble formation. A single generator can be used to cover the station, but only for 24.3 seconds if no reserve energy has been stored in the capacitance banks. With the banks at full charge, the single-generator operation time is extended to 61.2 seconds. These are not hard values, however, since numerous combinations of energy allocations, generator/emitter pulse configurations, and other factors will determine the exact defensive-field lifetime under crisis conditions.

The actual graviton field release takes place at the emitter blocks. Once the polarized gravitons leave each generator, they are transmitted through a series of three waveguides in the boom arm and arrive at the angled emitter block. Here they are split into 454 smaller waveguides for routing to a rapid-switching emitter controller, which performs the final polarization and vector determination for each pulse of gravitons. The order of graviton release and frequencies of the shield bubble are randomized within the ops defensive weapons subprocessors. This is standard procedure to minimize any threat force ability to match frequency windows and penetrate station defenses.

Heat dissipation is controlled by a set of four passive thermal-projection radiators on each emitter, as well as two active liquid sodium coolant loops per emitter tied into the fusion generators (see 5.1). Each loop can handle 120,000 megajoules of heat energy under normal conditions, and up to 370,000 megajoules in emergency forced dissipation mode through the station phaser strips.

Shield operation can be triggered by voice command, control panel inputs, and automatic activation subroutines. During heightened alert status, the auto-activation mode takes precedence. In theory, no weapon energy above 550 megawatts will penetrate the shield bubble in the first forty-three milliseconds, after which the shield will hold, then decline at a known rate under continued weapon fire. During full shield operation, external scanning capabilities are reduced by 15 percent, outgoing phaser-energy

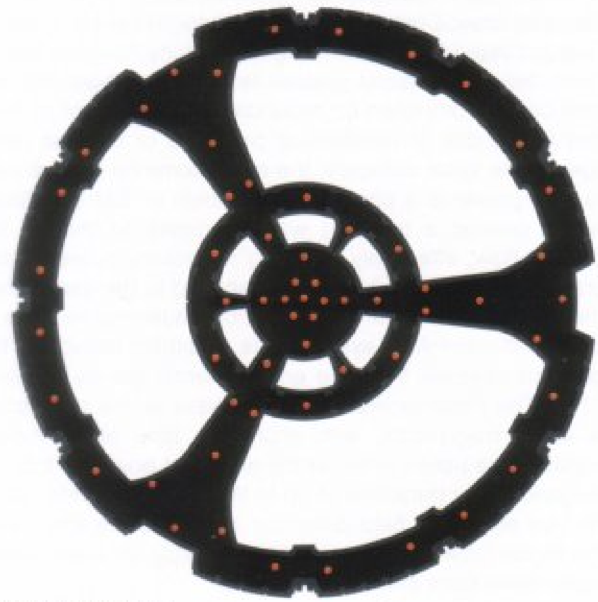
Deflector shield emitter and support arms

weapons must be frequency-locked to the second-order harmonics of the shield emissions to prevent shield overloading and beam rebounding, and outgoing torpedo weapons must have an active shield window transponder running. All impulse and warp vessels, including runabouts and shuttlecraft, must auto-respond to computer signals to shut down all active engines. If a spacecraft must enter or exit the shield, especially during combat conditions, a shield window transponder must be operating, with the proper embedded ID codes.

10.6 AUTO-DESTRUCT SYSTEMS

In 2371, the Cardassian-designed auto-destruct system sustained a single aborted activation. It had been designed into the original Terok Nor structure, presumably to deny the station to any hostile forces while under Cardassian rule by destroying it, in much the same way that Starfleet vessels would when faced with unstoppable threat forces. Why the Cardassians did not carry out the destruction of Terok Nor in 2369 is still the subject of much conjecture. In the time since Operation Return, the level of tensions in the Bajor Sector, coupled with the deployment of the *U.S.S. Defiant* and other assets, have compelled Starfleet to request an agreement with the Bajoran provisional government that the system be kept in place aboard Deep Space 9 and maintained at full readiness. Discussions were ongoing as of mid-2374.

Station residents and visitors have long been informed of the existence of the system, and most understand the risks associated with this aspect of life in a war zone. One section of the docking contract transmitted to commercial and exploratory vessels specifically requires the captain and owners of said vessels agree to hold the Bajoran provisional government, Starfleet Command, and the United Federation of Planets blameless for any losses incurred if those docked ships are damaged or destroyed during the station's auto-destruct command execution. The particular clause is a formality since, even in the worst simulated scenario, all affected vessels and personnel would have been ordered to leave before hostilities required the system to detonate.



Auto-destruct locator

COMMAND AUTHORIZATION

With the station under the operational custody of Starfleet Command and the Bajoran security forces, the computer authorization codes required for station destruction must be verified by one Starfleet and one Bajoran officer. All operational destruct software codes have been rewritten and placed within the Starfleet computer CPG, and all original Cardassian counterinsurgency program code discovered to date has been copied for analysis and deleted from the main computer. The present code will accept inputs from Starfleet personnel down to the position of the chief of operations and Bajoran security personnel down to the rank of lieutenant.

Predictive/adaptive computer routines in the CPG regularly monitor combadge signals, lifesign-sensor readings, and incoming subspace communications during major military actions to check for valid authorization codes. If the station commander and Bajoran chief of security are not available, the CPG checks for the succession of command personnel using rules established for Starfleet vessels. Verbal or keyboard input procedures requesting initiation and concurrence codes remain the same, as do destruct cancellation prior to T-minus-zero, when the system activates. Audible warnings in all represented languages on the station will sound, the specific language determined by the operational area in question. Warnings are also output through individual com devices. Warnings commence with the requested time-to-destruct setting and continue every fifteen seconds until the T-minus-one-minute mark, when the audible warning counts off each second. Graphics displays in all languages provide time-remaining information.

HARDWARE CONFIGURATION AND OPERATION

The original Cardassian detonation scheme involved a deliberate overload of the fusion-power generation system. At T minus zero, stored EPS energy would be channeled into the 1296 laser-pulse devices within the six main generators, 216 per unit. The deuterium fuel pellet stream nozzles, normally set to form 1.3-centimeter compressible pellets at a rate of 23 per second, open to form 2.7-centimeter pellets at nearly 150 per second. The laser-pulse focusing elements continuously adjust to fuse the larger pellets. The laser fusion compression rate rises dramatically within 0.14 seconds, and the resulting energy is routed back into the system. The generators cope with the accelerated thermal and higher-energy EM feedback by tightening the normal safety force fields, up to the point where the detonation energy overwhelms the structural and field containment. As the containment fails, all the remaining deuterium fuel fuses due to the progressing shockwave of the generator explosion, resulting in the total structural failure of the space station and partial vaporization of the expanding debris shell. The thermal energy release is theoretically comparable to 780 standard photon torpedoes, equivalent to 11,700 isotons.

The proposed Starfleet plans for enhancing the detonation process consist of adding up to ten matter-antimatter ordnance packages, ensuring that no recoverable pieces of classified information or hardware would survive to fall into the hands of threat forces. These packages would be derived from photon torpedo warheads, scaled up 1.5 times from what is normally installed in a torpedo casing. The detonation sequence would remain essentially the same, with the timing of the ordnance packages set so that they would detonate 0.23 seconds after the primary generator failure. Computer models indicate that earlier detonation would cause shockwave fratricide and counteract the effects of the fusion explosion. A secondary measure to back up the photon warhead in the event of their failure involves ramping up the station's defensive shield generators, increasing momentarily the EM density of the shield bubble to further contain the detonation and drive up the vaporization fraction.

Typical auto-destruct configuration

10.7 SPECIALIZED ORDNANCE

The most recent development in deployable ordnance from the Deep Space 9 weapons facilities is the self-replicating mine, a small but capable device that incorporated a networked replicator unit and a matter-antimatter warhead. The mine was first suggested by Diagnostic and Repair Technician Rom and fabricated in response to the impending invasion by the Jem'Hadar fleet late in 2373. A shell of mines was maneuvered to envelop the neutrino point source marking the opening of the wormhole.

The basic shell of the mine is adapted from an octagonal duranium cargo container 1.76 meters across and 1.85 meters tall, and outfitted with off-the-shelf equipment for detonation, station keeping, and replication for filling in gaps in the wormhole perimeter. The explosive system consists of a stripped-down standard photon torpedo warhead and includes only the central combiner tank into which the cryogenic deuterium and antideuterium have been premixed, but kept separated by a long-term toroidal magnetic field driver. The contact and proximity sensors would command the driver to collapse the field, allowing the matter and antimatter to detonate. Complete fuzing of the mine envelope was delayed until the entire shell was in place, in order to prevent warhead fratricide.

Station-keeping thrusters were cannibalized from a class-1 instrumented probe and connected to a single cold-gas nitrogen pressure tank. Modulation of the warhead magnetic field was also used to keep the mines aligned within a four-frequency icosahedon geodesic sphere. A neutrino source counter was incorporated into the sensor package to keep the mines at a uniform distance from the wormhole opening.

The replicator system was designed to accommodate a swarm detonation of up to twenty mines and still maintain the total shell. The replicator was a kludge of Cardassian and Starfleet types and included a raw-matter supply container able to contribute enough mass to build one-sixty-fifth of a complete mine. Mass for any one new mine was transported through the replicator's subspace emitters from as many mines away as was necessary, in a bucket-brigade system. As distributed over the entire shell, enough mass was stored to replace over 2,500 mines. In the event the mass supply dwindled below 85 percent, the replicator sections were designed to extract particles from the zero-point vacuum domain to replenish the system. The threshold was set deliberately high because of the long lead time required to produce small numbers of particle pairs.

The minefield was eventually taken down by antigraviton beams generated by the reconfigured station's deflector array while it was temporarily under the control of Gul Dukat, and shortly before the station was retaken by Starfleet and Klingon forces. The resulting matter-antimatter detonations had little effect on the wormhole, within which the Jem'Hadar fleet reinforcements had vanished.

Self-replicating mine

Self-replicating mine, service configuration

10.8 SECURITY CONSIDERATIONS

All hardware, data, and plans related to Starfleet and Bajoran defensive operations are subject to standard security procedures. The particular level of security is determined by type of system requiring restricted use, crisis level, and data sensitivity. Stand-alone hardware consumables, and chemicals and alloys are categorized as to potential security threats as sabotage agents and may be placed under restricted access rules.

Physical and computer access to major defensive hardware systems is limited to authorized Starfleet and Bajoran officers and crew, and other personnel with clearances of level-1. The restricted systems include station-mounted phasers, photon and quantum torpedoes, fusion power generation, computers, defensive shields, tractor beams, communications, and auto-destruct devices. Additionally, all personal phasers, powerpacks, photon grenades, and related battlefield equipment are protected in guarded armory sections in ops, Mid-Core, Lower Core, and Habitat Ring. Above a condition-3 conflict ranking, if time permits, all salvageable weapons and strategic materials will be transferred to available warp-capable ships.

Computer restricted access is typically handled by autonomous security routines in the CPG. Data terminals required for routine operation of the station will continue to function at all but the most dire conflict ranking of condition-5, in which the station is in immediate danger of falling to threat forces. Cascading terminal shutdowns and selective command lockouts will automatically isolate ops from the rest of the station, and inactive consoles can be reinitialized only with a combination of the proper decryption keystrokes and passcode voice commands.

All Starfleet strategic plans and tactical operations data can be accessed only by senior staff from certain consoles and remote padd-type devices. Screen graphics will automatically drop out and deep memory storage data may be purged if the authorized user is incapacitated or compromised, as determined by a combination of lifesign scans, periodic passcode requests, and other undisclosed methods.

10.9 TACTICAL POLICIES

Starfleet tactical policies, particularly in pursuit of Federation goals in the Bajor Sector, allow for a broad range of defensive operations and limited offensive missions in order to ensure the survival of the Bajoran people and the security of the wormhole. As long as the agreement with the Bajoran government stands, Federation interests in the sector will be preserved. Various options exist within the framework of the agreements and upward through the organization of the Federation that can be exercised, in the event Bajor breaks from Federation protection, to continue Starfleet operations in the sector if events demand, in order to maintain Federation security for the core star systems and allied worlds.

All possible measures to defend Deep Space 9 against threat force attacks are authorized under the present rules of engagement. These measures include heavily armed tactical security force movements within the station, force field containment, and border repulsion by any hardware systems available. Threat spacecraft incursions may be repulsed through available Starfleet and commandeered commercial vessels, and major invasion events will be countered by organized Starfleet and allied fleet formations.

The limited offensive operations include covert space vessel movements to cause the disruption of any activity deemed a danger to Starfleet, Deep Space 9, and Bajor, and ultimately the Federation. Threat assets of all types may be considered as targets for space, air, or ground assault. Additionally, intelligence operative insertions and extractions may be performed at any time, as well as eliminations of threat operatives whenever necessary. The total in-theater offensive operations per standard year authorized by the Federation Council nominally will be calculated as a factor of those tangible strategic impediments to the threat force that will drop that force to a less-than-equal balance that Starfleet for at least four months' time.

11.0 ENVIRONMENTAL SYSTEMS

11.1 LIFE SUPPORT AND ENVIRONMENTAL CONTROL

The hardware and consumables required for maintaining a habitable environment are distributed about key areas aboard Deep Space 9 and service all accessible volumes. All humanoid life-forms need water, foodstuffs, and breathing gas for basic survival; within an artificial environment, one also needs the systems needed to supply and recycle them. The significant environmental factors to be stabilized for comfortable living are pressure, temperature, humidity, and radiation, and to a lesser degree, gravity. Other related factors include the detection and elimination of contaminants in the biological intake, exposure to EM fields, and medical intervention in adverse environmental conditions.

Aboard Deep Space 9, the diverse nature of the resident population requires an equally diverse set of controllable environments, with common areas of the station accessible to a baseline standard for oxygen-breathing races (see 11.2).

Groupings of life-support subsystems, such as gas and liquids tanks and airflow venturis, are organized into primary, secondary, and reserve life-support facilities aboard the station. Most groupings are interconnected for maximum options in rerouting consumables in both benign and crisis conditions. Some 2,650 kilometers of additional ducting and fluid piping was added by Starfleet in 2369 to handle the redistributions. The secondary and reserve systems are not truly independent loops, but do provide backup valving and pumping capability in the event the primary systems falter.

Atmospheric chemistry subsystems and airflow handlers are located on Levels 1, 3, 6, 11, 15, 24, 30, and 36. Fluid storage and mixing tanks, plus associated transfer pumps, are located on Levels 1, 3, 8, 11, 15, 26, and 32. Multimode sensors for the total environmental system are located on all station levels and report to both local system controllers and the central computer cores for homeostasis command responses. Emergency situations that likely will overwhelm automatic responses will trigger crew actions with appropriate hardware, as in fire-fighting situations, hull breaches, and so on. Emergency supplies of stored breathing gases, foodstuffs, and protective garments are distributed about the station (see 13.1), independent of the consumables distribution network.

The general Starfleet requirements for Deep Space 9 life support are as follows:

- **Environmental specifications.** Environmental systems to conform to SFRA-standard 104.12 for class-M compatible oxygen-breathing personnel. All primary systems to be doubly redundant. Atmospheric and fluid transfer systems to be maintained with 4,850-hour MTBF components.
- **Population limit.** Ability to support up to 25,000 total crew, residential, and transient personnel.
- **Environmental range.** Facilities to support class-M environmental range in all individual living quarters, provisions for 25 percent of quarters to support class-H, -K, and -L environmental conditions. Transient facilities to include an additional 3 percent class-B, -N, and -C environments.
- **Radiation protection.** All habitable volumes to be protected to SFRA-standard 354.32(c, d) levels for RF, subspace, and nuclear EM. Subspace flux differential to be maintained within 0.02 millicochranes. All primary environmental shielding systems to be doubly redundant.

11.2 ATMOSPHERIC SYSTEM

Like most class-M-compatible systems aboard starships and starbases, the atmospheric system aboard Deep Space 9 maintains an oxygen-nitrogen atmosphere at a prescribed pressure, temperature, and humidity. Nominal atmospheric values for the common areas of the station differs slightly from Starfleet Standard 102.19, at 25° Celsius, 45% relative humidity, with pressure maintained at 99.7 kilopascals (748 millimeters of mercury). Atmospheric composition also differs, to accommodate most Bajoran nationals, at 77% nitrogen, 21% oxygen, and 2% trace gases, mostly argon, helium, and xenon. The new conditions have been added to the SFRA database as Standard 104.12.

All of the original Cardassian charged-stream airflow units remain in place with minor modifications to the electrostatic grids with Starfleet EPS regulators. The grid devices temporarily charge the air in the unit, apply a motive force to the air mass via an eight-stage magnetic coil assembly, and recycle the charge before the gases leave the unit. The overall exit pressure is regulated by a combination of physical constrictor valves and magnetic-coil power level. Large units in the core assemblies, Habitat Ring, and Docking Ring are designed to handle up to 80 m^3 per minute. Smaller units can move up to 43 m^3 per minute. The air handlers also control temperature and humidity via a series of EPS warmers and chillers, and water vaporizers and dehumidifiers. Supply gas analyzers check the safety of the air being transferred. Temperature and humidity levels are computer controlled by room, section, level, or entire assembly, and most areas can be configured by voice command. Specific areas requiring critical environmental control are configurable only by authorized crew members.

Silenced inflow vents are present in all habitable spaces and are organized upstream into ducting from 8.3 centimeters across to as large as 1.2 meters across. Return ducting is similar in size and organization; in some cases, both directions are handled within a single divided duct. Most ducting is protected from outgassing migration from adjacent systems as well as resistant to medium-level radiation effects. Additions of stored gas can be made at computer-controlled valve inputs along the ducting or incorporated into the airflow handlers. Some provisions were made for crowd control gas input, using anesthezine analogs. These input ports were located mainly in the Promenade, Lower Core, and ore processing facilities in the pylons.

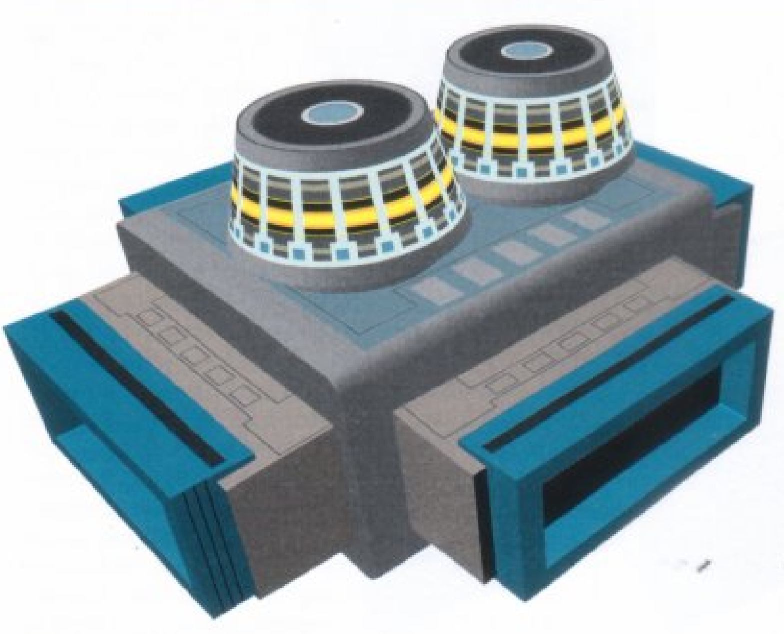
Return airflow enters the system via the return vent plates in most areas. Prior to being reintroduced into the supply ducting, the air within each loop is channeled through a carbon dioxide scrubber, return gas analyzer, suspended particulate filter, and organics removal grid. Waste gases are separated by molecular type, condensed, liquefied, and either stored or vented overboard. In some cases, molecularly bound oxygen and nitrogen is uncoupled and returned to the general breathing gas supply.

EMERGENCY SUPPLIES AND PROCEDURES

In emergency conditions, designated sections of the station can be isolated as emergency shelters, a practice that has worked well with most starbases and fleet vessels. Supply and return ducting can be closed off for a number of possible scenarios, either preventing unwanted flow into an area or preventing atmosphere from escaping. Inbound flows containing chemical or biological agents can be stopped automatically or by crew command. Hull breaches in adjacent sections, through which air can escape, can be closed off by a combination of barometrically activated valves and force fields.

Controlled breathing gas infusions can be accessed by console, padd, or voice command, or with manual valves. Scrubbers and overboard pressure-relief valves for each emergency shelter can also be activated by the same methods. Because the total station atmospheric volume versus interior pressure is high, most predicted decompression dangers will allow crew and residents up to two hours to head to shelters or evacuation spacecraft. This is more than adequate time for repair crews to converge on the breach internally with EVA suits and externally with Work Bee pods (see 14.3). Major damage to Upper Pylon 3 during hostile action resulted in a massive, explosive decompression in only twelve compartments, since all major bulkheads were sealed prior to the attack.

Once Deep Space 9 had been retaken, significant swapouts and resupply missions brought additional emergency equipment to the station, including temporary pressure suits and contingency atmosphere supply modules (CASM). All have been taken from equipment rotations originally scheduled for delivery to starships damaged or destroyed in Operation Return and other actions. The current emergency pressure garment (EPG) has a lifetime of three hours in low tidal mode breathing, with electrochemical recycling. The CASM units can support eight people for fifty-two hours, given that the set-up area has a breathable atmosphere to begin with. Tests within a twenty-one–m^3 sealed area starting at 0.00 atmospheres indicate that a CASM can sustain eight people for 30.5 hours.



CASM

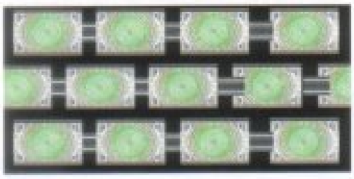
11.3 GRAVITY GENERATION

The original Cardassian gravity generator net remains in place aboard Deep Space 9, with minor enhancements and periodic maintenance. It operates on principles similar to those used in Starfleet vessel and starbase gravity generators and tractor beams, though the actual configuration of the graviton device and arrangement of distribution nodes are different.

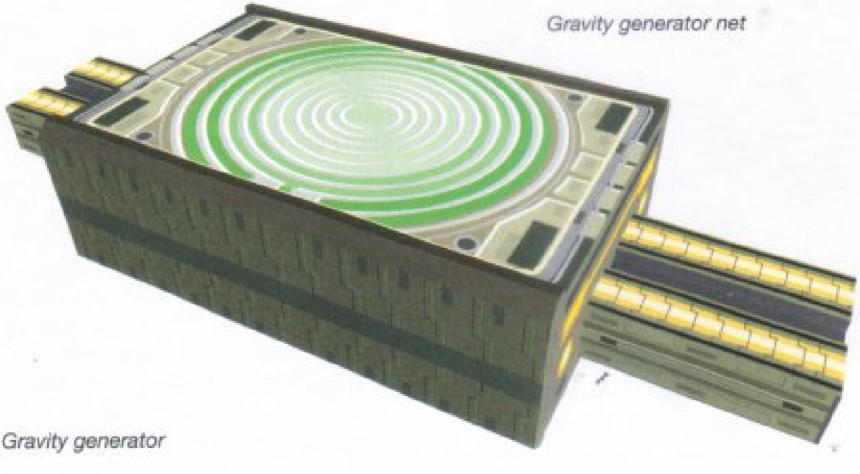
Central to the Cardassian design is a graviton emitter block. The emitter utilizes no free-moving parts as in the Starfleet rotor-stator type, but rather generates gravitons from high-speed vibrations set up in a forced-matrix metal-composite block. The block is fabricated from alternating single-molecule layers of duralumin and gesselium ayanaminide, which creates the subatomic spaces necessary for the formation and liberation of gravitons with the proper attractive force. The dorsal surface of the block is etched by focused proton beams with circular collimation patterns, allowing the emitted graviton waves to form the proper crests and troughs for comfortable motion though the installed area. A 0.03 percent gravity gradient is unavoidable using this scheme, but is tolerable by 99.3 percent of the station residents and visitors. The emitter block is encased in a cured composite resin of semacryl butanide with exposed EPS microconduits available for connection to a small EPS step-down manifold.

The emitter block measures 8.34 centimeters in width by 13.53 centimeters in length by 5.29 centimeters thick. The emitter casing and EPS leads measure 9.67 centimeters by 14.86 centimeters by 6.62 centimeters. A single emitter creates roughly one-twentieth the coupling force of a Starfleet gravity generator and is usually installed in 5-by-5 matrix mats containing twenty-five blocks. The total combined force of a single mat at full power approximates the acceleration conditions on Cardassia Prime, 1.15*g*. Each mat manifold is connected to the general utility conduits on each station level. The layered nature of the emitter block allows for a delayed tail-off of the graviton field in the event of an EPS interruption. Subspace capacitance effects assume the load of providing residual gravitons for up to forty-eight minutes. In areas where the graviton field is not necessary, the stored EPS charge can be extracted back into the power grid for emergency applications.

Gravity mats are installed within all habitable and work spaces on Deep Space 9. Stored spares amounting to a 15 percent backup inventory were located in the Habitat Ring and have been dispersed to various engineering repair sites around the station. The number of mats per unit volume drops off within the ore-processing spaces within the Docking Pylons, presumably to aid in the transfer of heavy masses in the vicinity of the matter separators and refining furnaces. Six areas within the Lower Core, between Levels 24 and 28, were found to have their gravity mats turned off and were discovered to be low-*g* environmental laboratories. Starfleet engineering modifications to this system have involved reconfigurations in the critical areas of ops, environmental control, Habitat Ring, and Docking Ring. The changes include quadruple redundancy achieved in gravity-mat EPS taps, additional backup Starfleet gravity generators installed, and computer controls for all gravity mats upgraded to respond to programming from the Starfleet CPG.



Gravity generator net



Gravity generator

11.4 CONSUMABLES STORAGE AND DISTRIBUTION

As with other major space vessels and free-floating facilities, Deep Space 9 maintains a continuous matter flow of all forms, including breathing gases, potable fluids, fuels, ingestible solids, chemicals, and various raw and manufactured goods. Temporary storage areas are present in all major station structures and are arranged according to the requirements for the specific areas. All consumables reaching the station from docked ships are processed through the Transited Cargo Inspection stations at each docking port and cargo transporter pad prior to turbolift routing and cargo bay holding assignments. Once cleared for station use, consumables are loaded into the proper supply tanks, bins, and lockers for further distribution. Consumables destined for individual merchants do not join the general supply and are maintained by those merchants in leased holding areas.

General-use breathing gases in the form of nitrogen, oxygen, argon, helium, and xenon are stored in 428 pressure tanks on all levels around the station and connected to the primary, secondary, and reserve life support systems. The tanks range in size from 1.2 by 3.6 meters to 3.1 by 6.8 meters, with operating pressures from 200 atmospheres to 306 atmospheres. Nonstandard gases are stored in an additional 173 static and portable 0.52 by 2.1 centimeter tanks. Fill, vent, and purge lines to the tanks are maintained as part of the general periodic maintenance (PM) on the environmental control systems. Some waste gases are liquefied and separated for research and industrial uses, or are vented into space.

Potable fluids, mainly distilled water as well as that produced from hydrogen-oxygen fuel cells, are stored in eighty-seven polysteel tanks, each measuring 8.2 by 12.3 meters, with a capacity of 210.9 m^3, for a total volume of 18,350.47 m^3. Most of the fluid tanks reside on Levels 10, 13, and 16. As with the breathing gases, the water tanks are connected to the main nodes of the environmental control system. All additional fluids for food and medical use are stored in thirty-seven smaller spherical tanks 7.0 meters across, each with a capacity of 195.89 m^3. All other specialized fluids in quantities below 195.89 m^3 are stored in isolated tanks appropriate for each type and hazard level. Return flow and recycling storage is stored in eight to ten of the eighty-seven main tanks.

Primary food storage is handled by twenty-three large polysteel tanks connected to the replicator network. These tanks measure 7.6 by 13.2 meters and hold 183.86 m^3 each, totalling 4,228.78 m^3. The raw fiber and nutrient matrix is drawn off by electrohydraulic conduits and reduced in the replicator transmission processors prior to proportioning and reassembly at the user site. No return solids are stored in these tanks unless those solids are replicated foodstuffs re-entered for system uptake. Nutrient materials for nongeneral use are stored separately in eight warehousing sections on Levels 9, 11, 13, and 18.

Deuterium fuels for Deep Space 9 power plants are produced off-station and delivered by tanker and other vessels and are stored in dedicated tankage on Levels 30 and 32 (see 5.2). Antimatter for Starfleet spacecraft is also produced off-station and delivered by unannounced starships. Antimatter is typically loaded onto the station in standard magnetic containment pods, though magnetic suspension antideuterium transfers have been made directly into the storage system conduits. Most antimatter pods are installed immediately into their respective ships awaiting refueling.

Security measures in protecting the food supply and other materials have been of vital concern, given the history of hostilities in the quadrant. Hazardous materials, biogenic weapons, computer virus attacks, and other dangers are targets of multiredundant scans by Bajoran and Starfleet teams. Life-threatening incidents have occurred, and station personnel remain alert for all threat agent acts of sabotage.

11.5 WASTE MANAGEMENT

Like most starships, Deep Space 9 benefits from stringent waste management and materials-recycling protocols. In some cases, recycling is mandatory, since many materials have been in short supply due to ongoing conflict. Starfleet and Bajoran techniques have been melded to achieve an efficient level of matter reduction per unit cost in energy. Any material deemed too costly in energy (and therefore deuterium fuel) allocation to process is either stored or discarded through various means. Certain reduced materials of even limited strategic value will be retained or moved by Starfleet ship.

Waste water from all sources, including residential, commercial, and experimental spaces, is collected and processed. Normally, water-usage areas of similar type remain routed through separate loops for ease of recycling. The original Terok Nor fluid system was evaluated for engineering integrity, difficulty of operation, and chemical and biological safety. All systems were deemed usable by Starfleet, though additional reclamation and safety equipment was installed on all major loops. All microscopic and macroscopic materials are filtered out and fractionated. Organic residues are biologically deactivated, reduced to CHON (carbon, hydrogen, oxygen, and nitrogen) compounds, and reintroduced into the raw storage tanks for replicator and scientific use. The Cardassian and Bajoran recycling units typically produce a continuous flash-electrolysis product of hydrogen and oxygen, which immediately exits through a fuel-cell bed to produce pure water and usable EPS current.

Solid wastes for recycling are mechanically reduced to 0.01-millimeter fragments by combined sonic and EM field emitters. Materials are separated by specific gravity and further reduced to melts or powders by thermal means, usually EPS or phaser. Most materials that can be reduced to CHON compounds are returned to replicator stock or longer term storage. Metals, particularly strong forced-matrix alloys, can be reduced to elemental form by EM matrix uncoupling, akin to replicator or transporter material manipulation, at an energy cost proportional to the bonding energy of the atomic structure. Alloy samples of like type can be fused and reentered in the station's usable stores. All other simple matter conversions can be handled by the replicators.

Hazardous waste materials of strategic reuse value may not be immediately rendered harmless, and may be stored in protected cargo bays, (see 11.4). Those substances categorized as storables are contained, sealed, recorded, and separated into chemicals, biologicals, geologics, and metallics. Any material from any source not able to be broken down by normal methods, whether mechanical, thermal, EM, or subspace, is placed under restricted access for study by Starfleet and Federation science facilities.

12.0 PERSONNEL SUPPORT SYSTEMS

12.1 PERSONNEL SUPPORT

Since the custodial handover of Terok Nor to Starfleet, numerous changes have been made to the meager Cardassian support system, so that today Deep Space 9 is a true scientific and commercial center in the Alpha Quadrant. The fact that the station has also been a hotly contested property in the center of a war zone has not deterred the residents and commercial operators from carrying on their lives. The present conditions are a vast improvement over what Starfleet engineers and intelligence operatives found when they first arrived.

Structural repairs and cleanup work eventually led to the institution and growth of shopping, trading, restaurant, and educational facilities, primarily on the Promenade. Holoenvironment suites have been expanded at Quark's, the central bar and gaming establishment in Arc 1 of the 360-degree common area. Medical facilities have been augmented with the latest equipment and supplies. The security office has been expanded to include additional computer records systems, forensic analysis gear, and holding cells. The Bajoran presence on Deep Space 9 was strengthened with the establishment of the shrine, which has become a welcome refuge for Bajoran citizens and members of the religious orders. Ongoing work within the Habitat Ring has produced comfortable senior staff, crew, and resident quarters from the spartan Cardassian accommodations. Retaking the station from the Cardassian and Dominion forces required some systems recoveries and cosmetic interior repairs, but this work was relatively minor compared to that required at the original handover.

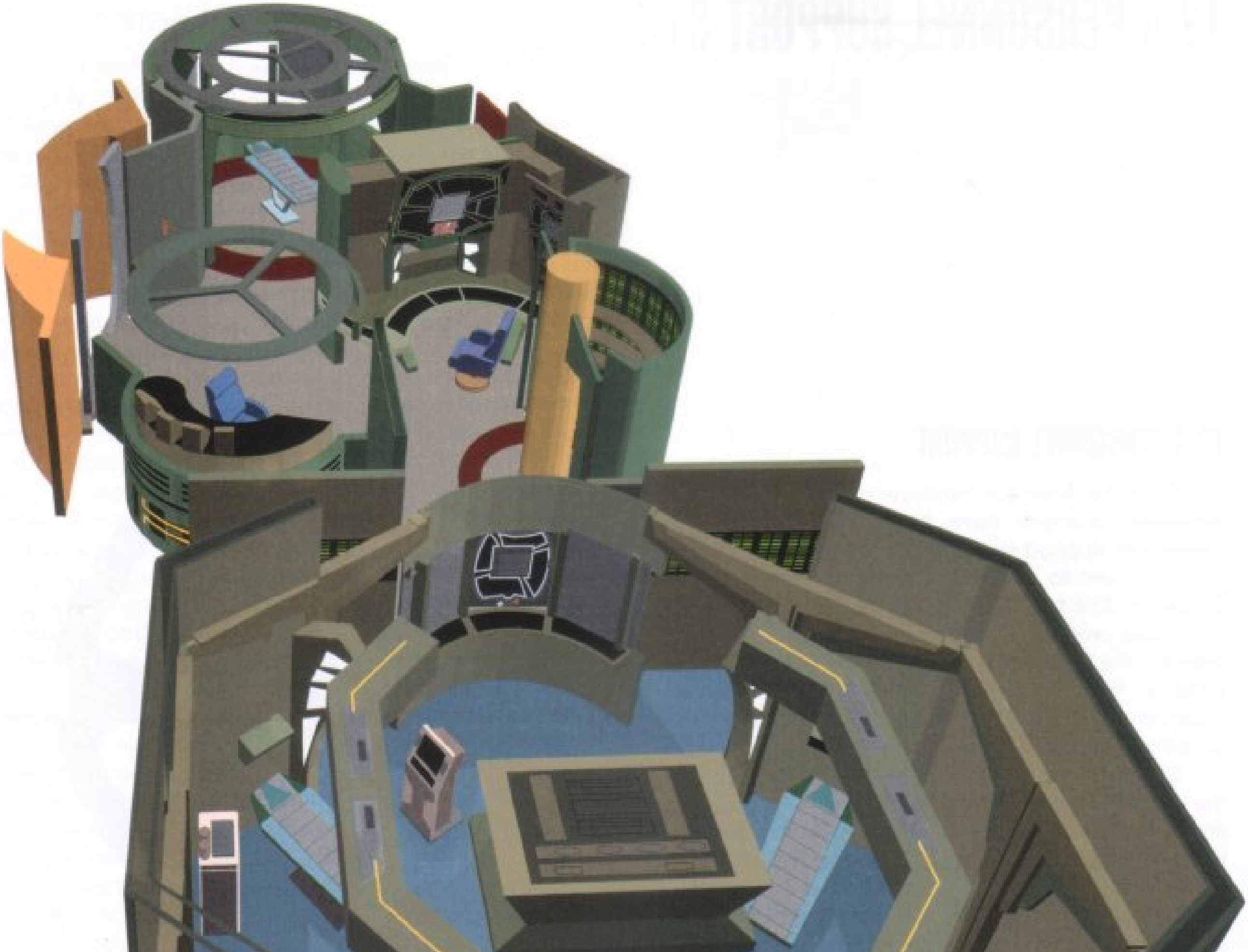
12.2 MEDICAL FACILITIES AND SYSTEMS

The primary medical care facility aboard Deep Space 9 is the infirmary located on the Promenade lower level. The nature of the station as a convergent point for large numbers of Alpha Quadrant races has placed unique demands on the staff and available systems from a basic biological science standpoint. Wartime operations have placed a different set of demands on the facility in the area of emergency treatment.

Infirmary locator

FACILITIES

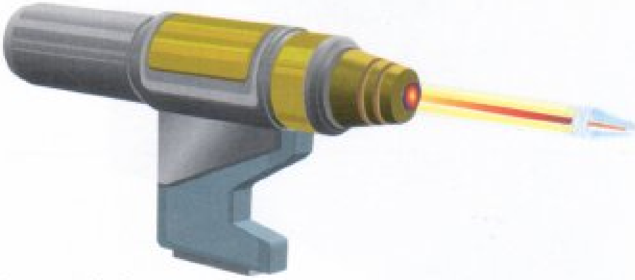
The infirmary consists of a collection of rooms (along Arc 1) with its entrance set in the outer pedestrian walkway. The main sections are the surgical suite, diagnostic and research center, and medical intensive-care ward. Two large noncritical-care wards are located in the Mid-Core on Level 13, and forty-five smaller unattended stations are distributed about Deep Space 9 for initial emergency treatments prior to transfers to the infirmary. While critical patient movements can be made by transporter within a ten-second window, transfers may involve distances of up to two kilometers by turbolift in the event the transporters are unavailable. Patient transfers from the runabout pads are normally quick moves through the crossover bridges and up to the Promenade, and any incoming patients brought through the large docking ports are also quickly moved through the bridges.



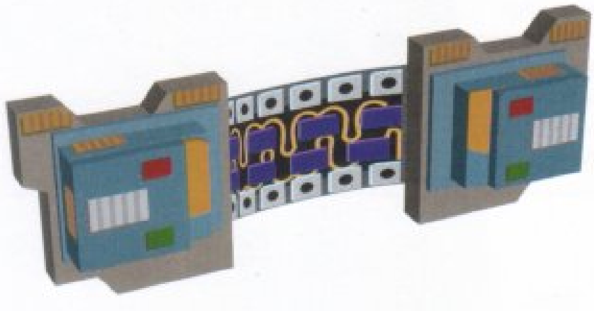
Infirmary

Blood infuser

Defibrillator



Laser scalpel



Neural stimulator

Other related medical facilities located in the Habitat Ring and Mid-Core are physical therapy suites, microgravity research lab, dental care office, immunological lab, stereotaxonomy lab, and EM cytology analysis lab. While there is no dedicated biohazard-isolation section, most habitable spaces close to the medical labs can be quickly converted to isolation units through the use of force fields.

STAFF

Normal infirmary and medical department staffing is ten staff physicians, five of whom are expected to have undergone emergency medical training; nine medical technicians; and a mixed complement of twenty Starfleet and Bajoran certified nurses. The normal 8.75-hour duty shift in the infirmary proper involves one staff physician, two nurses, and two medical technicians. The remaining staff are distributed to the laboratories and other research suites and are rotated to the infirmary in three shifts per twenty-six-hour day. An overlap of some ten minutes allows the shifts to exchange updates during changeover. Research laboratory personnel not directly assigned to the infirmary rotation number anywhere between fifteen and twenty-five, and are Starfleet, Bajoran, or independent scientists and technicians who have brought special projects to Deep Space 9.

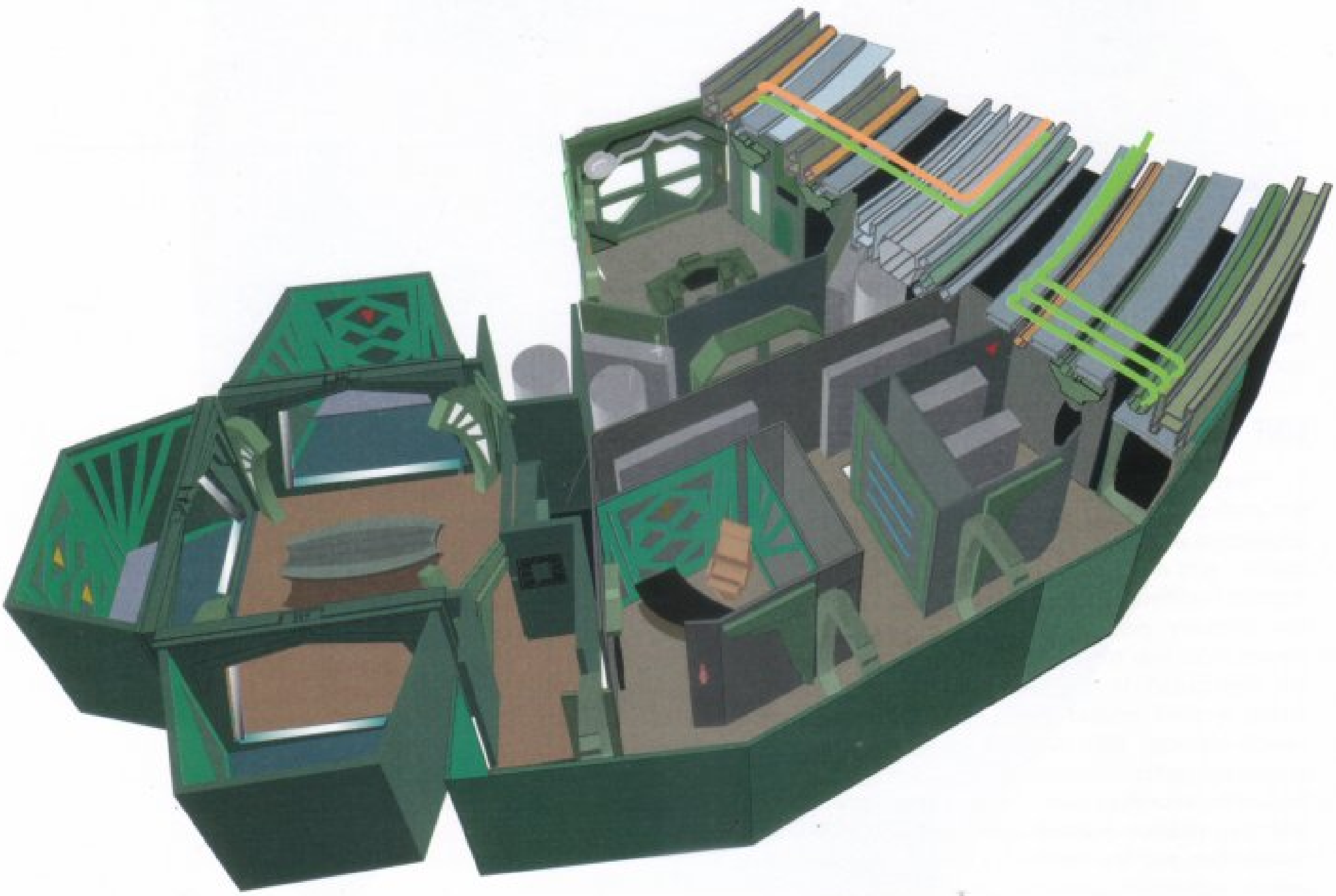
Hypospray

12.3 SECURITY FACILITIES

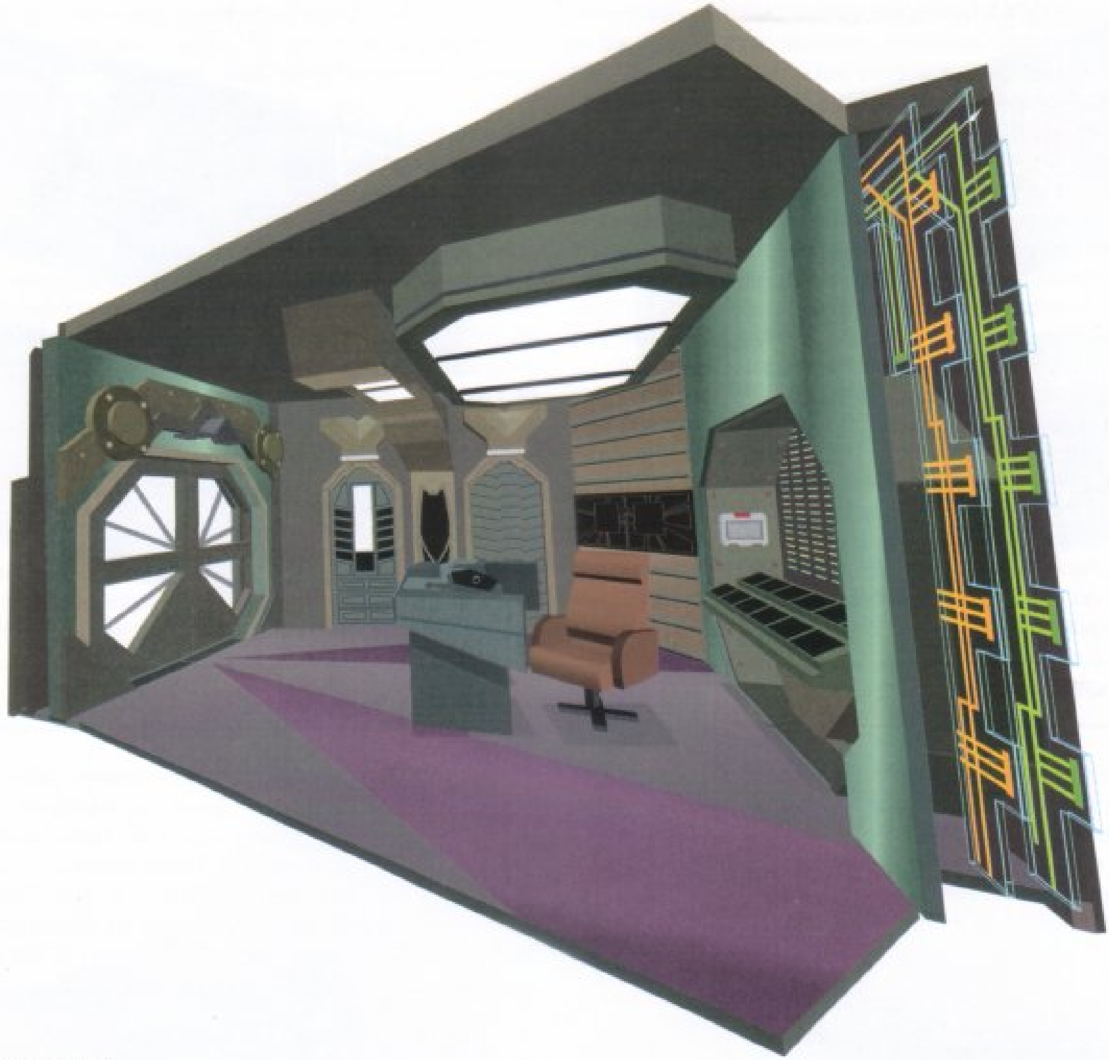
The internal protection of the total Deep Space 9 orbital station is controlled from the security office (located in Arc 1 of the Promenade). This department has been overseen by Chief of Security Odo, and since 2369 has included both Starfleet and Bajoran security personnel. The department is concerned with the internal volume of the station, and so external defensive operations involving Deep Space 9 or allied spacecraft are not normally involved and are left to Starfleet officials. The physical layout of the office includes the lockable office entryway and chief of security's office, access corridors, records storage and computing center, forensics laboratory, armory, holding-cell control entryway, and three holding cells. Additional holding facilities are available in Arcs 2 and 3 around the Promenade and in the Mid-Core assembly of the station.

The access corridors are set inboard of the main outer Upper Core access ring and connect the various compartments of the department. As with the systems access tunnels, these passageways are protected with duranium sheeting to prevent unauthorized scans.

Security locator



Security



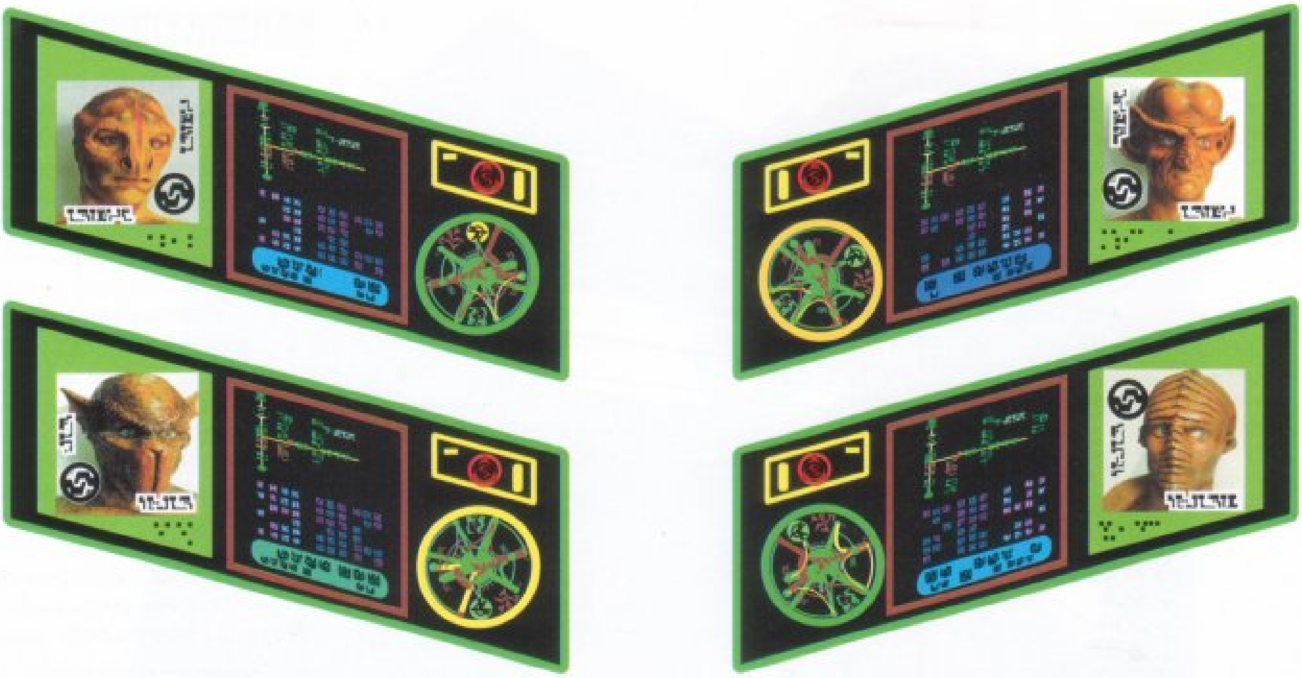
Chief of Security's office

The Chief of Security's office is equipped with computer access consoles for logging daily activities, analyzing evidence, and studying details of cases. The computer capabilities include protected storage and stand-alone processors to minimize information theft and sabotage. The security department computers are connected to the main cores for deep encrypted storage and additional data access. The computers consist of twin isolinear rod arrays with a total processing and storage capacity of 5.4 megaquads.

The forensics laboratory is equipped with physical-evidence scanners covering all biological and inorganic substances. The available gear is similar to that found in the infirmary laboratory facilities and is optimized for criminal investigations. Miniaturized versions of most forensic analysis gear can be packed into a portable kit for on-site work within the station or for away missions. Evidence storage is provided for tissues and materials requiring special preservation methods, including inert gas suspension, cryogenic freezing, and stasis fields.

The armory holds most security-force phasers and restraint devices used in normal operations. The department armory supports twenty-five Starfleet type-2 phasers, eighteen Bajoran pistol phasers, twelve Starfleet type-3 rifles, and twelve Bajoran rifles, plus their respective charging clamps. The normal supply of 30 trackable cuff restraints is augmented by 250 kemminide polymer restraint strips for lower-risk individuals. The armory also supplies a variety of covert intelligence-gathering devices used to counter smuggling, illegal financial activities, and political insurrections. Additional weapons are stored in the general Starfleet armory sections and are available according to specific Starfleet weapons operations rules.

The holding cell section is accessed through the outer security perimeter corridor. Suspects and visitors are checked in at the control desk and then brought to the



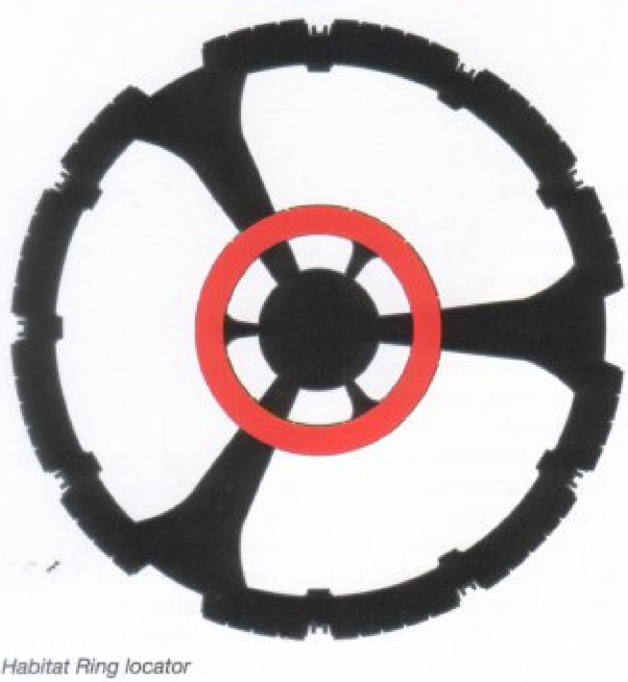
Typical security criminal activity logs

central cell area. Suspects are held within three adjoining cells and are retrained by standard planar force fields. All force field devices are Cardassian with Starfleet EPS regulators to control plasma-current levels. In the event of an emergency that might overwhelm the security office physical structure, all prisoners are placed in trackable cuffs and escorted to a safe environment.

12.4 CREW AND RESIDENT QUARTERS

The primary grouping of living quarters is contained within the Habitat Ring, the first major assembly outboard of the Mid-Core. This ring is connected both to the Mid-Core and Docking Ring via two types of structures: the three large crossover bridges and three smaller crossover bridges. The latter extend only to the Habitat Ring and do not continue to the Docking Ring. The Habitat Ring consists of five levels, designated Levels 11-15, or Habitat Levels 1-5. Continuous 360-degree circular corridors connect most levels within the ring, except for interruptions to accommodate the runabout launch and maintenance bays.

Some 452 large residential quarters were originally constructed by the Cardassians, reserved for high-ranking officers. Another 231 smaller quarters were assigned to lower-ranking officers and some Bajoran nationals working for the Cardassians. The current Habitat Ring assignments are given to Starfleet and Bajoran crews, diplomats and other dignitaries, and some commercial operators and transient ship crews. The large quarters typically spanned four or five window bays, and the smaller units spanned two or three window bays. Since the handover, some of the non-load-bearing divider walls have been moved about to create custom-built spaces. These spaces include some duplicate personnel services found in the Promenade, emergency medical services, emergency space operations hardware, and auxiliary laboratory areas. A total of 343



Habitat Ring locator

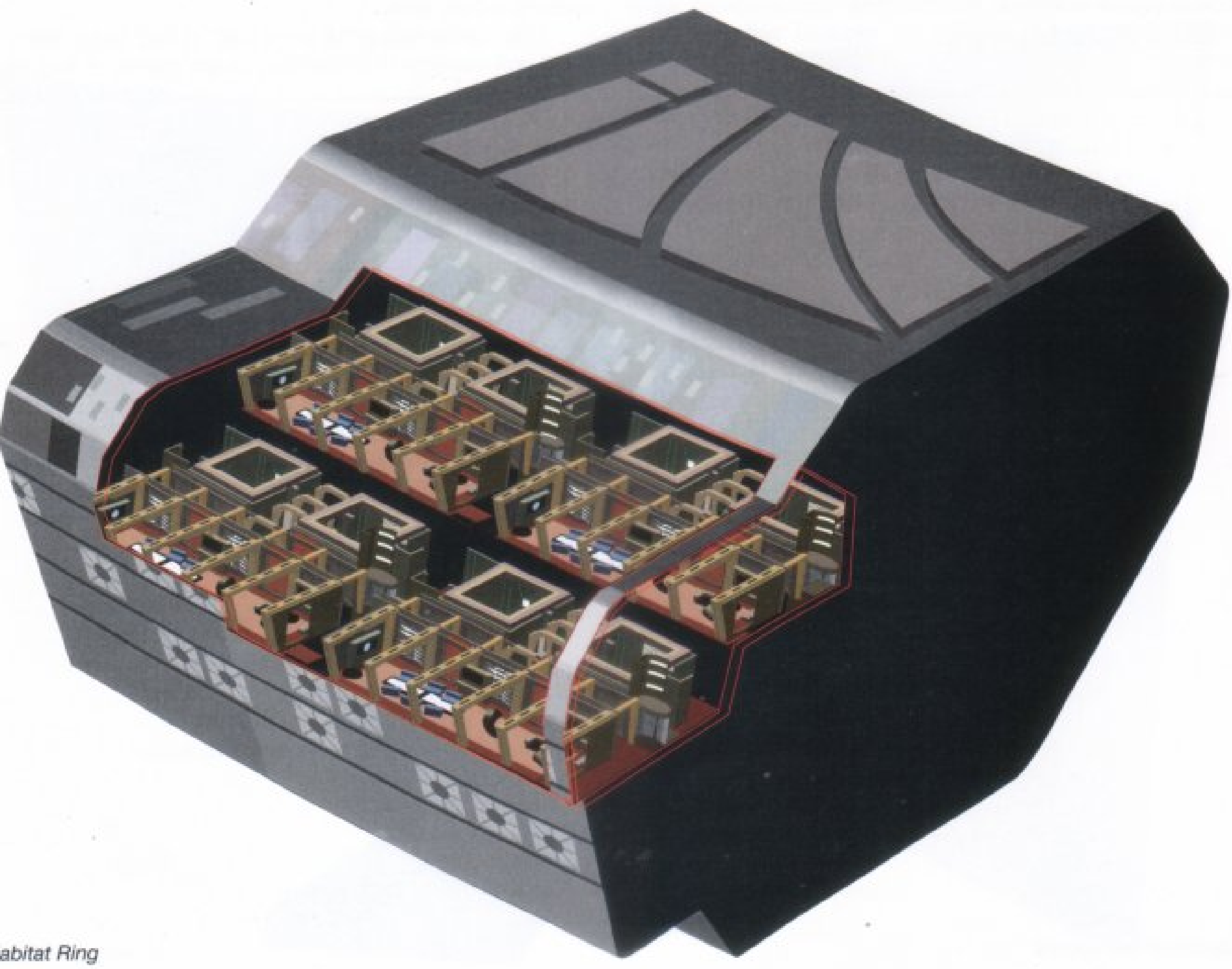
additional quarters are maintained in the Mid-Core for overflow transient ship crews, for some engineering and security support personnel, and as contingency accommodations for evacuees or refugees.

The typical Habitat Ring residential space set into the outboard structural area includes a few large transparent aluminum windows, room partitions, a replicator, wash facilities, and connections for EPS-powered devices, com systems, and computer terminals.

The windows are equipped with opacity controls set into the innermost structural layer. When set for automatic operation, the shading level is ramped up and down by isolinear processor to prevent full sunlight from entering the room. All opacity controllers can be set manually to create a totally opaque surface or diffuse lighting source, or any intermediate setting. The individual rooms are usually set into a linear arrangement of central living room with entryway, followed by one or more bedrooms, with washrooms attached to the far ends of each bedroom. Some transverse corridors in the Habitat Ring are closed off to produce short hallways within a particular residence.

Replicators are the original Cardassian units, which have been checked out by the present engineering crews to the best of their abilities; numerous operational glitches and Cardassian computer viruses already discovered have been purged. Some Starfleet food replicators have been installed in some areas of the Habitat Ring as a handy adjunct to the Promenade food services (see 12.5). The washing facilities typically include a sink, toilet, and sonic shower. Not all Cardassian quarters were originally equipped with the sonic shower modules; as with other types of requisitioned gear, a number of Starfleet sonic showers were rotated out from normal starbase and starship salvage.

Power and consumables connections for the residence units include EPS user power, RF and subspace com links, and hardline ODN circuits. Most of the EPS user devices employ induction-power transfers, so that few EPS connections are required as breakouts through the wall paneling. The RF and subspace microantennae required for combadge and computer terminal handshaking are embedded within the ceilings and walls and provide nearly continuous coverage throughout the station. The ODN fiber line connections are primarily for high-speed, secure communications and



Habitat Ring

computer operations and work with most short-range encrypted IR, UV, and subspace converters built into Starfleet and allied desktop and console units. All residences are also provided with entertainment and news channels through the room audio systems and display screens.

Standard environment for the units is that of class-M planets. Twenty-five percent of all quarters have been augmented with semipermanent breathing-gas and liquids-processing modules and subfloor connections to support class-H, -K, and -L environmental conditions. Transient facilities have been augmented to support an additional three percent class-B, -N, and -C environments, with reinforcements applied to the compartment force field systems to constrain non-class-M substances. In these cases, most interior walls and furnishings have been fabricated from compatible materials or sealed with anticorrosion agents.

The units are also equipped with audible emergency warning repeaters, configured for the exact location within the Habitat Ring or Mid-Core assembly. These repeaters are triggered by authorized security personnel and direct all Deep Space 9 inhabitants regarding the specific procedures required for a particular situation. Evacuation routes are calculated within the computer core and sent to each room. Space vessel dockings, lifeboat units, and sheltered areas are all considered in creating the required traffic-flow patterns.

12.5 FOOD REPLICATION SYSTEM

The crew-support replicators are located in nearly all residences and other key locations on the station. These units are used primarily to replicate potable liquids and foodstuffs, though small inorganic items can be produced, limited only by the physical volume of the replicator chamber. In most cases, the matter to be replicated is stored as a high-resolution data template within the main computer core, or within a local isolinear data storage module. The local storage devices are often more efficient in retrieving popular menu items.

Cardassian units built into the original Terok Nor facility have been augmented by a limited number of Starfleet replicators from ship salvage rotation. Starfleet units have been modified to include a small molecular matrix unit, eliminating the need for extensive matter-stream waveguides within the station, normally employed aboard starships to transmit the matter streams from large remote matrix units. The Cardassian replicators utilize small, individual matrix-field manipulation devices. In place of the high-power matter-stream waveguides, lower-power raw nutrient and foodstuff conduits are provided from the intermediate supply tanks.

The Cardassian units were built in two basic sizes, a small unit capable of dispensing single dishes or two bev-

Cardassian replicators

erages, and a larger unit designed for multiple items over a longer operational interval. The smaller unit is equipped with quick-swapout isolinear storage rods for template changes and is located in areas where connections to the main computer might be interrupted, as in ops. The larger unit maintains an isolinear component that is rewritable from the control panel or a padd and requires engineering assistance for swapouts. A Starfleet replicator is similar in that it stores food and inorganic-object templates in isolinear form. The units can be grouped in order to service larger numbers of personnel and take advantage of shared data storage, power, and raw-matter conduits.

In the case of creating a new data template, the object to be replicated is placed within the chamber, and a series of molecular imaging scanners reads the quantum geometry of the material, in a manner similar to that employed in transporters. Most early Starfleet production-version replicators were not designed with imaging scanners, though a few were placed aboard each starship and starbase in order to enter new items into the database and to break down used dishware for return to the general matter supply.

Overall raw food stock is maintained as a subset of the general matter supply. Replenishment is handled through the cargo-processing bays in the Docking Ring. Approximately 91 percent of the food items replicated on the station can be recovered and reused through the use of standard osmotic and electrolytic fractioning of waste materials, plus replicator uptake recycling. Uptake recycling is slightly more energy intensive, but in large batches can be a time-efficient method of restocking the raw supplies, as well as separating reusable food materials from inorganics that cannot be broken down further.

Improvements made to test sections of the Cardassian replicator system have entailed 3.5 percent increases in the molecular resolution, resulting in a measurable increase in nutritional efficiency. Single-bit errors are still common, though the results continue to be generally untasted by most users. As with other parts of the personnel support system, most of the foodstuffs stored in the replicator database are tailored for life-forms from class-M worlds, with close to 30 percent of the templates adjusted for cultures with specialized nutrient, temperature, pressure, or radiation intake needs.

Standard replicator

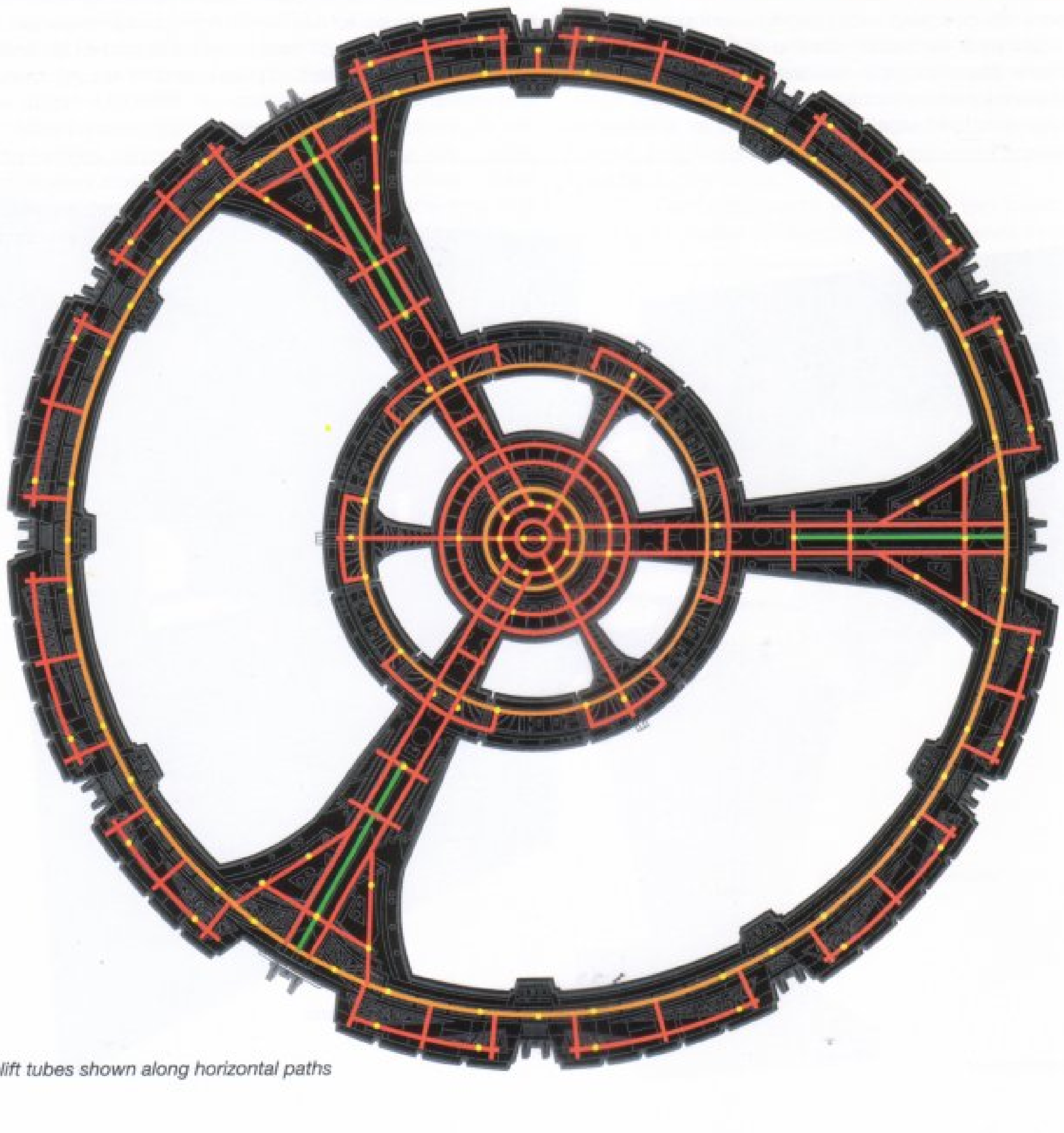
High volume replicator

Starfleet replicators

12.6 TURBOLIFT TRANSPORT SYSTEMS

Powered intrastation transportation for personnel and cargo is accomplished by the existing turbolift system. Two distinct networks provide access to all habitable and operational areas of Deep Space 9: the personnel turbo system and the cargo transfer system. The personnel turbo system reaches all 34 levels of the Station Core and 252 levels of the Docking Pylons by open-cage mobile platforms with a capacity of six persons. The larger-capacity cargo transfer system accesses all spacecraft berthing facilities in the Docking Ring and Docking Pylons, and cargo bays in the crossover bridges, Mid-Core, and Lower Core.

The personnel turbo network consists of some 16.54 kilometers of energized tube guides divided among three identical main pathway layouts and varied subbranches. All three main arteries are interconnected to provide maximum flexibility in tracing routes from origin to destination. The longest possible pathway, from an Upper Docking Pylon to any Lower Docking Pylon, measures 2.3 kilometers and can be made in approximately 123 seconds, at a peak velocity of 17 meters per second. While there are no dedicated emergency turbo paths, the routing software for all personnel turbo cabs was designed with the ability to commanded rapid reassignments to evacuation stations for waiting Cardassian officers. The cargo-transfer network has been optimized for moving large quantities of ore, processed materials, and cargo along twin wide magrail guideways. Turbos moving through the Docking



Tubolift tubes shown along horizontal paths

Ring and crossover bridges were often formed into multi-cab trains working in opposite directions. These were essentially all horizontal in the local gravity frame. Vertical movement within the Docking Pylons, which contained the ore-processing facilities, required the trains of turbo cabs to separate and travel in sequence along the perpendicular guideways.

Each personnel turbo cab is a combination of kelindide and toranium framing beams and duranium skin panels surrounding the internal linear induction motor systems. The occupied area is open to the turboshaft, due partly to mass considerations and partly to emergency escape opportunities; most shaft access doors can be opened from inside. Two synchronized maglev motors pick up EPS power through induction circuits from conduits built into the shaft walls. The EPS energy is converted into multiphase alternating current, which powers a series of fifteen maglev coils. The coil-energizing order determines the movement direction and is controlled by an onboard isolinear data processor. The individual turbo cab processors, rather than an overall computer control system, sense other cabs within the network and automatically perform velocity changes, collision-avoidance routines, and standby duty stops, depending on their programming. Cabs are not equipped with true inertial damping field generators but are protected by a pseudo-IDF effect provided by the guideway EPS conduit coatings, which emit low-level polarized gravitons.

During the occupation, the turbo system access was controlled by a combination of security passcode devices similar to combadges and security scanners. Many areas of the station remain restricted to civilians, and most passcode keys have been replaced with updated thermal, retinal, and voice-data security scan systems. Turbolift operation is performed by voice direction or manual destination input on a data panel. Level numbers, common station area names, or specific station locator section codes are addressable by the onboard processor. Startup movement by the cab begins at 0.2 meters per second and then accelerates once in the main traffic pattern.

Tubolift car

12.7 COMMERCIAL FACILITIES

The principal commercial space aboard Deep Space is the Promenade. The physical arrangement places it within the Upper Core assembly, protected by the defensive shield generators above and the reactive shield wall below. The Promenade is divided into three 120-degree arcs, each arc defined by structural reinforcements capable of lockdown utilizing compartment-type doors and force fields. The space is further divided into three floors, consisting of Levels 5, 6, and 7. The lowest space containing the majority of the shops and food services occupies Level 7. The middle floor on Level 6 provides a view through the large, elongated windows, plus some office and storage areas. The uppermost area, Level 5, is taken up by holosuites, structural core access, and storage spaces. Around the base of the lower level runs a long, circular corridor, which provides access to the freight-handling areas and additional access to the security gates and turbolifts.

The Level 7 concourse provides a wide range of shops, trading posts, services, entertainment, and food establishments, plus the Bajoran temple. Commercial space is controlled by the Deep Space 9 Merchants Association and is leased by the cubic meter, in addition to partition construction and utilities costs for EPS power, common gas and fluid supplies, and ODN connections. The number and type of merchants will vary from time to time, though the occupied volume is typically around 82 percent. The open shops and services that can usually be found include spacecraft and other hardware-spares traders, systems repair shops, clothing shops, mineralogical assay stations, rare *objet d'art* dealers, spacecraft and planetary salvage operators, a schoolroom, expedition outfitters, communications gear dealers, and chemical and alloy suppliers. Normally, any merchants known to deal in major weapons systems are prohibited from working out of Deep Space 9, as part of the Starfleet-Bajor agreements, though some smuggling and deal facilitations have occurred on the station.

Food and entertainment are as varied as the other types of shops. By far the largest purveyor of food and drink on the station continues to be Quark's bar, located along the centerline of Arc 1 and impossible not to notice. Quark's also offers the station population and visiting crews games of chance, notably dabo and *tongo*, as well as an engaging mix of holosuite programs. Other food services have included a Klingon restaurant, a *jumja* stick kiosk, and the Replimat.

The Promenade

The Replimat is a self-serve facility providing multiple Cardassian food replicators, and it offers menus from many different worlds, with the exception of Ferengi meals. It has long been a favorite spot with station residents and visiting crews for quick bites and the Klingon coffee, *raktajino*.

While not a commercial facility, the Bajoran temple is nevertheless situated within the main hub of personnel movement. It has been built and furnished in the style of the temples on Bajor, based on architectural forms dating back to the ancient city of B'hala. Bajoran residents and visitors use the Promenade temple for daily prayers and meditations, as part of their search for guidance from the Prophets. The station's temple has been a temporary holding area for some of the Orbs received from the wormhole entities.

13.0 EMERGENCY OPERATIONS

13.1 INTRODUCTION TO EMERGENCY OPERATIONS

The potential for loss of life aboard Deep Space 9 is considered to be higher than that calculated for starship operations, based on the numbers of unknown dangers from threat forces, covert activities, privateers, and elusive systems failures. Collectively, starship security and systems maintenance is by no means perfect but is more easily quantifiable and historically represents an extremely safe environment. Starfleet military actions leading to high ship-loss numbers have served to make the organization that much more cognizant of the effort required to keep its crews safe and to move them to survivable areas should the situation turn grave. These lessons are being adapted for use aboard remote outposts such as Deep Space 9, where the added responsibility of providing for the safety of additional civilians and cultural leaders is analogous to that found in major planetary centers.

The primary dangers faced by the station inhabitants include fires from combustion and EPS sources, epidemic spread of bacteriological and viral agents, poison and other biohostile substance releases, energy-weapon firings, hull breaches from natural disasters, and direct attacks on Deep Space 9 from enemy actions, both internal and external. Specific procedures have been established for emergencies on the station and are practiced periodically with Starfleet and Bajoran crews. Drills involving transient personnel from other cultures are conducted as necessary, especially in cases concerning hazardous cargo and VIPs requiring special protection.

Firefighting crews are trained in the operation of suppression force field devices and extinguisher technology, evacuation procedures, and first aid techniques. Medical staff from the infirmary and associated laboratory departments are prepared to treat victims of trauma and biological agents and will seek to eliminate the causes as time permits. Engineering crews work with complex space systems to ensure that evacuations are performed safely and efficiently with onboard lifeboat craft, runabouts, shuttles, and starships, and will deal with any systems or structural breakdowns within their purview.

Early warning is vital to the combined crew's ability to deal with rising danger levels. Computer monitoring of all systems, threat analysis, security sensor vigilance, and intelligence gathering all contribute to minimizing the loss of personnel and equipment assets. Technological and intuitive decision making are both utilized in keeping Deep Space 9 safe.

13.2 FIRE SUPPRESSION

The accidental or deliberate combustion of materials aboard Deep Space 9 is an ongoing concern. Today, a wide range of situations exist that could trigger an automatic fire-suppression system or require the deployment of trained crews to extinguish an uncontrolled thermal reaction. While most station materials do not support combustion by themselves, numerous structural and decorative items can react with exotic chemicals or energy sources. The recent history of the station has seen numerous weapons discharges, explosives detonations, and high-energy EM field effects that have been proved lethal, but would have resulted in greater loss of life without the activation of onboard firefighting measures.

Most Cardassian fire-detection systems had been installed in the Terok Nor command center, Habitat Ring, and Lower Core, with less coverage in the Docking Ring, Docking Pylons, and Mid-Core. Few if any sensor packages were installed in the Upper Core where the Promenade is now situated, though EPS power connectors and ODN junctions for additional sensors had been built into the structure. It is clear from even casual observation that the Cardassians had concentrated these emergency systems in their own protected areas, with little regard for the station's Bajoran workforce. Starfleet upgrade work had not yet completed the total emergency detection grid by 2373, but enough coverage was currently in place to allow station security to respond in rapid order.

No station-wide installation of containment force fields had been considered by the Cardassians, though some sensitive areas, like laboratories and high-value consumables storage bays, did receive limited-range field emitters. There is no data record of any of the emitters having been tripped, and current maintenance checks indicate the systems would work properly. Some fifty-eight additional Starfleet fire-suppression field devices have been tied into the emergency ODN net, so that coverage is brought up to the minimum SFRA Standard 613.4 d for starbases and research outposts.

All Starfleet and Bajoran static and deployable firefighting gear currently on the station include nozzle/conduit assemblies dispensing nitrilimane halofoam or fluoromane gas, depending on the nature of the combustion, as well as storable diemathyl gel extinguishers. These high-pressure gel atomizers have been particularly effective in quenching EM discharges. Other devices and procedures in place follow typical starship practices of isolating affected sections of habitable areas with auto-sealing doors and venting dangerously involved fire areas to space.

13.3 EMERGENCY MEDICAL OPERATIONS

The well-known procedures for dealing with medical emergencies aboard starships and starbases have been adapted for execution aboard Deep Space 9. Disaster plans have evolved in the years since the station handover and are meant to cover, through computer-generated prediction trees, every possible permutation of biological and physical ordeal. The relative proportion of trained medical crew to potential patients is much smaller than that encountered on the typical frontline starship, which would tend to make a station-wide catastrophe difficult to manage. However, at least 20 percent of the combined Starfleet-Bajoran crew have been cross-trained for various secondary assignments in emergency medical, triage, and other disaster-response functions.

During most predicted station-wide emergencies, all ten staff physicians, nine medical technicians, and twenty nurses would be called up to form the initial rapid-response medical team. Rotations of staff members and cross-trained crew would be initiated after the first fifteen hours, if the situation were not stabilized by that time. All qualified laboratory and medical engineering specialists available on the station are also pressed into service. All contingency medical stations in the Habitat Ring will be activated by medical department personnel and placed on alert status.

Each contingency medical station contains what amounts to a smaller scale copy of the infirmary, with limitations on specialized surgical hardware and amounts of standard supplies. Medical tricorders and small overhead sensor clusters provide rapid comprehensive scanning capabilities, and the collected data can be fed to semiautomated diagnostic and treatment gear. The contingency station computer processors adjust the operating modes of the equipment to match the qualification ranking of the personnel performing the medical procedures. The goal of the contingency system is to provide patient care ranging from simple walk-in needs to organ-system stabilization prior to movement of a patient to the infirmary or other department section.

Typical emergency medical kit

The most compact emergency care system is the portable medical kit. Also adapted from standard-issue starship medical gear, the medkit is equipped to perform scanning, diagnostic, and treatment functions, plus database management and computer interface operations. The medkit normally contains one medical tricorder, two multimode hyposprays, one dermal regenerator, one blood infuser, one defibrillator, one padd, and one neural stimulator. The case also houses a variety of injectable fluids, bandages, device powerpacks, 6.5-kiloquad isolinear processor, and subspace transceiver assembly. Medkits are issued to qualified department staff members and are distributed about Deep Space 9 in key locations in all major structural assemblies. Some eighty-five medkits from new stores and salvage rotations have been moved to the station.

Depending on the level of the emergency, the chief medical officer will issue orders covering quarantine, compartment conversion for additional patient load, and evacuation. Resident quarters can be set up as quarantine facilities with the use of entryway and bulkhead force fields and can be adjusted to class-H, -K, -L, -B, or -N environmental conditions if not previously set up for those conditions. Expansion beyond the infirmary for increased patient load normally begins in the laboratory spaces, then moves to Habitat Ring quarters and Mid-Core quarters; in certain large-scale disaster scenarios, the Docking Ring cargo bays and Lower Core assembly can be converted. Depending on the severity of the disaster, various combinations of recommended procedures would be offered by the computer.

13.4 EMERGENCY SPACE HARDWARE

The designers of Terok Nor provided for limited emergency operations and personnel escape from the space station in the event of a catastrophic failure of onboard systems, external attack, or cosmic threat. Since the arrival of the first Starfleet engineering crews to secure the new Deep Space 9, all serviceable Cardassian equipment has been run through rigorous checkout procedures. Allocations of Starfleet emergency equipment have been added to increase the survival chances of station crew and residents. The Starfleet equipment includes thirty-five standard lifeboats in the form of ASRVs, fifty-five EPGs, and thirty-eight SEWGs. All Starfleet equipment has been culled from starship and starbase supplies that had reached their primary operational lifetimes, but were still well within safety parameters.

The equipment abandoned in place by the Cardassians includes lifeboats and temporary-use survival suits, the latter determined to be at least thirty years old and in unusable condition. No robust EVA pressure suits similar to Starfleet SEWG garments were ever found—although numerous recharging stations were discovered—and it is thought that all EVA gear used in the construction and maintenance of Terok Nor was collected and transported away when the Cardassians retreated. The lifeboat design is thought by Starfleet Intelligence to be the most advanced type produced by the Cardassian engineering bureaus in 2352 (see illustration). The abandoned units had been dated as seven years old at the time of the station turnover. Additionally, the design appears to incorporate innovations common to Starfleet hardware built at approximately the same time. As such, industrial espionage is suspected to have played a major role in the completion of the lifeboat upgrades. It is interesting to note that only twenty-seven lifeboats were deployed at Terok Nor, because only senior Cardassian officers down to the rank of gil were to be accommodated in the event of an evacuation. This suspicion has been confirmed by former and current Bajoran personnel serving aboard the station. The lifeboats were apparently designed to be activated primarily in short-notice cases where evacuation to docked ships or shuttles was not possible.

LIFEBOAT CONFIGURATION AND OPERATION

The lifeboat is characterized by a set of clipped-corner trapezoids describing a pressurized upper environmental cabin and a sealed lower equipment bay, connected by four thruster housings. The overall dimensions are 3.74 meters on a side by 4.69 meters high, sized to fit within launch tubes set into the Habitat Ring ventral surface. Construction is primarily beznium tellenite and neffium-copper-borocarbide for both internal framing and double-walled skins. Frame alloy gamma-welding has been copied directly from Starfleet five-axis programming, with the application of microexplosive melt fasteners unique to Cardassian methods in the hull skinning. Minimal hull penetrations have been made for umbilicals, consistent with simplified fabrication techniques and long-term propellant and consumables storage. Reinforcing plates have been added to most exposed surfaces to provide maximum thermal and impact protection, and the entire shell has been plasma-sprayed with a thirteen-millimeter thick coating of rodinium and toranium.

The total mass is 4.68 metric tonnes for structure and fuel, and 3.1 kilograms dedicated to mid- and post-transit survival consumables. Starfleet analysts have confirmed that while Terok Nor was in orbit about Bajor, the lifeboats were capable of sustaining six Cardassians for barely eighteen minutes while the craft performed a powered descent to the planet's surface. The Starfleet ASRV, by comparison, was designed for a wider range of flight situations and can operate up to one year with onboard recycling. However, it must be said that this Cardassian design is highly reliable within its prescribed localized flight

Cardassian lifeboat

Starfleet standard extravehicular work garment (SEWG) environment and able to withstand large-scale operational stresses. More importantly, most Cardassian interstellar vessels, like the *Galor*-class warship, do employ ASRV-type lifeboats capable of performing over longer times and distances.

Lifeboat propulsion consists of a three-part system operating on a single isolinear navigation processor and event timer. The first section activates an argine initiator that propels the lifeboat downward away from its launch cavity. The event timer then fires pyro valves to sever the initiator circuits and automatically activate the second section, a force-feedback RCS that commands small microfusion thrusters to align and maintain the lifeboat's deorbit attitude. Upon reaching the correct angle and distance from the station, the timer fires the main engine in deorbit mode, propelling the lifeboat in a prograde orbital direction toward a predetermined touchdown location on Bajor. Typical maximum accelerations imparted to the crew reach 9.5*g*, necessary to leave the destruct radius of the station in the case of total weapons and fusion-generator detonation. Upon arrival at Bajor, the main engine fires in touchdown mode to set the lifeboat on the surface. Deceleration forces typically reach 12.5*g* in the final 25.8 seconds before ground contact.

Since the transfer of custody of the station and its move to the Denorios Belt, Bajoran and Starfleet authorities have recorded the disposition of the twenty-seven Cardassian lifeboats as follows:

- 5—Tested to destruction by Starfleet R&D and Bajoran Defense Forces
- 2—Disassembled, analyzed, and stored at undisclosed Starfleet locations
- 8—Upgraded and transferred to Bajor orbital facilities
- 12—Upgraded to interplanetary flight capability and retained at Deep Space 9

EVA SPACESUITS

The current operational EVA pressure suit used aboard Deep Space 9 is Starfleet's Type-3 SEWG. This model is characterized by modular construction designed to fit from 38 to 76 percentile humanoid personnel. Torso, leg, boot, glove, and helmet assemblies are built in fifteen different sizes to allow for a wide range of body morphologies. The life support backpack and chest plate are furnished in three different sizes to accommodate different mission requirements and allow for custom loading of atmospheric gases, cooling liquids, recycling gear, power supplies, and communication equipment.

The average suit empty mass is 19.6 kilograms, and 30.1 kilograms with backpack and full consumables loading. All flexible inner pressure bladders are constructed from fifty-nine alternating microlayers of duranium hexylamide and 2,1,3 polyurmedane, with a total thickness of 0.86 centimeters. The outer thermal micrometeoroid covering consists of sixty-one layers of woven disellenide-carbonitrium fibers jacketed with plasma-sprayed silica excelerine, with a total thickness of 1.2 centimeters. The helmet, backpack, and chest plate are typically molded from aluminum borotritonide, and standard transparent aluminum is employed in the helmet faceplates.

As in previous versions of the SEWG, an average consumables load of 9.6 kilograms of nitrogen-oxygen is designed to last a minimum of sixteen hours, and twenty hours in low tidal mode with maximum recycling. Suit power, provided by six sarium-krellide cells, is rated at a total of 95.6 kilowatt-hours, which exceeds by 15 percent the power required for three optional suites of external sensors and isolinear data recorders. The total power available for EVA missions is increased to 114.6 kilowatt-hours with the addition of a hot-gas thruster maneuvering unit.

II. STARFLEET, ALLIED, AND THREAT VESSELS

STARFLEET COMMAND
UNITED FEDERATION OF PLANETS

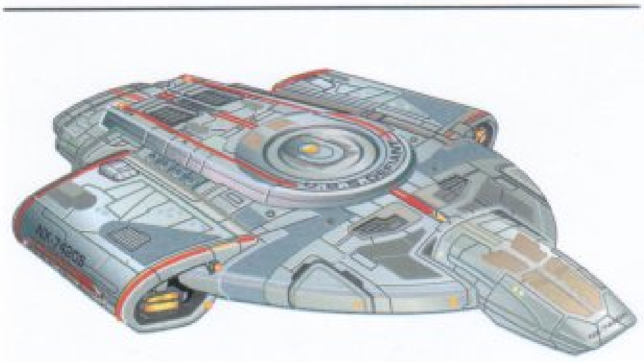
14.0 STARFLEET SUPPORT SPACECRAFT

14.1 U.S.S. DEFIANT

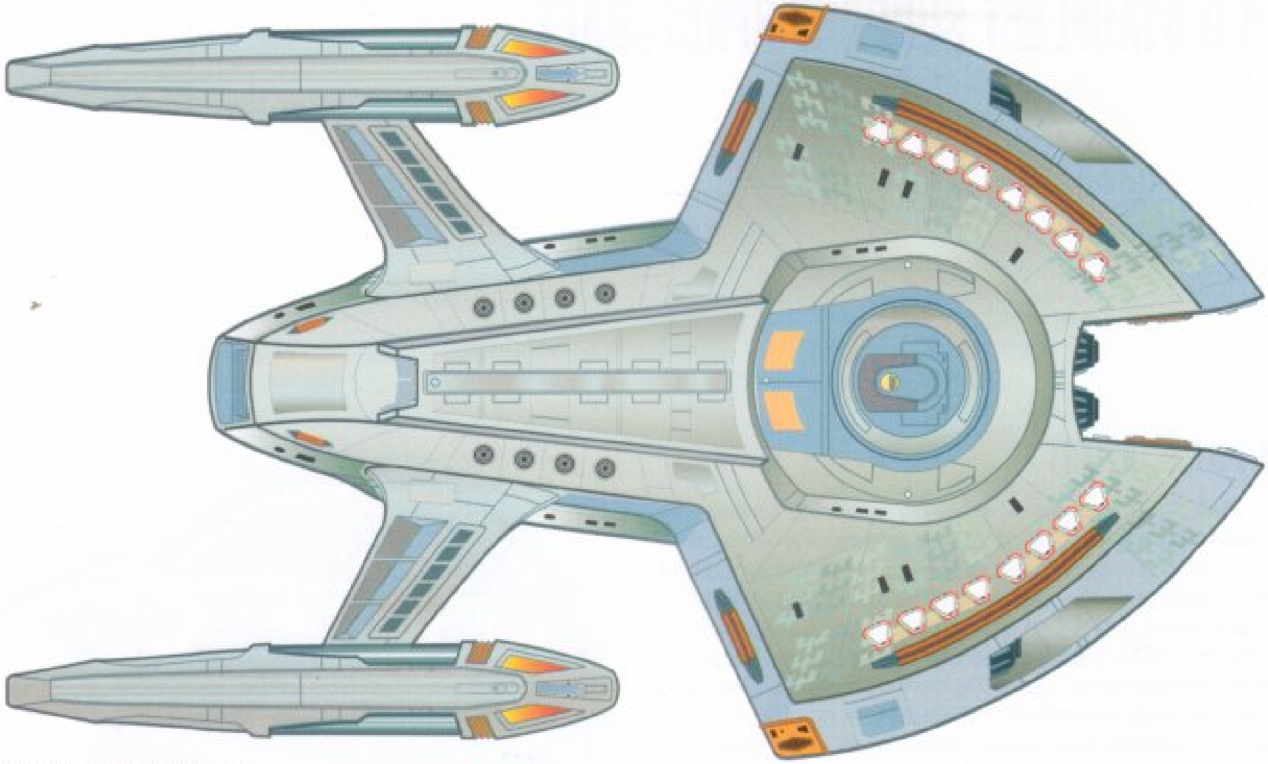
The *U.S.S. Defiant* is a heavily armored, limited-role Starfleet vessel developed at the Antares Fleet Yards in response to the Borg threat to the worlds of the Alpha and Beta Quadrants. The project was officially begun in 2366 by Starfleet's Advanced Starship Design Bureau (ASDB) under less than ideal conditions, as far as the accepted normal sequence of research, development, testing, and evaluation was concerned. Fortunately, a number of hardware innovations and design adaptations were already in the inventory and allowed for an acceptable level of reliability versus speed of systems integration and vehicle construction. The final dimensions of the new ship became 170.68 by 134.11 by 30.1 meters.

MISSION OBJECTIVES

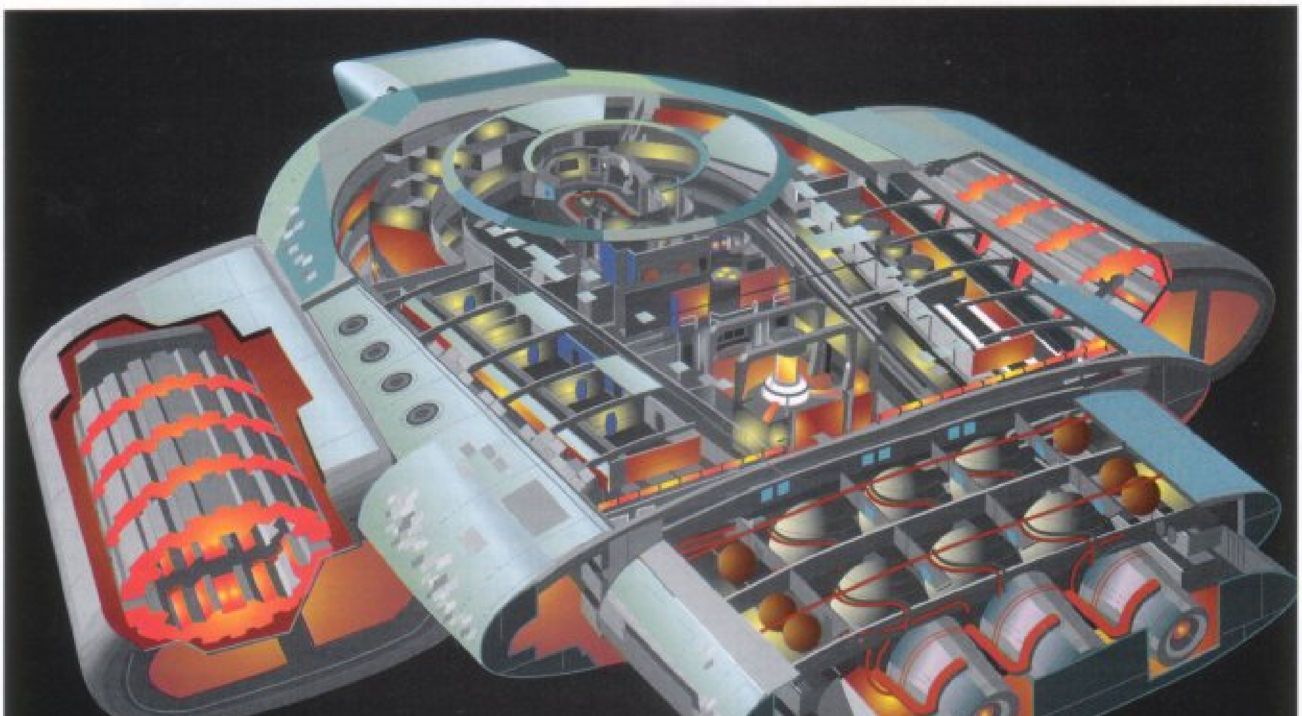
The *Defiant* project, overseen by Admiral Batelle Toh of the ASDB, began with the selection of an existing spacecraft design that had just entered the initial systems-level review stage. No spaceframe had yet been constructed, and the hull shape was undergoing warp field interaction simulations. The study vehicle, designated NXP-2365WP/T, was being considered as a fast torpedo attack ship for high-warp penetrations of threat defenses. This *Defiant* pathfinder would have mounted six torpedo launchers, four in the primary hull and two in the engineering hull, capable of firing photon and quantum torpedoes at speeds up to Warp 9.982.


U.S.S. Defiant

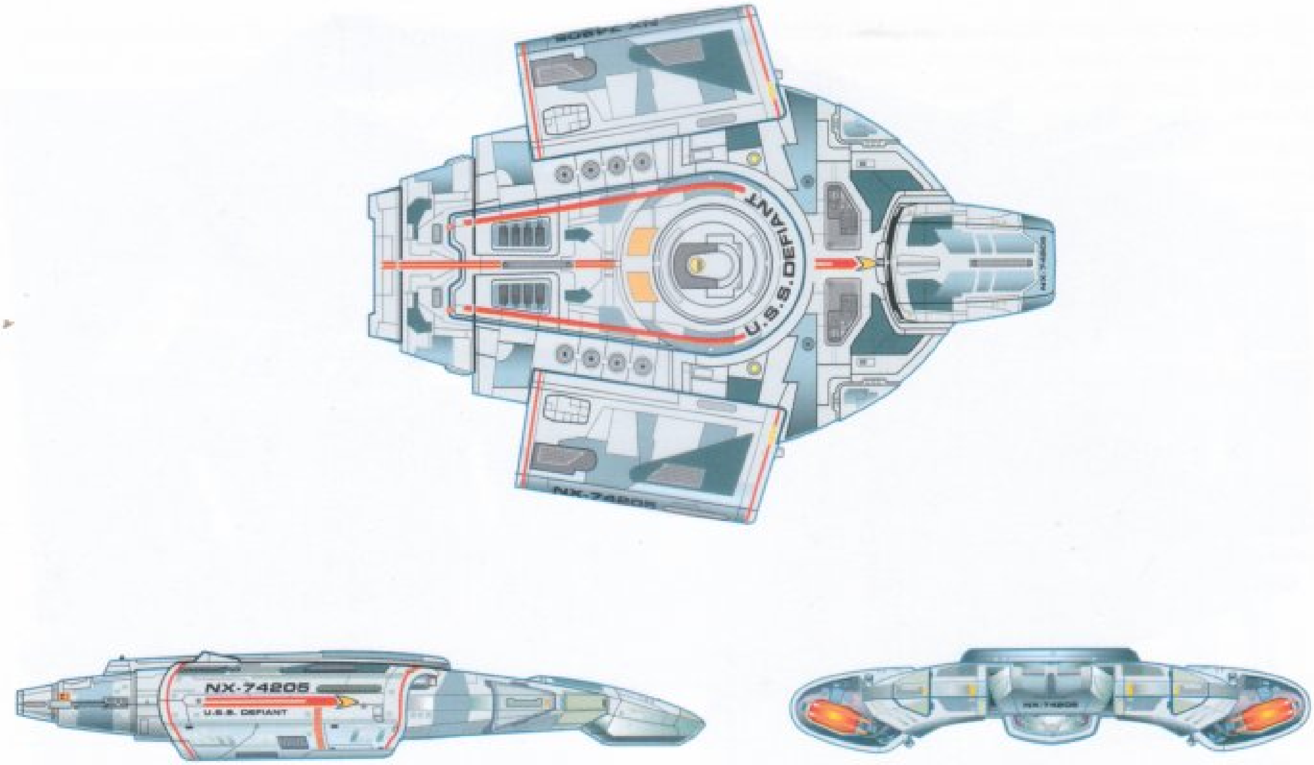
When the Borg threat drove the redesign of the pathfinder vessel, it was decided to compact the planform with warp nacelles and other structures, which were pulled in closer to the engineering hull, minimizing the sensor cross-sectional area and vulnerable appendages. It was also deemed necessary to surround the hull with multilayer ablative armor, long considered unworkable for production starships. In its initial Borg-suppression role, the *Defiant* class would have produced as few as six custom-built copies. The mission of the *Defiant* did not change radically until it was out of the systems integration stage late in 2370 and into final hull reinforcing. Intelligence-gathering efforts had come upon the Jem'Hadar problem, and in the final year of spaceworthiness testing (2372), the NX-74205 was redirected to Deep Space 9 to become a mobile defensive platform with orders to defend the space station, the wormhole, and Bajor. *Defiant* was also tasked with patrol missions in the Bajor Sector and the Gamma Quadrant, engaging threat forces if necessary, as well as special covert assignments ordered by Starfleet Command.



Original Defiant *pathfinder*



Early engineering conceptual rendering of the Defiant

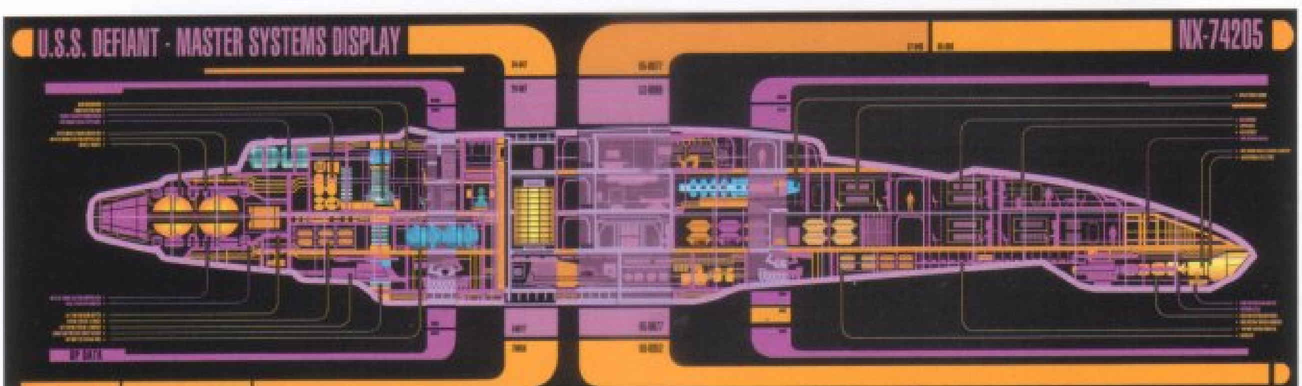


U.S.S. Defiant

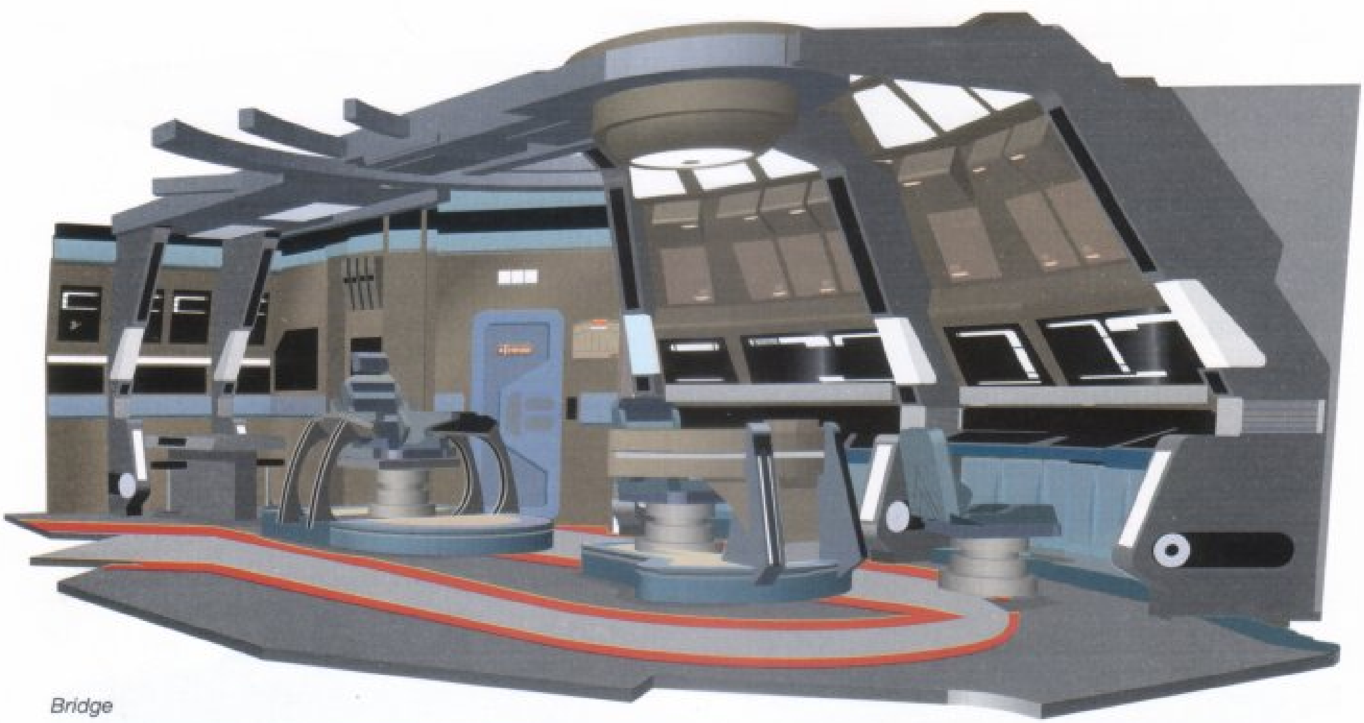
SPACECRAFT STRUCTURES

The *Defiant* is constructed of standard tritanium and duranium alloys and composites. The bridge has been submerged within a larger Deck 1 than was envisioned for the pathfinder vehicle, and the entire vessel has been shortened to four decks plus allowances for crawlways and cable trunks. The notched forward hull has been equipped with a detachable pod consisting of the vehicle's main sensor and navigational deflector, airlock module, and a last-resort matter-antimatter warhead. The warp nacelles have been brought inboard to a minimum safe distance for field EM, and all EPS weapon-power conduits have been truncated to provide a nearly zero lag time between activation signal and beam launch.

All protected internal systems that require access to the vessel exterior are equipped with articulated or jettisonable hull plates, so that most of the familiar structures are hidden from view, including shuttlebay doors, docking ports, lifeboats, impulse vents, and consumables resupply connectors. An integral set of ventral docking clamps and landing pads had been designed into *Defiant* for possible



Master systems display for the U.S.S. Defiant*, as of 2372*



Bridge

U.S.S. Defiant *dedication plaque*

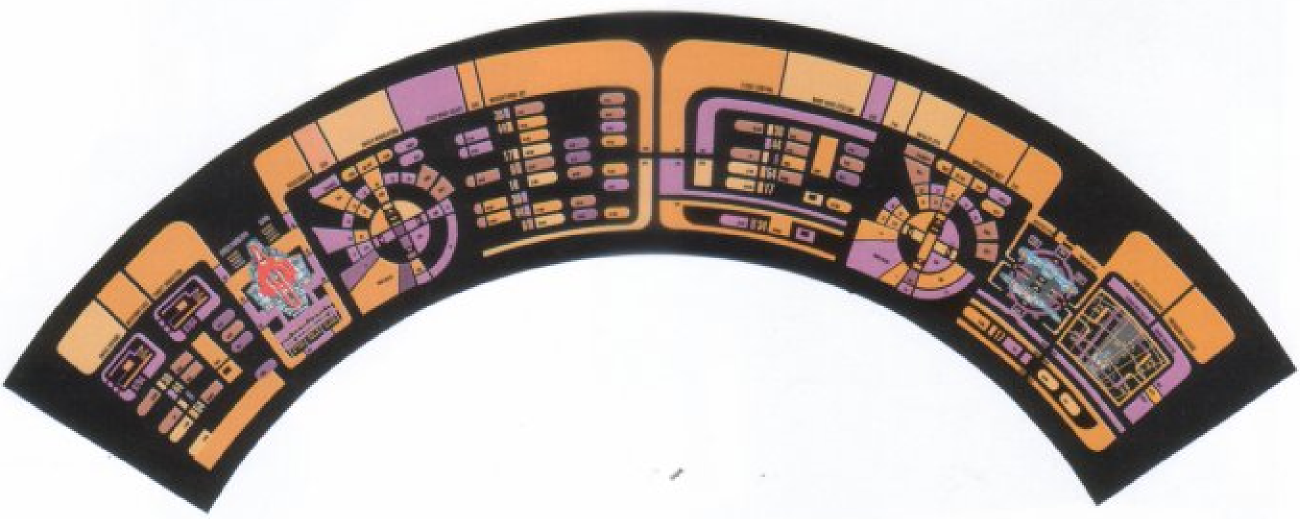
ditching operations as well as for recoverable planetary landings. No practical demonstration has been attempted, though simulations indicate that if the impulse and reaction control thrusters are fully operational, a successful liftoff to orbital velocity is likely.

COMMAND SYSTEMS

Defiant is equipped with a battle-ready bridge and ship-wide systems control. The bridge contains the typical complement of control stations, with the addition of a redundant tactical station designed to handle increased weapons system crew workloads. An integral master situation monitor and conference table allow the crew to study and plan strategies and tactics during reduced action periods. Engineering and science stations have been included and have dedicated ODN lines to the main computer and critical systems, though neither is absolutely vital to the operation of the ship in battle. A single forward flight control (conn) and operations (ops) station replaces the traditional helm and navigation stations, and represents a trend in control design and computer-aided guidance and navigation.

Flight control and operations

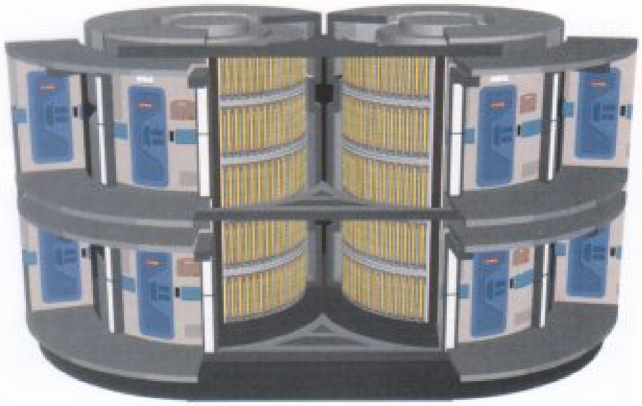
Captain's chair



Conn/ops control interface

COMPUTER SYSTEMS

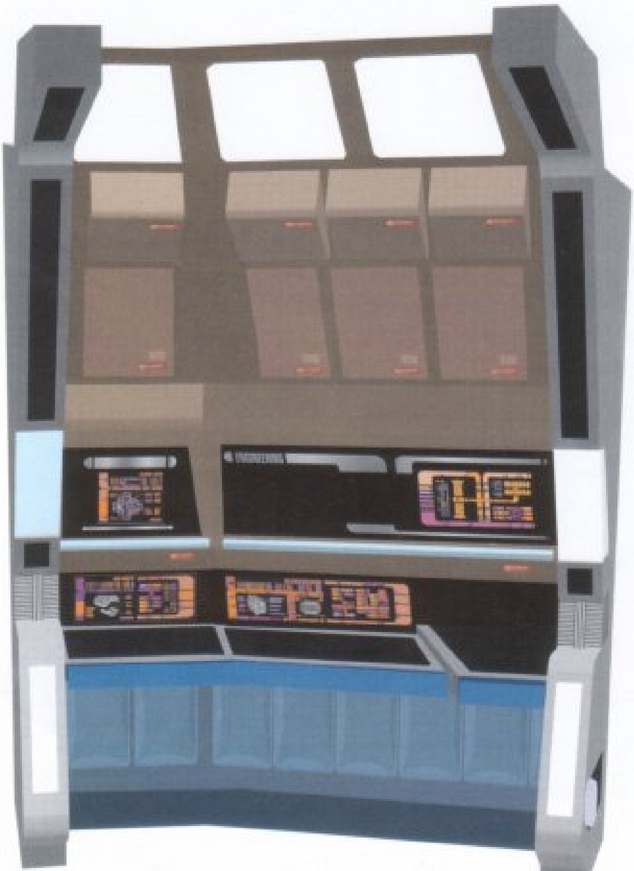
Twin isolinear processing cores are situated just aft of the bridge on Decks 2 and 3. The total computer core possesses 675 banks of chromopolymer processing and storage sheets, for a total capacity of 246.87 megaquads. The system is normally powered by an EPS shunt from the aft impulse reactors, but can be powered by a smaller regulated EPS conduit from the warp core. Cooling of the isolinear systems is accomplished by a regenerative liquid nitrogen loop, which incorporates a delayed-venting heat storage block for stealth activities. The typical mission requirements for the main computer involve only 45 percent of the processing and storage capacity; the other 55 percent is reserved for intelligence-gathering or tactical operations, or taking over for a damaged core. *Defiant* can operate on a single core and can even retain some critical data from a damaged area through compression and scattered storage methods.



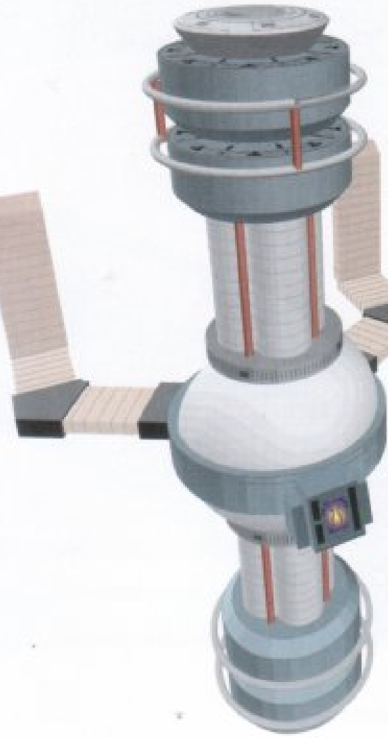
Computer core

WARP PROPULSION SYSTEMS

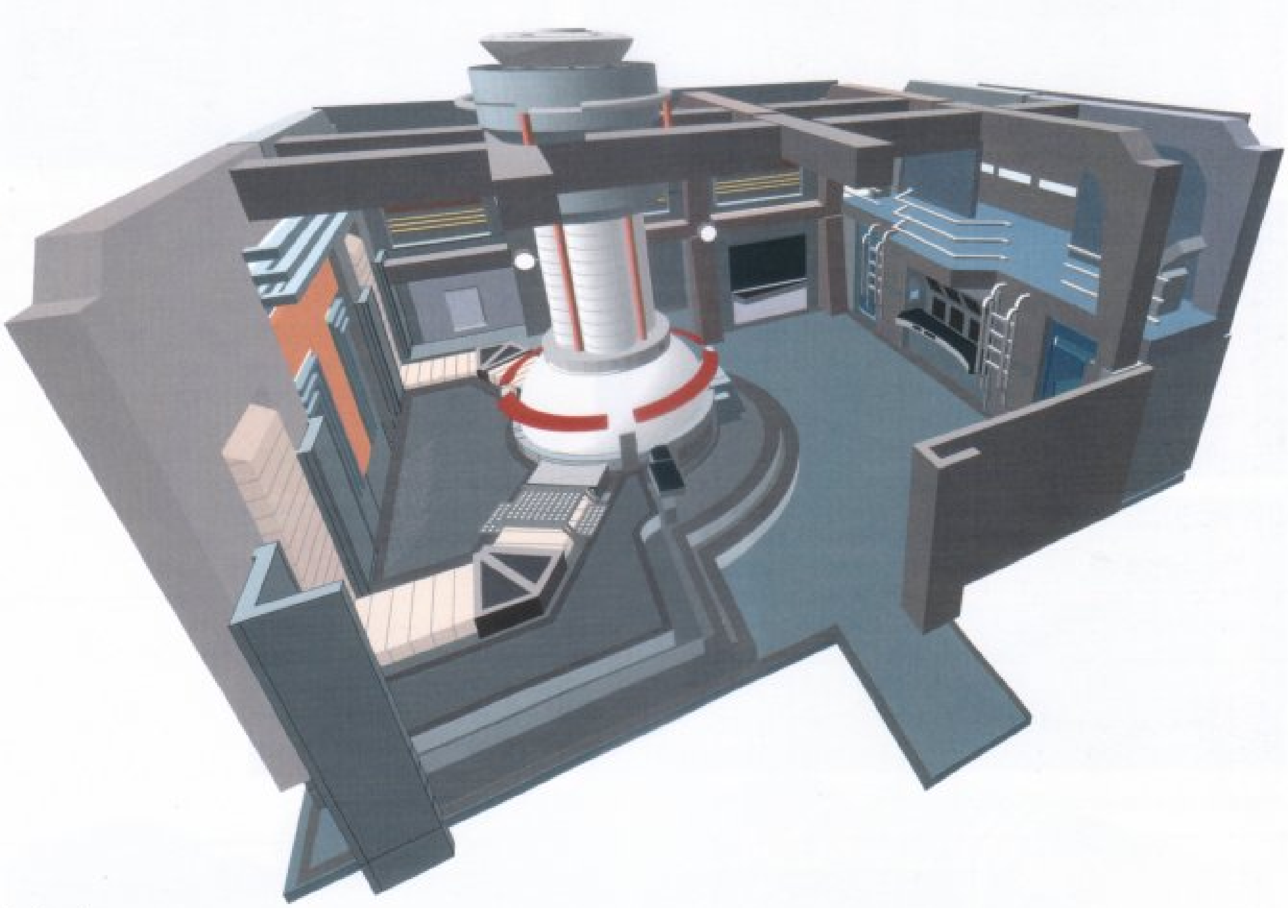
The warp core is located in the aft engineering section and spans all four decks vertically. The matter-antimatter reaction assembly (M/ARA) is embedded within Deck 3, with the surrounding systems balcony above, on Deck 2. The core is constructed from a central translucent aluminum and duranium reactor with dilithium articulation frame, four-lobed magnetic constriction segment columns, and matter and antimatter injectors. Plasma transfer conduits exit the core on Deck 3 and extend laterally to the nacelles and the warp plasma injectors. The nacelles incorporate an experimental in-line impulse system, which accepts matter intake and heating within the nacelles and exhausts the heated gases through a space-time driver assembly in the nacelle aft cap. Antideuterium is stored in a series of standard Starfleet antimatter pods on Deck 3, forward of the warp core. All regulation warp engine controls and procedures apply to *Defiant*.



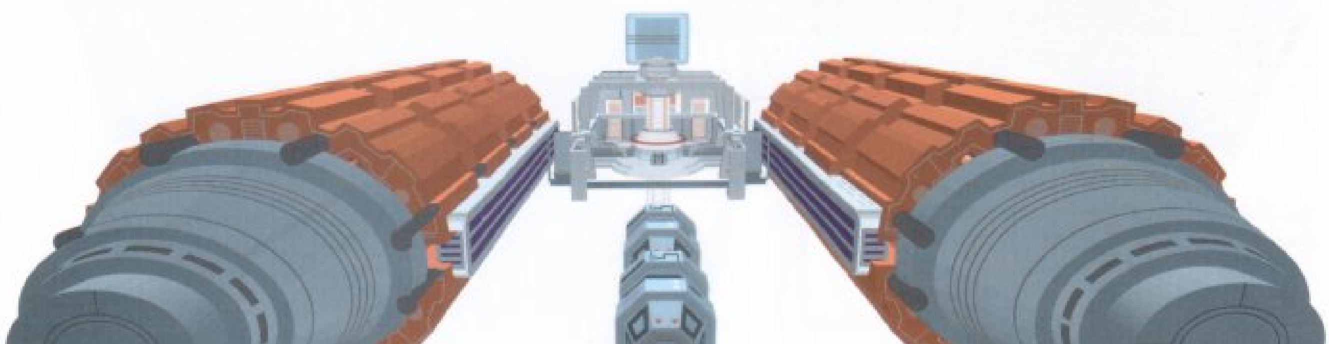
Bridge engineering station



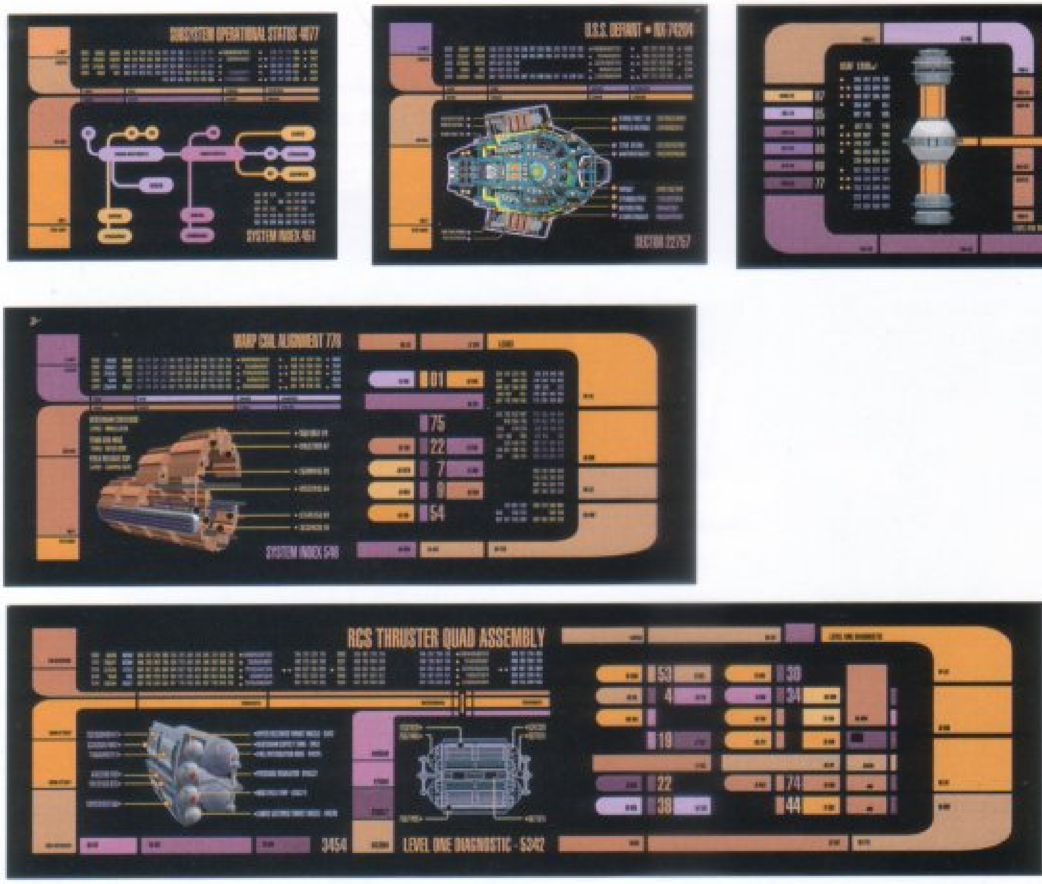
Warp core



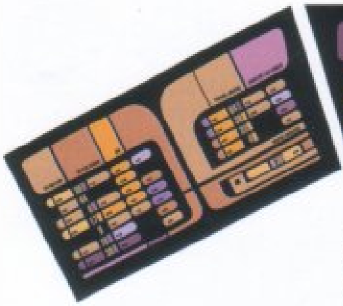
Engineering



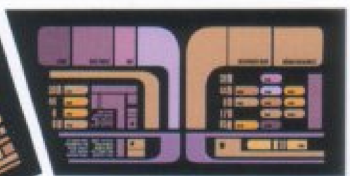
Warp propulsion system



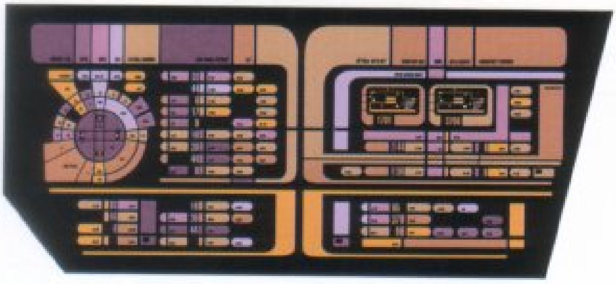
Bridge engineering status display



Subsystem checkout—secondary systems monitor



LCARS coordinator—library computer access retrieval system coordinates engineering computer functions between ship systems



Primary systems manager—chief engineer's primary status display of engineering systems

Bridge engineering interface

IMPULSE PROPULSION SYSTEMS

The primary impulse system consists of three pairs of redundant fusion reactors, space-time driver coils, and vectored exhaust directors. The exhaust products may be held temporarily in the impulse nozzle cowling, to minimize the ship's ion or EM signature, or they can be vented through electroporous plates along the trailing surface of the cowling.

The RCS thrusters are adapted from thruster packages from *Galaxy-* and *Ambassador*-class vessels. A total of eight thruster groups are installed; two are placed in the forward hull, four in the mid-hull, and two in the aft cowling. Deuterium is supplied by the primary tankage on Deck 2 and immediate-use tanks within the thruster packages.

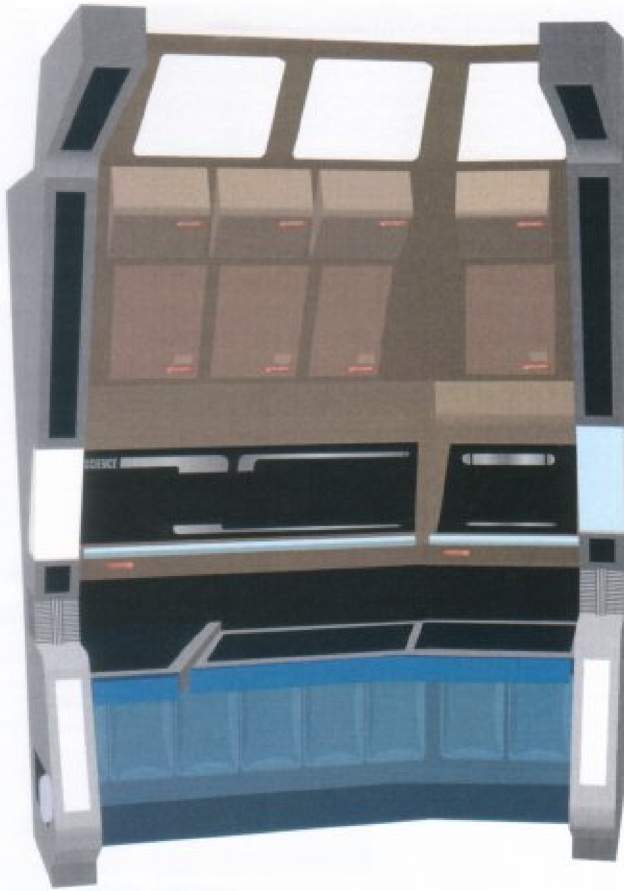
Reaction control systems (RCS) package

Impulse engines

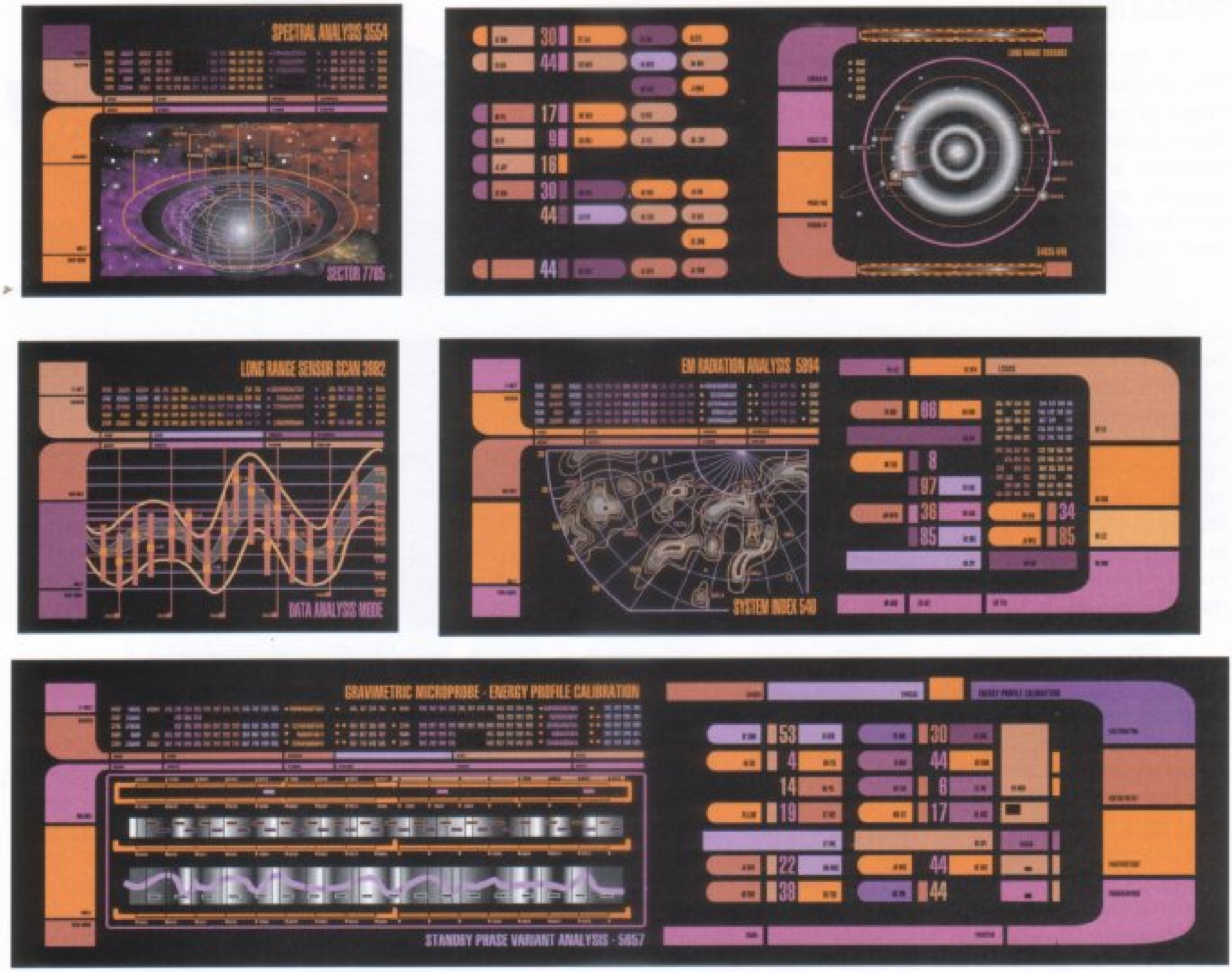
SCIENCE AND REMOTE SENSING SYSTEMS

Defiant is equipped to perform highly detailed scientific missions, especially those concerned with defensive operations. While not outfitted for extended scanning and analysis tasks, the suite of onboard systems is well suited for 82 percent of the standard astrophysical, biological, and planetological sweeps and accompanying data reduction. A loadout of ten mixed class-1, -3, and -5 probes is normally provided at Deep Space 9 or nearby starbase layoyers and can be supplemented with class-8 and -9 quantum torpedo-derived probes.

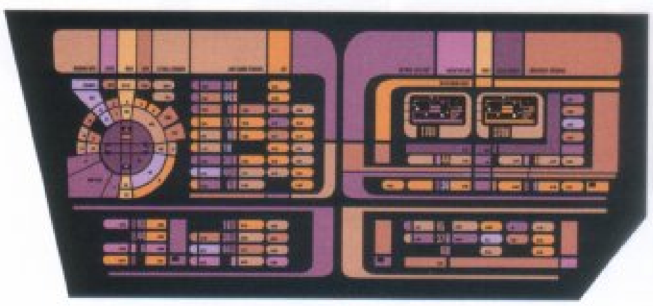
The external long- and short-range sensors are adapted from standard sensor pallets and set behind selectively EM-opaque hull plating. In most battle situations, the sensor clusters can retreat into reinforced wells until action levels have been reduced and then brought into closer contact with the hull plates. All sensor inputs are recorded and analyzed within the computer core and displayed at the science panels on the bridge, or on padds, tricorders, or other displays around the ship. Most sensor systems have been optimized for reconnaissance and spacecraft combat maneuvers.



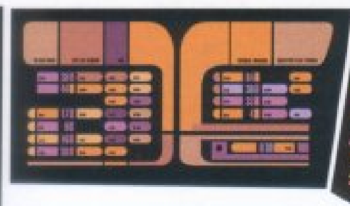
Bridge science station



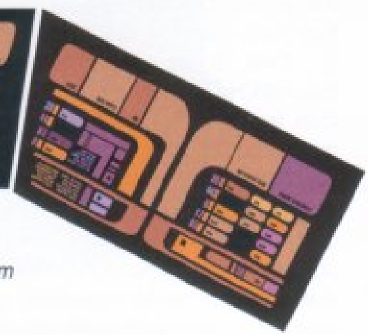
Science status display



Primary science system manager—access to sensors and interpretive software for primary mission and command intelligence



LCARS Coordinator—library computer access retrieval system monitor coordinates computer functions between ship departments and systems



Science subsystem checkout—auxiliary systems monitor

Science control interface

TACTICAL SYSTEMS

By far the greatest technological improvements incorporated into the *Defiant* have been its defensive weapons. These include the ship's Romulan cloaking device, ablative armor, pulse phaser cannons, and quantum torpedoes. All weapons are controlled through the twin bridge tactical stations, and in some cases can be commanded through repeater panels or padds elsewhere on the ship, although specific security constraints come into play.

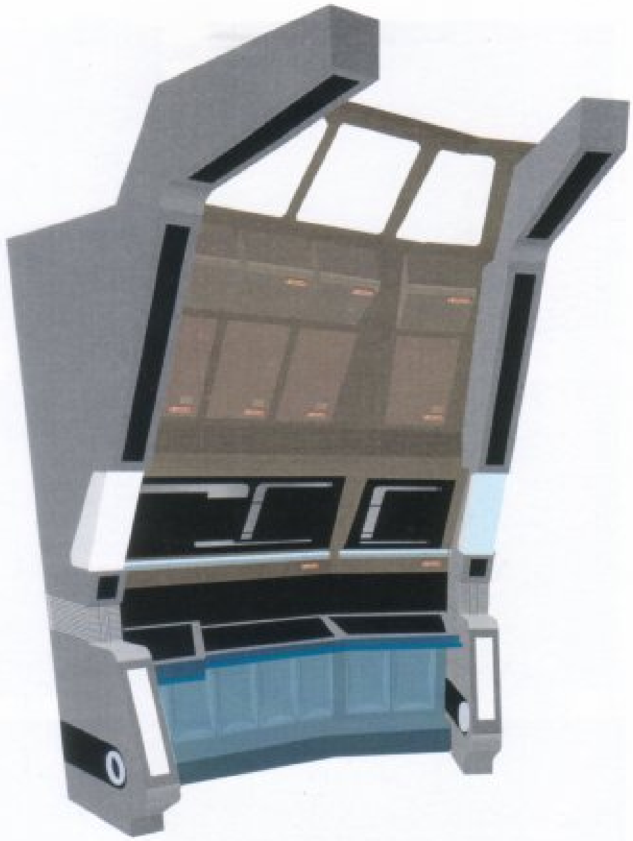
The development of the pulse phaser cannon applies a number of lessons learned at the Starfleet Tokyo R&D facility, where large, nearly flawless emitter crystals had been grown in ground-based microgravity chambers. The new crystals, combined with rapid-discharge EPS capacitance banks and high-speed beam-focusing coils, allowed the phaser discharge to be stored temporarily (up to 2.3 nanoseconds) within the coils and then released as a layered pulse. The emerging pulse is structured something like an onion and is able to land a target contact that is more difficult to disperse than a standard phaser beam. Four pulse phasers are located above and below the nacelle root attachments to the main body.

Two torpedo launchers are embedded within the upper forward nacelle cowling. The launcher coil assembly, gas generator, reactant loader, and torpedo conveyor are standard Starfleet deployed equipment for all deep interstellar ships. The systems can handle the mixed loadout of photon and quantum torpedoes, as well as sensor probes.

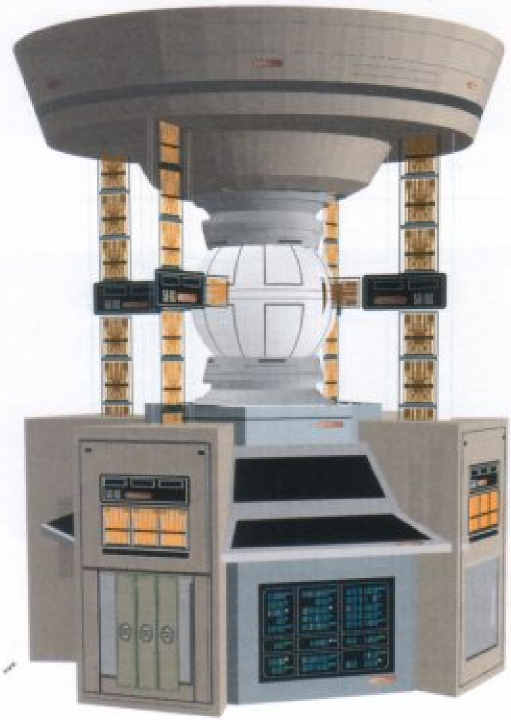
The ablative armor hull plating has been in development for a number of years, though various factors related to materials availability, instabilities, phaser and torpedo resistance, and long fabrication lead times have prevented its widespread use on frontline starships. The armor works in two stages; in the event of shield-envelope disruption, phaser or thermal EM is first dissipated over the hull surface, and above an undisclosed threshold causes the molecular matrix to boil off at a controlled rate, carrying away a large fraction of the landed beam energy. In most cases, the boil-off creates a medium density particle cloud, which may help disperse the incoming beam.

Prior to the protracted hostilities following the loss of the Jem'Hadar fleet in the wormhole, a cloaking device on loan from the Romulan government had been installed on the *Defiant*. While it is well understood that no cloak is foolproof, the device does aid in keeping the ship as stealthy as possible. Numerous incompatibilities had to be overcome, particularly among the power system, cooling, and control input connections. The cloaking device is subject to many of the same operating constraints as on Romulan vessels, in terms of continuous running time and periodic maintenance. Starfleet engineering crews have been trained in basic cloak technology and systems upkeep.

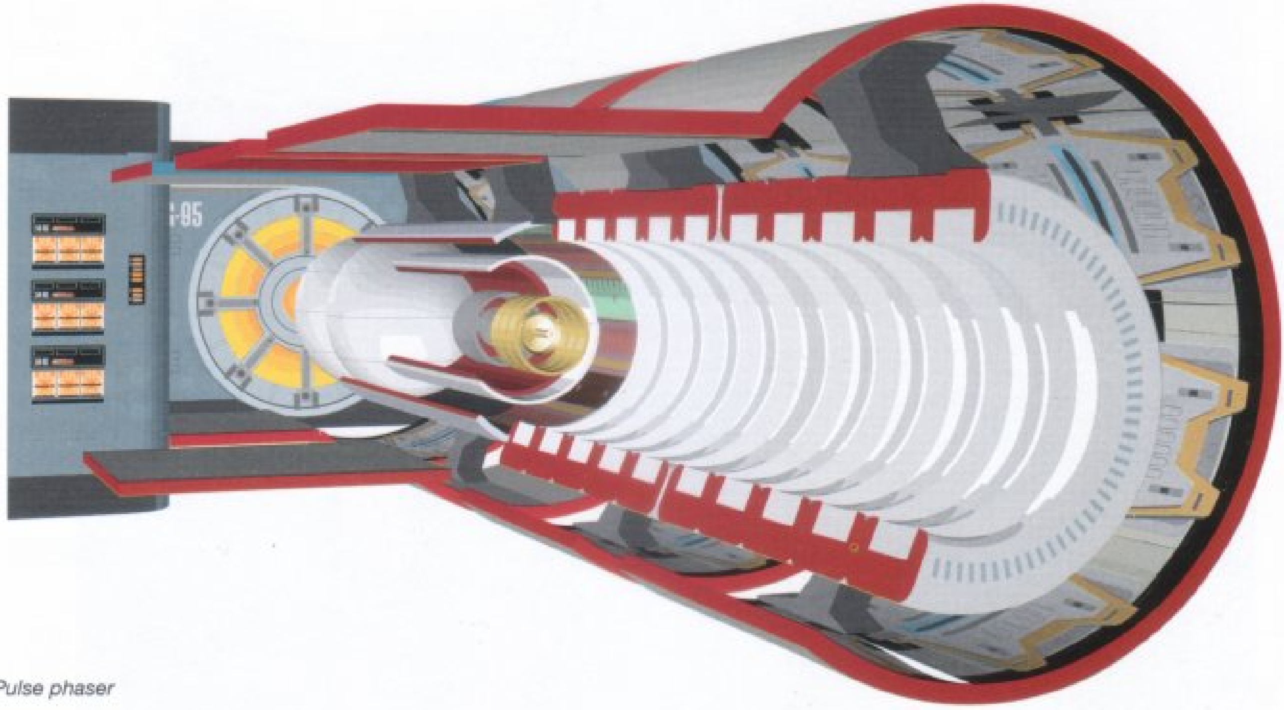
Other weapons systems aboard *Defiant* include the detachable warhead, auto-destruct, and specialized ordnance. The warhead section contains a separate miniature impulse engine and magazine of six photon torpedo war-



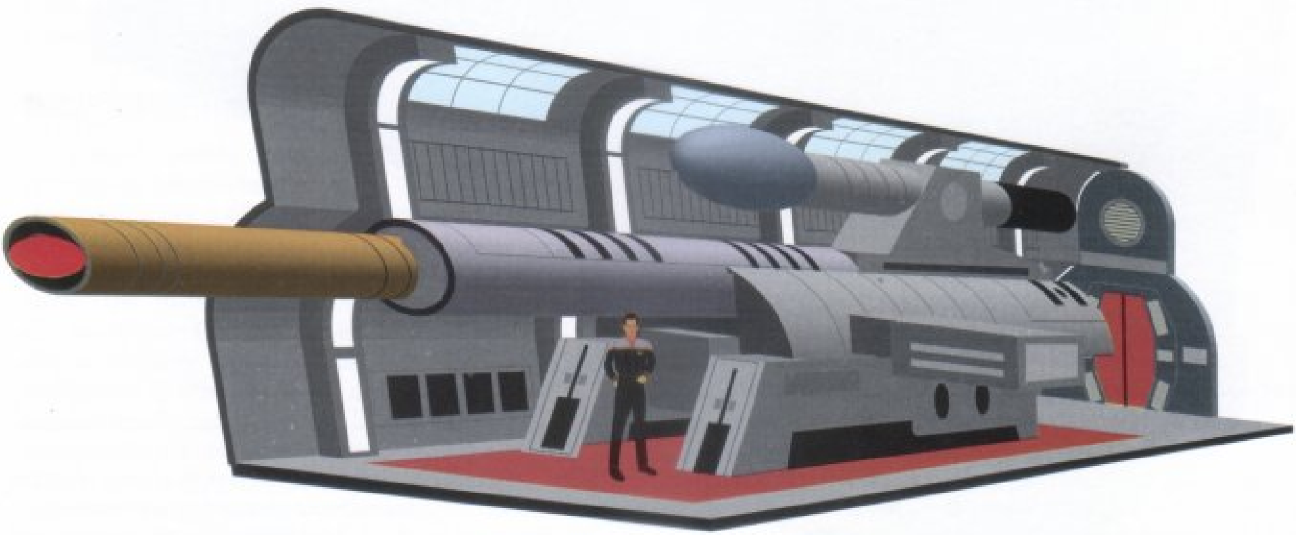
Bridge tactical station



Romulan cloaking device



Pulse phaser



Standard probe and torpedo launcher

Bridge situation table

heads. These warheads are also tied into the auto-destruct system. In the event the warhead must be launched, standard command authorization protocols are followed, and the device is fired and armed in transit. It is assumed that the warhead would be launched only in the most dire conditions, short of auto-destruct. The remainder of the auto-destruct system consists of sixteen additional photon torpedo warheads, plus release commands for all safety interlocks on the matter and antimatter tankage. The specialized ordnance currently consists of self-replicating mines and custom explosive loads incorporated into photon torpedo casings.

All defensive systems operations can be planned and executed following officer and crew conferences, often held at the bridge situation table. Since *Defiant* is not equipped with a ready room or dedicated conference room, a small area at the aft bridge is used, with the help of the surrounding monitors and computing hardware.

UTILITIES AND AUXILIARY SYSTEMS

All standard EPS, fluid transfer, ODN lines, atmospheric, and other energetic and consumable systems are installed aboard *Defiant*. The EPS conduits and ODN fiber bundles have been reinforced with jackets of multilayer woven polyduranium. Onboard gravity is provided by 153 improved stator-rotor gravity generators. Solid waste disposal is handled by compaction-desiccation units. Replicators are furnished for crew foodstuff and inorganic-object production, and are connected to raw matter and recycling tankage.

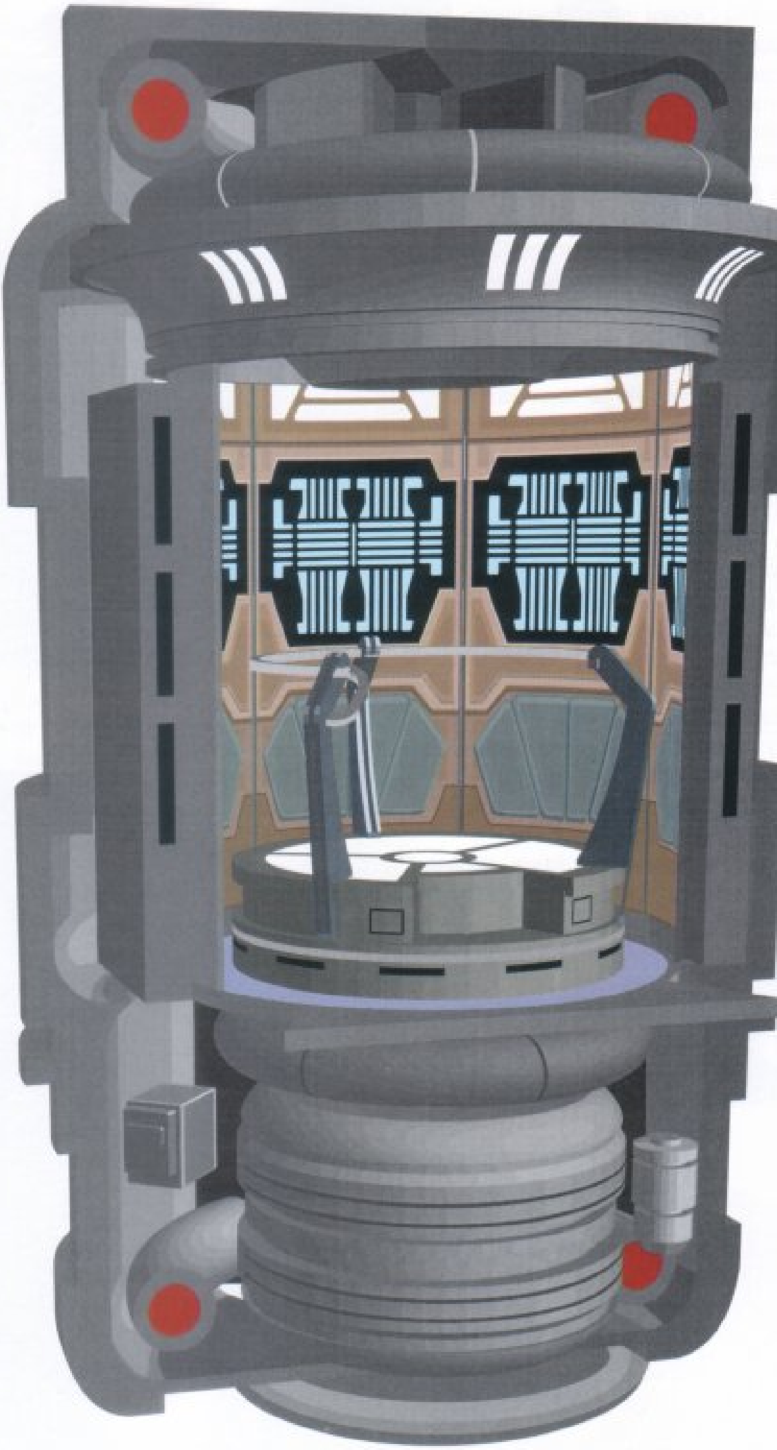
Cryogenic fuels are moved by standard magnetic-peristaltic conduits. Limited-capacity turbolifts provide access to key locations on the ship, primarily along its length. A small number of Jefferies tubes provide access to systems between and behind major compartments and deck structures.

COMMUNICATIONS

All standard RF and subspace communications systems are installed, with additional capacity for narrow-beam and encrypted signal transmission and reception. Stealth com is possible through modulated impulse exhaust streams and navigational deflector beams. A set of three primary and three backup subspace distress beacons is provided for emergency use.

TRANSPORTER SYSTEMS

Defiant normally carries one primary and one backup transporter on Deck 1. The modular unit includes a 45 percent scaled version of the standard pattern buffer tank and molecular imaging scanners found on larger starships. The transporter is powered by an impulse system EPS tap and is EM-shielded with a multilayer duranium jacket. The hull-transporter emitter pads are armored with electroporous plating, which requires the computer to maintain tighter control over the ACB in terms of look angle in dwell time on both beam-up and beam-down targets.



Transporter

ENVIRONMENTAL SYSTEMS

The *Defiant* is equipped with a standard suite of Starfleet life support devices and supplies. A normal class-M environment is maintained, but can be adapted in three of the crew living quarters for life-forms from class-H, -K, or -L worlds. All atmospheric conditions, heating, and humidity are controllable by deck and by section. All storable gases and fluids, as well as transfer and manipulation hardware, are distributed among all four decks and engineering spaces.

CREW SUPPORT SYSTEMS

The primary crew-support systems include the twenty-two main cabins, ten contingency crew cabins, replicators and wardroom, and sickbay compartments. The crew cabins are equipped with a minimum of two bunks, and can be outfitted for as many as six, for a potential total crew of 192. The normal operational crew is forty. The sickbay facilities are small, with space for four beds, expandable to six, plus a limited surgical suite. The replicators are tied into the raw matter and recycling supplies and contain updated menus for various cultures. A pair of units is installed in the wardroom.

Typical crew quarters

Replicator

AUXILIARY SPACECRAFT SYSTEMS

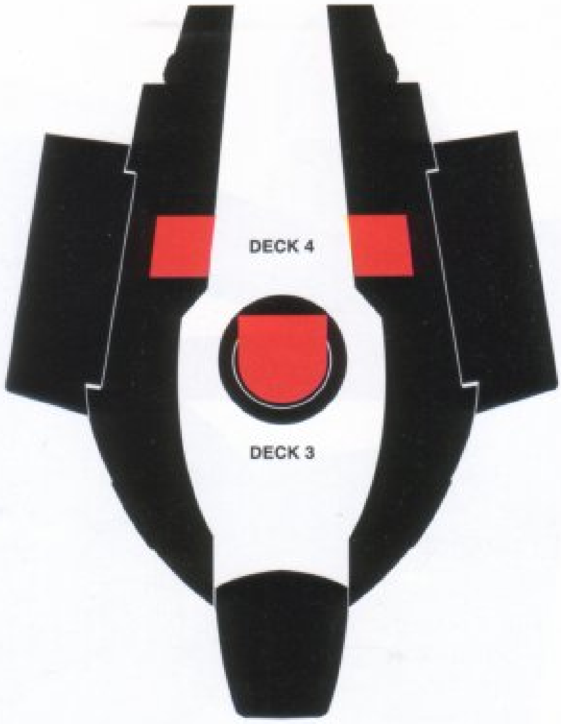
The *Defiant* can carry up to four small shuttlepods, each measuring 4.5 by 3.1 by 1.8 meters. Each can carry two operator crew and up to four additional passengers, or cargo. The shuttlepod is limited to impulse travel only, though it may travel for a short time at superluminal velocities if released at warp. The role of the shuttlepod is varied, including starship escape, planetary surface ops, and ship-to-ship transfers. The craft is equipped with limited phaser armaments, but can be modified to mount a number of small weapons systems.

TYPE-10 CLASS SHUTTLECRAFT

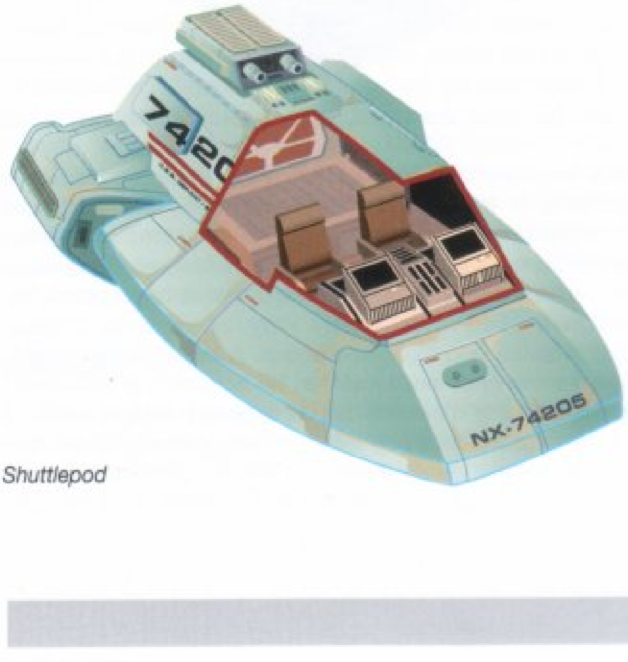
The Type-10 class shuttlecraft, its shuttlecraft bay, and spaceborne support equipment (SSE) are recent addtitions to the *Defiant* as part of Starfleet's ongoing engineering testbed evaluations. Other Starfleet directorates, particularly those responsible for auxiliary vessel development, defensive weapons deployments, and environmental control and life support systems (ECLSS) will be monitoring the performance of the Type-10 shuttlecraft to determine if fleet-wide production will be initiated.

The *Chaffee* is the current Type-10 assigned to the *Defiant*. It is a four-crew, multirole shuttle based on the Type-6 shuttlecraft spaceframe and equipped with subscale versions of larger starship impulse and warp propulsion systems. The craft measures 9.64 meters in length by 5.82 meters abeam by 3.35 meters in height. The basic unloaded mass is 19.73 metric tonnes, slightly heavier than similar shuttles due to its largesr warp coil assemblies. The warp nacelles are modeled after the armored *Defiant* engine pods. Off-the-shelf RCS thrusters have been taken from the Type-6 spares inventory.

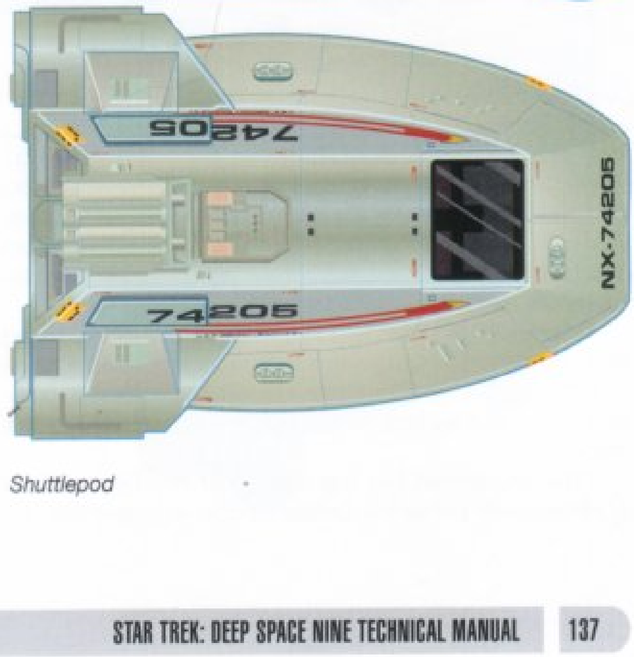
Defensive systems mirror those of most other auxiliary spacecraft and encompass phaser emitters, micro-torpedo launchers, shields, and signal intelligence jamming devices.



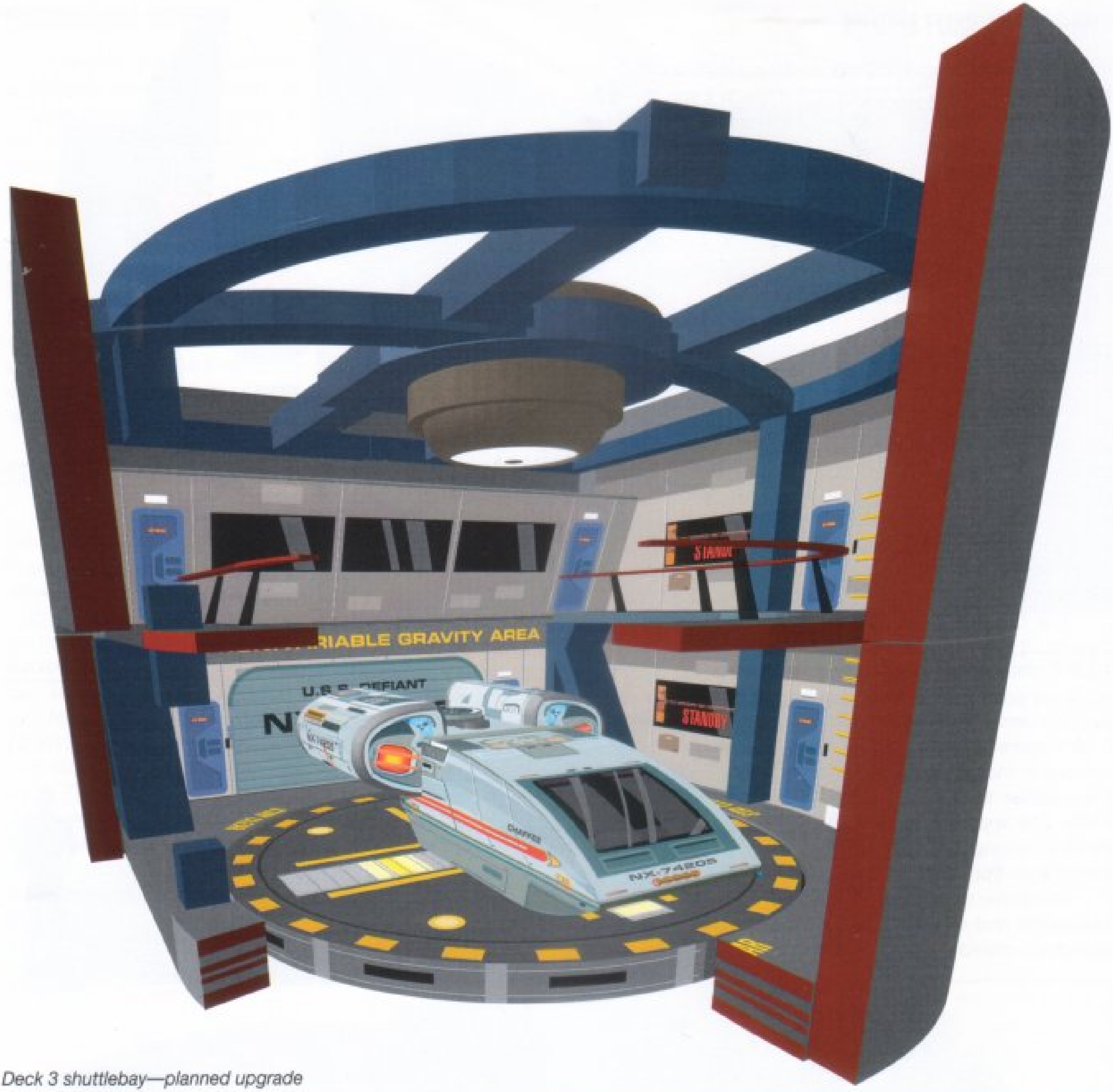
Shuttle locator — Deck 3 and Deck 4



Shuttlepod



Shuttlepod

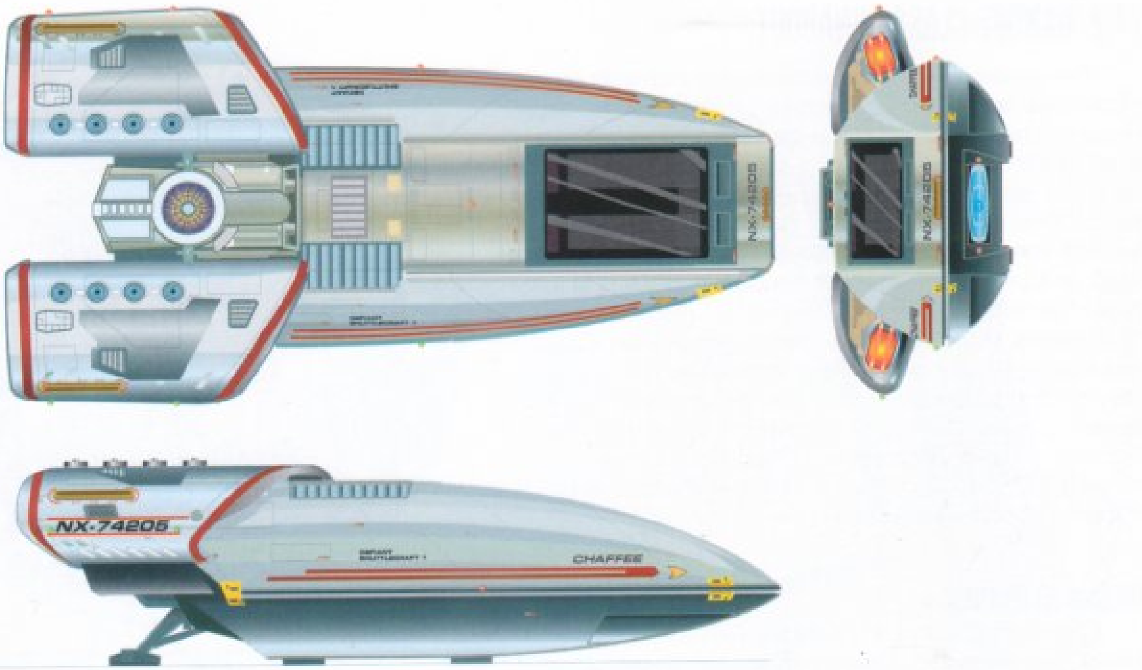


Deck 3 shuttlebay—planned upgrade

Onboard computer systems include a shortened version of the *Danube*-class runabout computer core, partitioned into five polled processor segments for optimum decision-making. Provisions have been made for bioneural gel pack peripherals and upgrades.

Planetary landing systems include both fixed and deployable surface pads. All other required hardware, such as formation lights, emergency beacons, transporter, pressure suits, and surface survival packs, are present in this model.

The shuttlecraft bay has been built into Decks 3 and 4, immediately below the *Defiant* bridge, in a reserved volume originally designed for future computer and weapon systems. It includes an aft maintenance bay and split launch doors, and can be isolated or protected with forcefields. Variable gravity control in both sections is possible for launch, recovery, and certain systems repair work. An enclosed observation gallery may be used to oversee maintenance and flight operations. A large central tractor beam emitter has been installed for both normal and emergency berthing functions, and is augmented by a series of sixteen smaller docking beam emitters designed for low velocity vehicle translations.



Shuttlecraft—type 10

U.S.S. DEFIANT FLIGHT OPERATIONS

All standard flight operational rules are in effect for *Defiant*, as a single, nonseparable interstellar vessel. The current mission types include tactical and defense, emergency and rescue, and secondary scientific investigations. The operating modes include cruise, yellow alert, red alert, external support, and reduced power.

EMERGENCY OPERATIONS

Aside from the escape options provided by the shuttlepods, the principal survival craft is the Starfleet lifeboat or escape pod. The current lifeboat is sized to include two main types, a six-person and an eight-person version. *Defiant* carries twenty-six of the six-person types, which measure 3.6 meters tall and 3.5 meters across the hexagonal faces. Each lifeboat contains enough consumables and recycling capabilities to keep the crew alive for eight months, longer with multiple lifeboats connected in standard "gaggle mode." All are equipped with navigational processors and impulse microthrusters, plus emergency subspace communication systems. The *Defiant* units have been specially modified for low-observability and minimal EM signatures due to the general wartime conditions.

CONCLUSION

The *Defiant* will remain a testbed starship for the foreseeable future, even as the class spacecraft has gone into limited production; it will retain its NX experimental registry. As new systems are proven in benign and combat flight regimes, they will be added to units under assembly and retrofitted to flying vehicles. No new cloaking devices are included in this arrangement, unless and until the Romulan government and officials overseeing the Treaty of Algeron deem otherwise.

Lifeboat

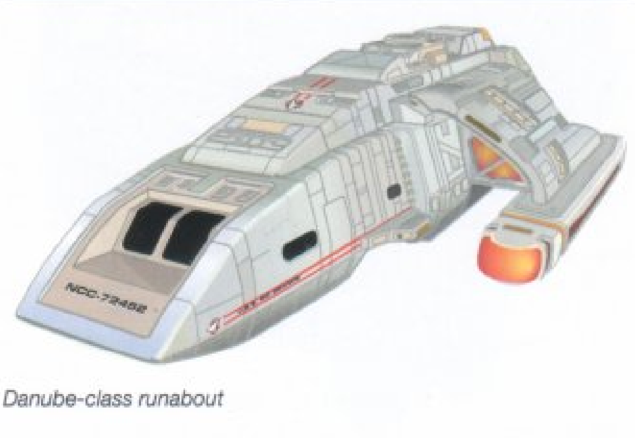
14.2 DANUBE-CLASS RUNABOUT

The runabout is a true multirole starship with engine efficiencies and cargo capacities proportional to larger vessels. The *Danube*-class project began as a vehicle study in 2363 at the ASDB for a ship that could perform a variety of scientific, resupply, and personnel-transfer missions. The prototype *U.S.S. Danube*, NX-72003, was ordered constructed at the Utopia Planitia Fleet Yards in 2365, and began flight trials off the surface of Mars in early 2368. The finished vehicle measured 23.1 meters in length, 13.7 meters abeam, and 5.4 meters tall. As the *Danube* was making its preliminary warp tests within the solar system, the first production series was well along into its final assembly cycle. The first five runabouts to be delivered to the fleet inventory were the *U.S.S. Rio Grande*, *U.S.S Mekong*, *U.S.S Orinoco*, *U.S.S Yangtzee Kiang*, and *U.S.S Rubicon*, all named after Earth rivers.

MISSION OBJECTIVES

Starfleet's directive covering the *Danube*-class project established the major mission objectives. These included the ability to perform rapid-response scientific expedition transportation, the ability to act as an orbital or landed temporary operations base for science missions, the ability to move intact experiment and cargo modules from site to site, and the ability to perform emergency and tactical missions limited only by the onboard supplies of fuel, weapons, and consumables. The tactical missions list is limited to covert activities related to intelligence gathering, personnel insertion and extraction, and undisclosed disruptions of threat activities where feasible.

All runabout activities are managed from six launch and maintenance bays constructed for the first three vehicles to reach Deep Space 9. These bays are set into the Habitat Ring at 60-degree intervals, between major load-bearing bulkheads. All resident quarters in the immediate vicinity of the new bays were either converted for engineering support or shielded from potential accidental detonations or other energy releases from support work. All other quarters more than two levels away were untouched and received only minor reactive soundproofing.

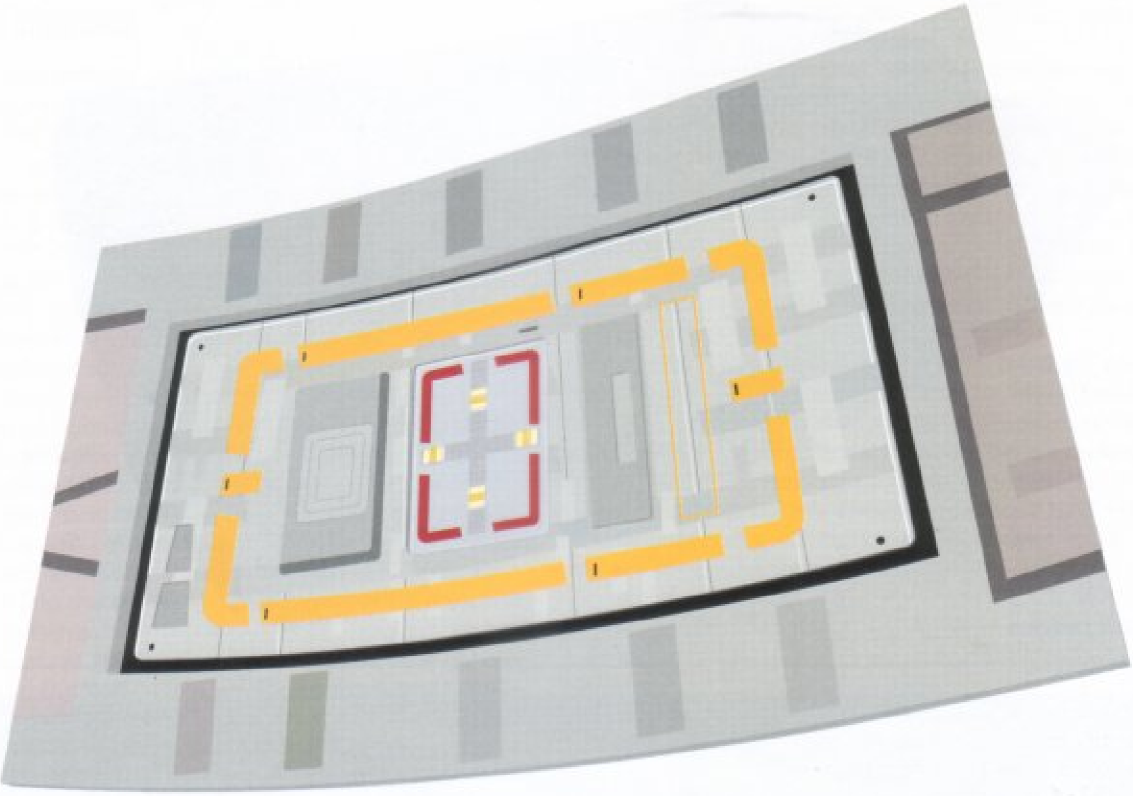


Danube-class runabout

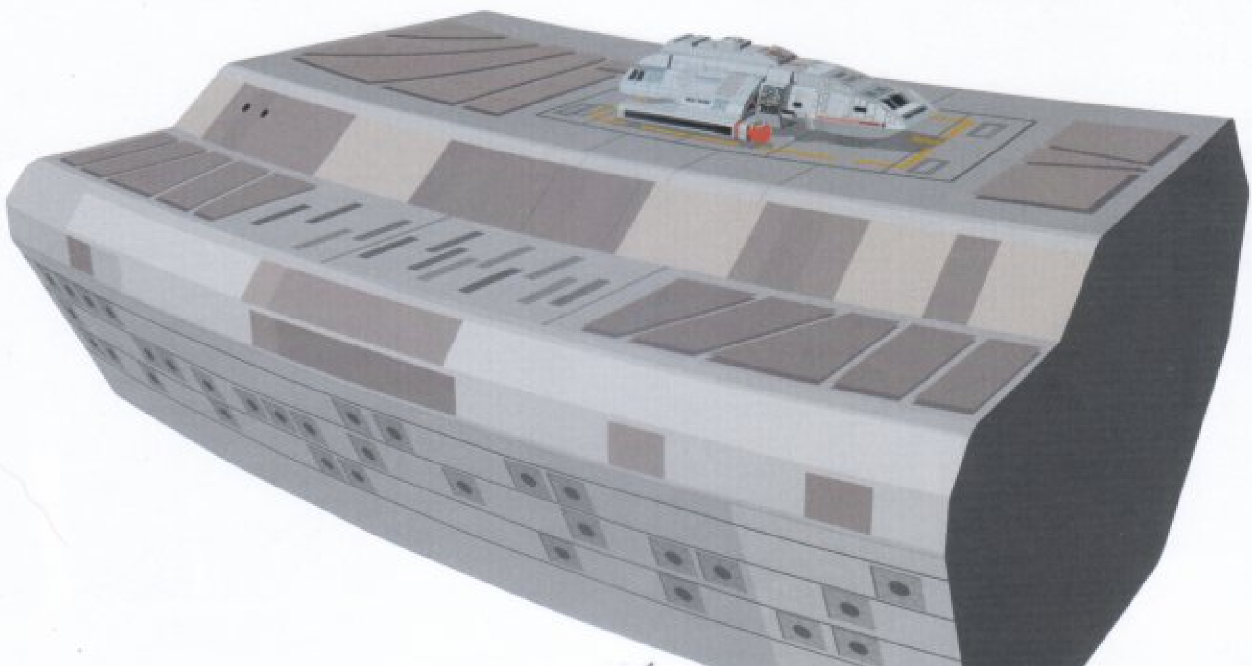
The surface liftoff and touchdown pad is the upper assembly of the runabout elevator system. The pad includes all navigational RF and subspace com aids, approach and departure lighting, and auto-capture tractor mooring strips. Once aligned by the approach vector subsystem, the mooring strips provide an EM-based hard docking latch-up to the elevator.

The maintenance bay interior is spacious enough to support a single runabout and at least two shuttlecraft. With the elevator lowered to its fully retracted position, the overhead entry door can be sealed. Force field generators are also in place to provide a temporary atmosphere restraint in the event the door cannot be fully closed. Runabout entry and exit can be made through a moveable airlock and transfer tunnel or through the main cabin entry hatches via a shirtsleeve or pressure-suit environment. The runabout swappable modules are serviced in the space adjacent to the elevator pad. All cargo, science, and defense payloads can be loaded, cleaned, and repaired within the two-level facility. Major overhauls to the runabout can also be performed within the maintenance fixtures.

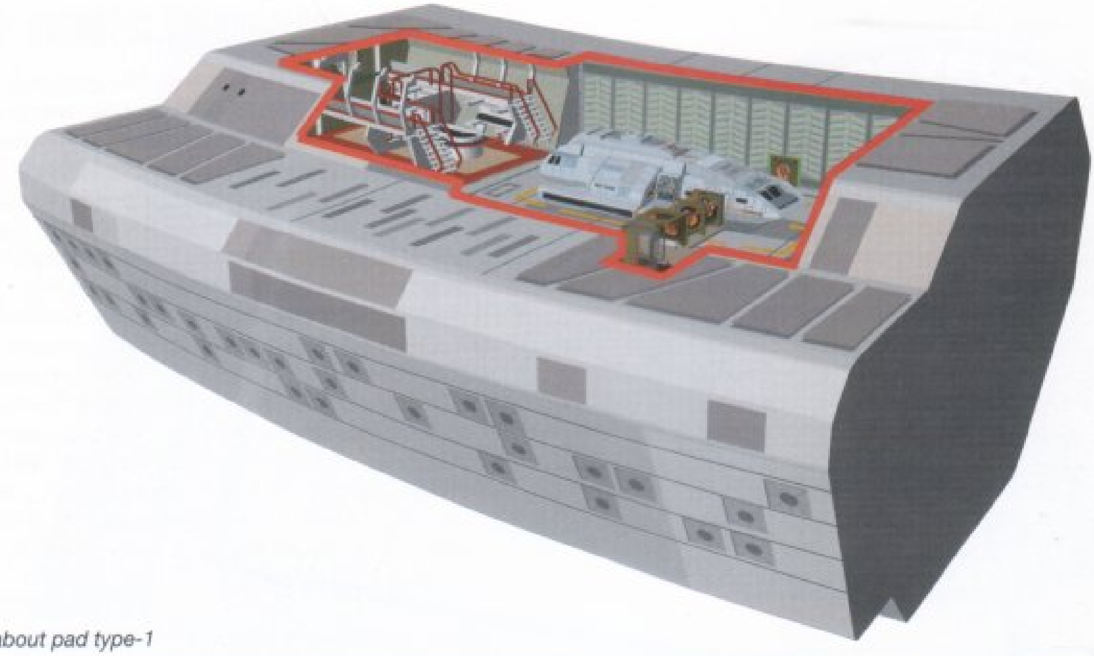
The elevator is a hybrid electrohydraulic and stored-tension mechanism capable of lifting a mass 2.5 times that of the runabout, which itself typically masses 158.7 metric tonnes. In many cases, the prelift sequence involves detuning the local gravitational mat to reduce the stresses on the elevator system.



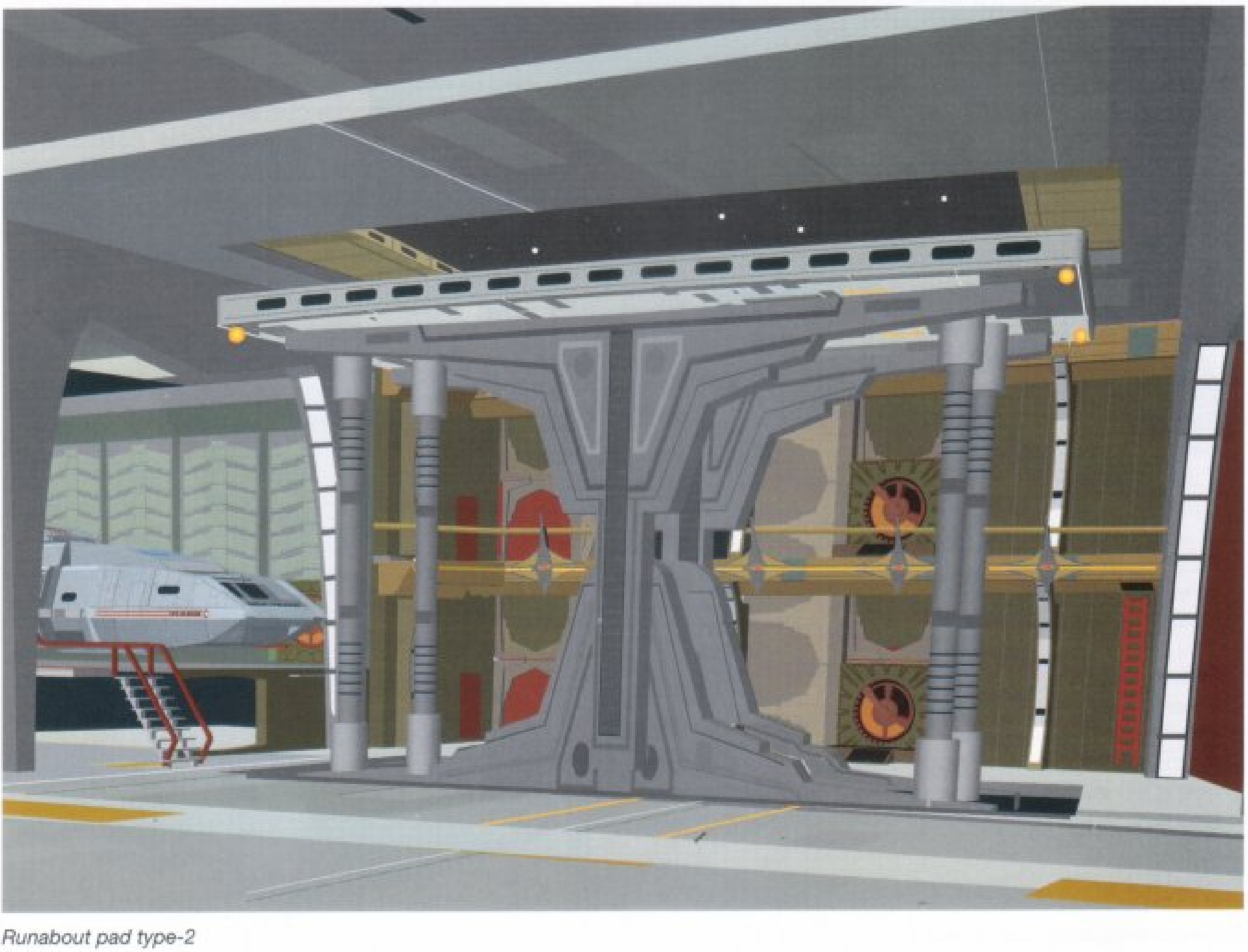
Runabout pad



Runabout deployed at Deep Space 9



Runabout pad type-1



Runabout pad type-2

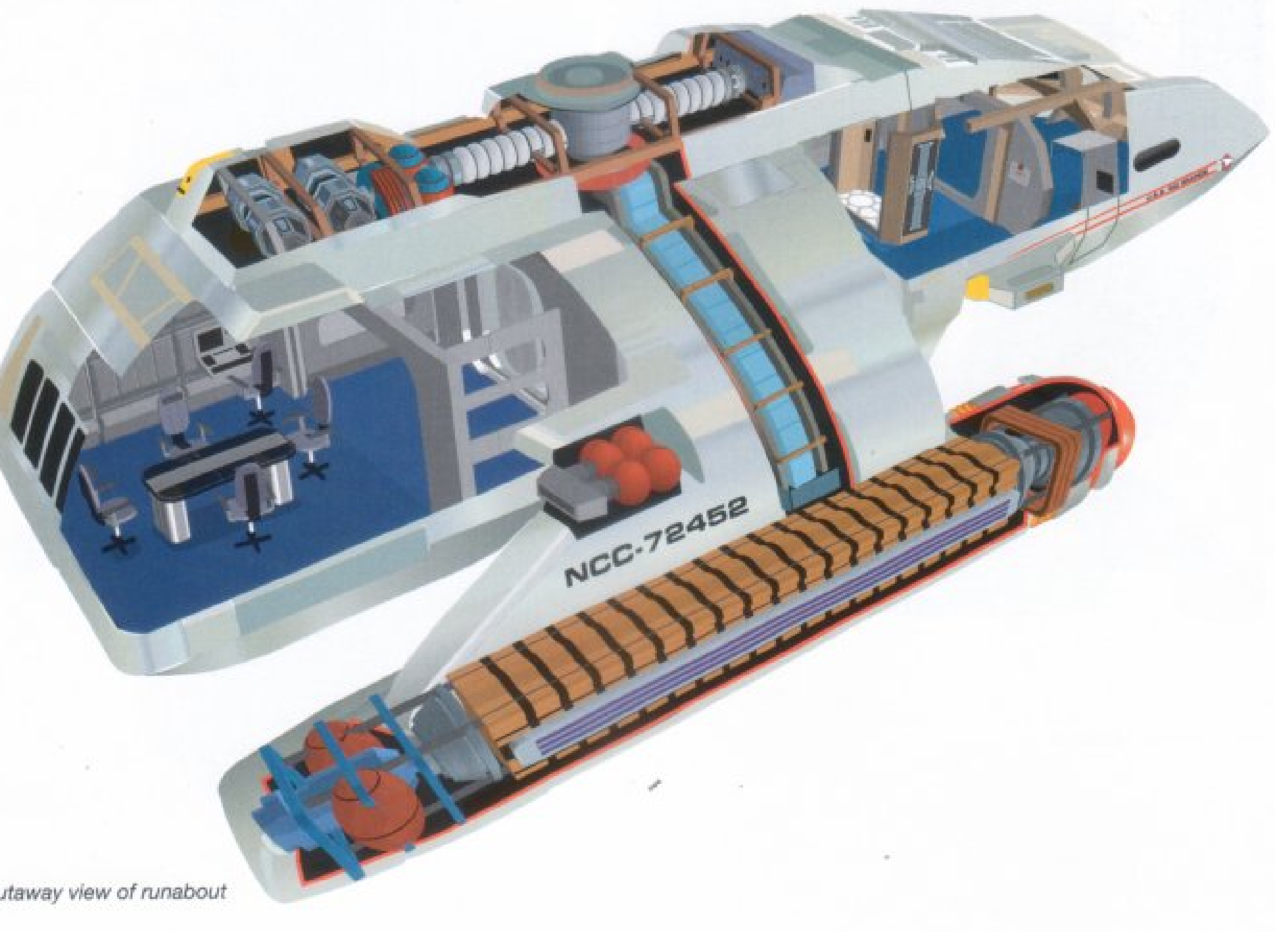
SPACECRAFT STRUCTURES

The *Danube*-class runabout is composed of seven structural component types. The main structural spine runs along the top of the vessel and is the first assembly set within the construction jig. The linear-radial warp engine core and aft RCS package are added to the spine, with connections to the nacelle pylons, particularly those of the power transfer conduits (PTC). The pylons are then attached to the spine. Set beneath the pylons are the impulse propulsion modules, containing separate deuterium fuel supplies from the warp-core fuels. The last basic step in the spine assembly is the attachment of the warp nacelles.

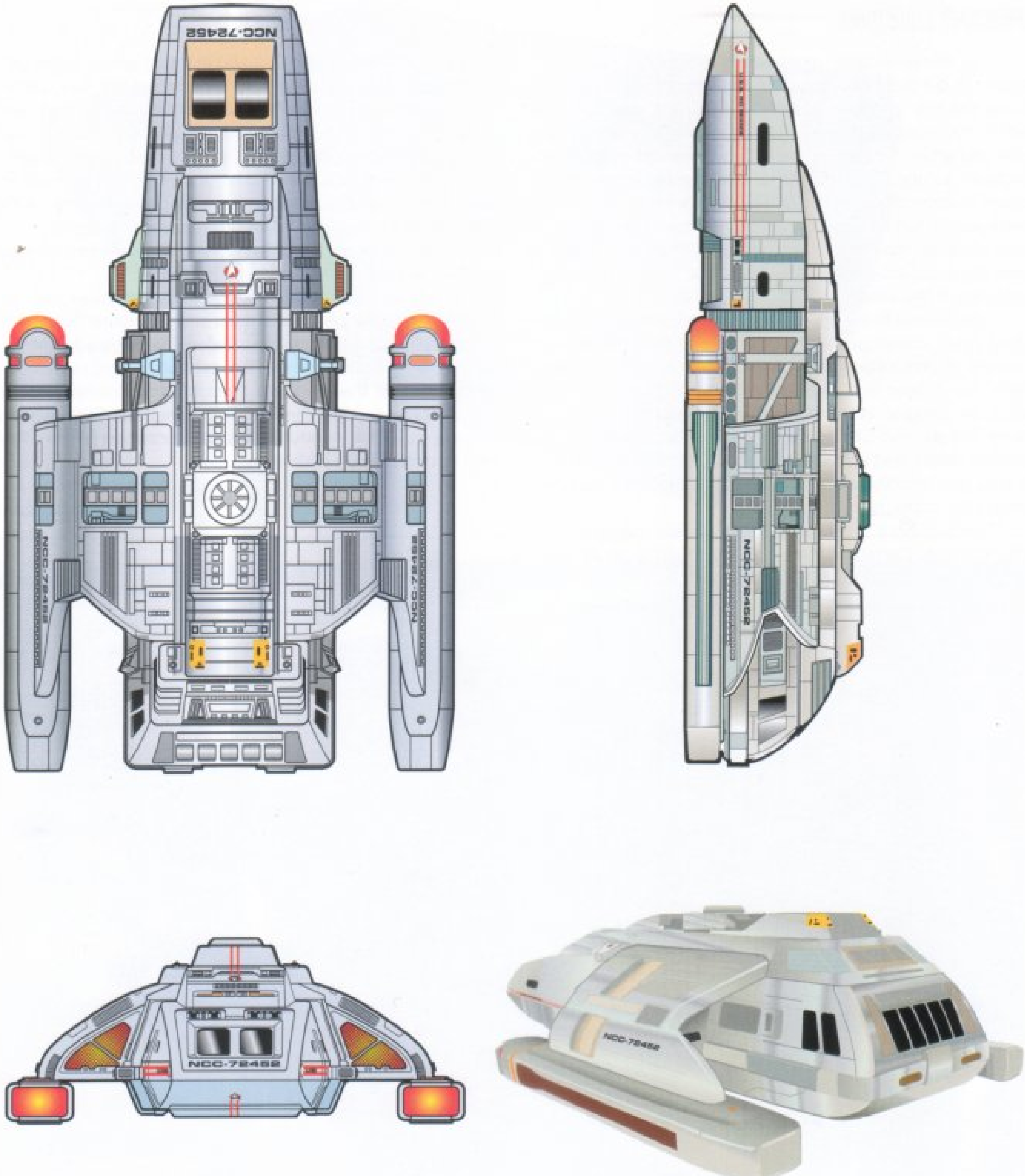
Once these five steps are completed, the three underslung body components are added. The detachable crew cockpit, multimission module pack, and aft living compartment are moved into place and docked. The spine contains an integral corridor with reconfigurable seals that make airtight and EM-protected connections between the module doors and utilities conduits. A small Jefferies tube is also built into the spine for access to the warp core and other ship systems.

The runabout modularity offers a wide range of mission options. Currently, there are four main sizes of available modules: mono-load, XY half-load, XZ half-load, and quarter-load. The mono-load module is a single large unit possessing a central spine notch and ventral bay doors. The XY half-load is half the size of the mono-load and spans the width of the cargo section laterally. The XZ half-load is also half the size of the mono-load, but runs lengthwise along one side of the cargo section. Other custom sizes are available, depending on the mission type ordered. Modules can be transported by starship, preloaded for attachment at Deep Space 9, planetary surface facilities, or starbases.

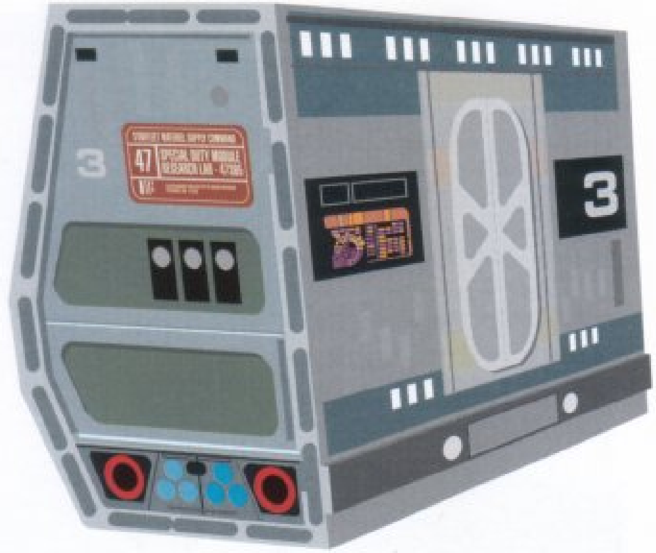
In some cases, special laboratory modules can be shipped to orbital or surface sites and left, either tended or automated, for later pickup. Defensive payloads, emergency habitats, and additional runabout living quarters can be outfitted to the standard module spaceframes. Power can be provided by the onboard runabout EPS system through subfloor conduits, or self-contained within fuel cells or microfusion sources.



Cutaway view of runabout



Danube-class runabout



Special duty lab module

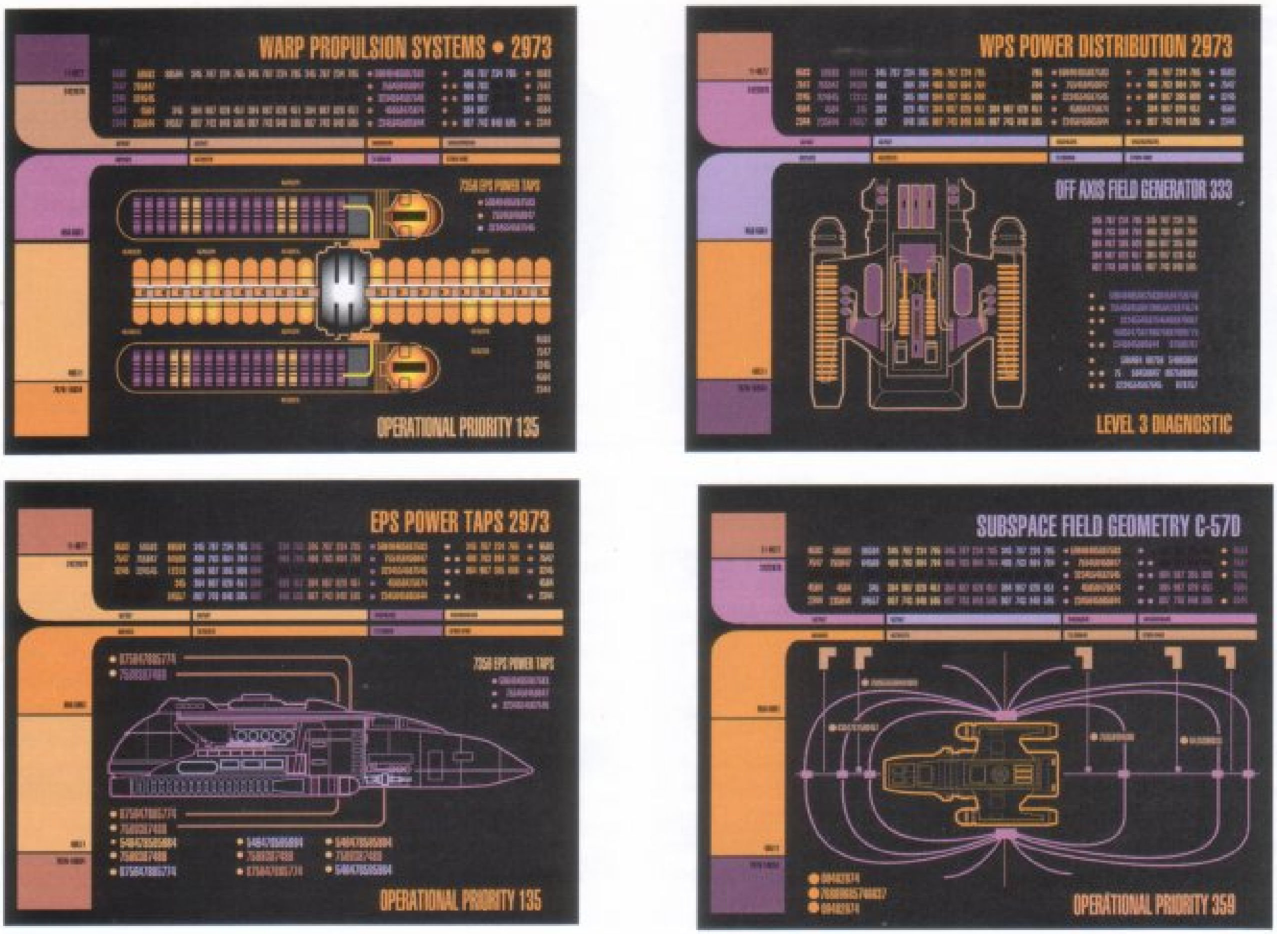
Runabout modularity

Runabout cockpit

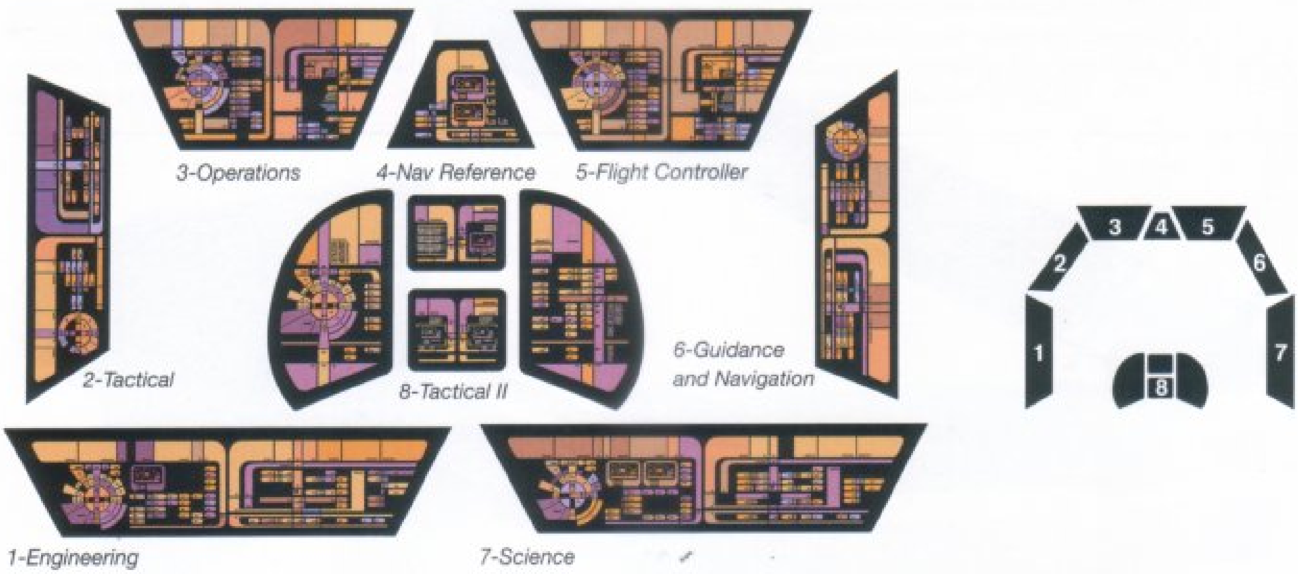
COMMAND SYSTEMS

The runabout cockpit design is derived from existing hybrid shuttlecraft-lifeboat escape craft systems and has the ability to detach in an emergency and either continue in space or land on a planetary surface. The forward section contains all of the flight controls, engineering, and tactical system panels. The primary flight controls are duplicated at the two central stations, though the normal configuration is to have the port station set as the mission commander's controls, and the starboard station set as the runabout pilot's controls. The aft port station, when filled, controls the tactical systems, primarily to take away a portion of the piloting crew workload. The aft starboard station monitors engineering functions. All standard starship functions are controlled through the cockpit, which is analogous to any larger starship bridge.

Cockpit flight operations



Ship status displays



Runabout control interfaces

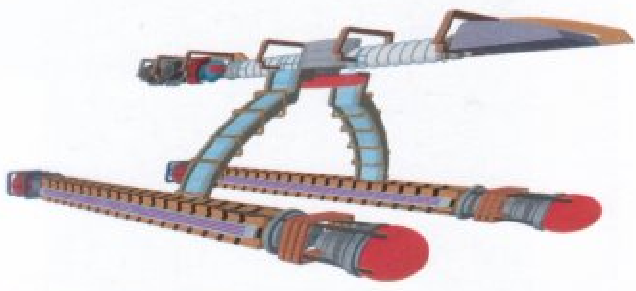
COMPUTER SYSTEMS

The runabout computer core is located within the cockpit subfloor and measures 2.3 by 2.1 by 1.3 meters. The twin-core concept, standard within most Starfleet vessels, applies to the runabout as well, with a total of 186 isolinear banks and fifty-three command preprocessors and data analysis units. Isolinear subnodes distributed throughout the runabout report to the core, though the connections are severed in the event the cockpit detaches. The core maintains reliable flight control for the cockpit module under all conditions.

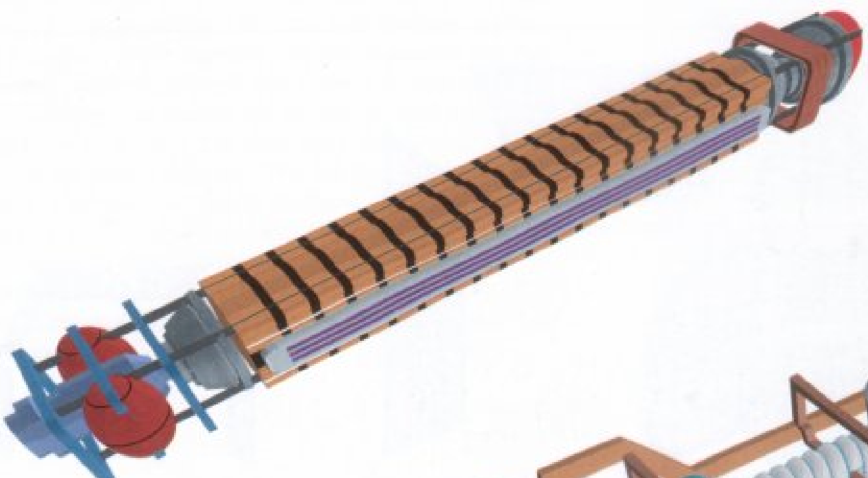
Computer core

WARP PROPULSION SYSTEMS

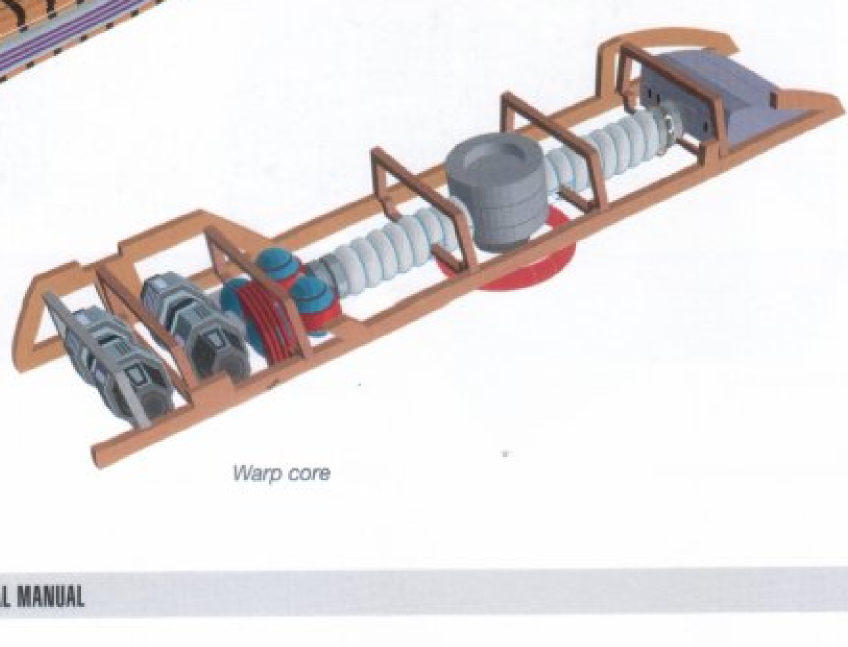
The runabout warp propulsion system employs a horizontal matter-antimatter reaction scheme, with the deuterium tankage located at the forward end of the spine and two standard antideuterium pods at the aft end. Reactant injectors and magnetic constriction assemblies drive the fuels into a flattened chamber, which is optimized for a spiral wave transfer of plasma energy out to the pylons. While the entire warp propulsion system appears exposed and vulnerable on the vessel exterior, the risk is comparable to that for starships with deeply protected cores. Threat energy weapons and torpedo detonations can be countered through the use of a portion of the warp energy feeding directly into the defensive shield generators.



Warp propulsion system



Warp engine



Warp core

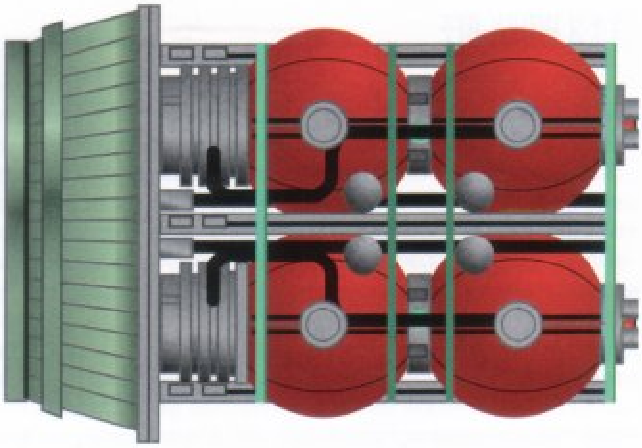
IMPULSE PROPULSION SYSTEMS

The *Danube* class utilizes eight subscale impulse fusion reactors, space-time driver coils, and vectored exhaust directors. The impulse propulsion modules are serviceable by removal from the warp nacelle pylons and contain all required hardware for impulse flight, including interstellar or atmospheric intake vents and condenser-separators for liquefied fuel distillation. Control and fuel cross-feed connections are accomplished through standard magnetic conduits and ODN fiber bundles.

TACTICAL SYSTEMS

Runabouts have typically carried no armaments beyond the six standard phaser strips mounted two forward, two on the nacelles, and two on the aft living module. In recent years, operations in the Alpha Quadrant have seen the deployment of 13.3-centimeter microtorpedoes, as well as delivery systems built into the multirole modules to carry at least four full-sized photon or quantum torpedoes. In the case of the microtorpedo, an extendable launcher tube is built into the sensor pallet beneath the cockpit. The breech and torpedo magazine are accessible from the cockpit interior, through a floor hatch. The micro torpedo is equipped with a miniature fusion thruster and can be loaded with a variety of chemical explosives or other warhead materials, such as gases or biological agents. In its science mode, the launcher can deploy sub-miniature class-1-S sensor probes.

The launch of a photon or quantum torpedo from the runabout involves a fire-and-forget system, in the absence of a magnetic tube launcher. The guidance and navigation package of the torpedo attempts to keep to the programmed course, but may have difficulty during the first 3.7 seconds of powered flight. After that, the guidance demands are significantly reduced while the torpedo settles down in the +Z direction.



Impulse engines

OTHER SYSTEMS AND PERSONNEL SUPPORT

All remaining systems and personnel support issues are identical to those aboard the *Defiant*. The runabout is equipped with a transporter, sensors, full life support, gravity generation, and emergency systems and medical kits. Four emergency EVA pressure suits are also available, as are a selection of type-2 hand phasers.

CONCLUSION

The continued production of the *Danube*-class runabout has been approved by Starfleet for the foreseeable future, even as a follow-on vehicle is undergoing initial design reviews and systems simulations at the ASDB. Spaceframe and systems tooling has been replicated and dispersed to three additional sites beyond the initial Utopia Planitia Yards, so that rapid deliveries of replacement runabouts can continue, pending Starfleet work order priorities and processed materials availability.

Micro quantum torpedo launch system

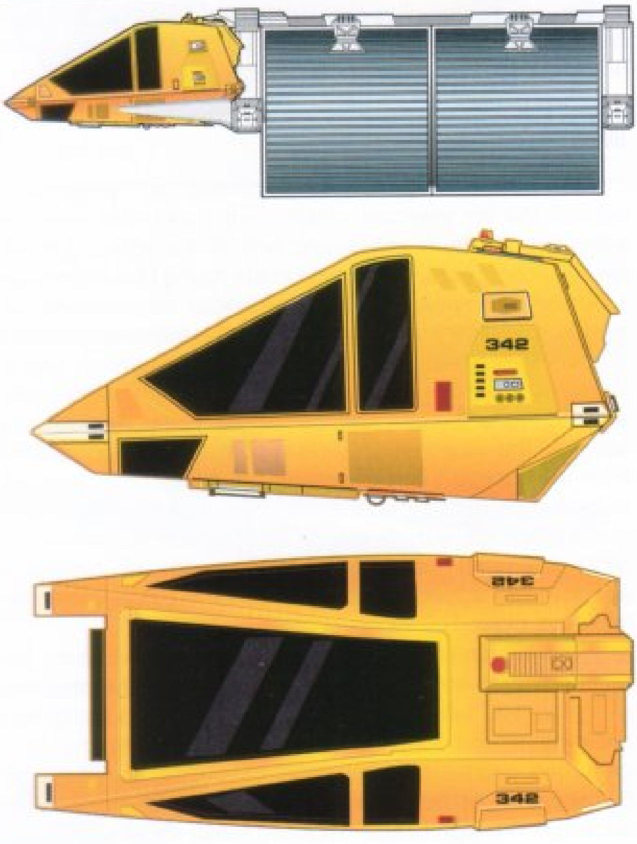
Micro torpedo

14.3 WORK BEE

The Work Bee is a small, microfusion-powered utility craft that has been in continuous service with Starfleet since 2268. The basic pressure shell design has changed little, though the interior systems have been periodically updated. The craft is capable of stand-alone operations dealing with inspection of spaceborne hardware, repairs, assembly, and other activities requiring remote manipulators. The Work Bee carries a sing'e crew member, usually garbed in at least an emergency pressure suit to protect against accidental depressurization. In certain applications, a full SEWG is worn to allow the operator to be able to exit the craft, perform any work not possible with the manipulator system, and return for repressurization. The cockpit module measures 4.11 by 1.92 by 1.90 meters, and masses 1.68 metric tonnes.

In its cargo-transfer role, the Work Bee is connected to one or more cargo modules set within a capture frame. The frame is equipped with additional RCS thrusters, which are commanded by subspace or RF link to the Work Bee flight controls. Inspection or assembly and repair tasks involve a pair of deployable waldoes tucked up into a ventral body cavity and operated by computer control or joystick. Voice commands and predictive computer routines are also used to reduce pilot workload.

The onboard life-support system can provide breathing gases, drinkable water, and cooling for the pilot for as long as fifteen hours. Fuel cell and microfusion EPS power is rated at 76.4 hours, allowing multiple operational runs before recharging is necessary. The window transparencies are controllable in opacity and selective EM penetration. Gravitational acceleration into the pilot chair can be ramped, though most operators seem to prefer a nearly null-*g* environment when working around large vessels and starbase structures, in order to minimize disorientation. The com system supports up to twenty-five discrete channels for maximum EVA coordination of simultaneous Work Bee tasks. All channels can be set to act as emergency beacon frequencies in the event the pilot encounters trouble. In certain advanced astrionics packages, the health of the pilot is monitored by the onboard computer as part of a standard procedures evaluation. If the system detects any values significantly out of normal, the distress beacon will be triggered, and the Work Bee will autonomously return to its docking bay for pilot rescue.



Work Bee

Work Bee

Cutaway display of Work Bee

14.4 STARFLEET STRATEGIC FORCES

STARFLEET SHIP TYPES INVOLVED IN STATION-RELATED COMBAT

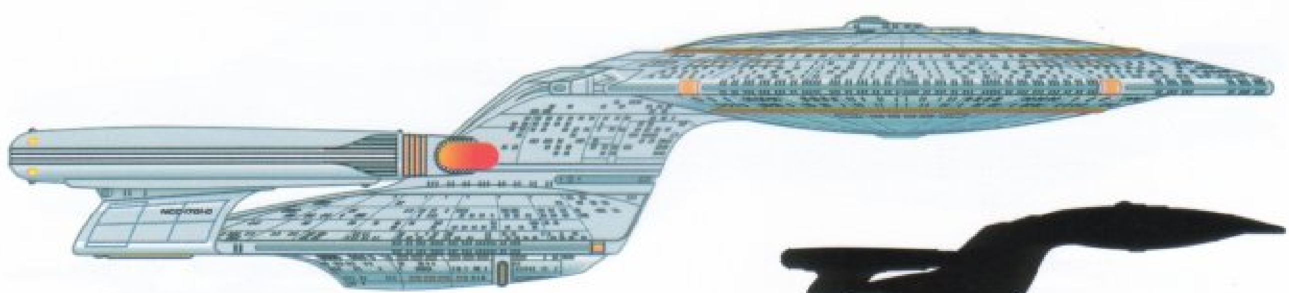
Eight major classes of warp-capable starship were instrumental in bringing about the victory at Deep Space 9 during Operation Return, the first extended military action involving multiple fleet groups since the Battle of Wolf 359. Four other classes saw limited numbers of vessels diverted from Beta Quadrant patrol duty to augment the Seventh and Ninth Fleets in Bajor Sector combat. In the months leading up to the military action, Starfleet made a number of alterations to its ship-building schedules across all fleet yards, including the three undisclosed assembly bases outside the Federation Defense Perimeter.

In addition to the following classes, rapid prototyping and refurbishment was initiated on at least 178 partial builds, salvaged hulls, and spaceworthy warp engine systems. The ships that could be structurally mated and outfitted were hastily launched and flight-tested, more often than not given no formal name or registry number. Some temporary designations for surviving vessels have passed through the formal review process since the operation and may be added to the official ship inventory. As an example of the expedited assembly procedures applied to some of the existing classes, a number of *Galaxy*-class hulls were pulled from the internal structures work path, equipped with additional weapons, and launched with 65 percent of their spaceframe volumes empty.

The accompanying silhouettes, data blocks, and elevation views provide general starship specifications and external configurations. All values are derived from vessel class baseline designs and may not represent all possible variants, yard changes, or field modifications.

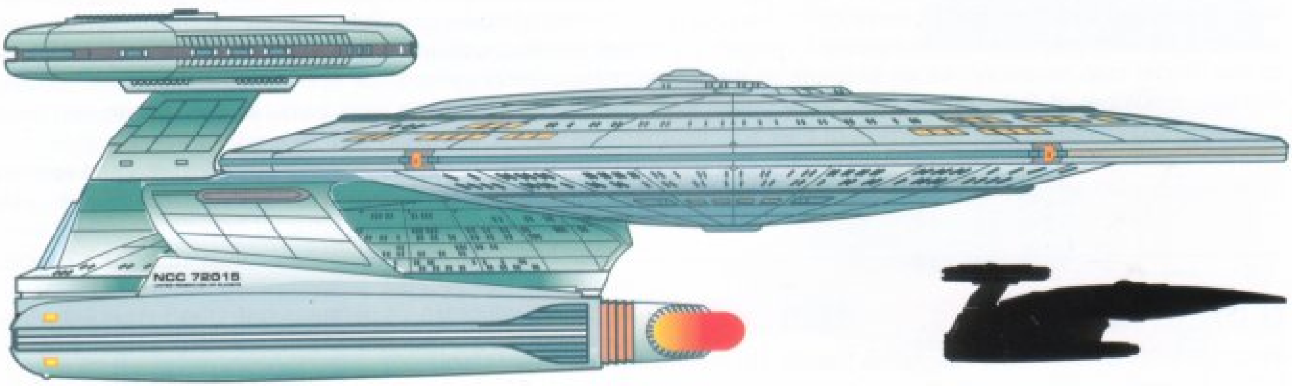
GALAXY-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Explorer.
ACCOMMODATION: 1,012 officers and crew; 200 visiting personnel; 15,000 person evacuation limit.
POWER PLANT: One 1500 plus cochrane warp core feeding two nacelles; one impulse system in stardrive section, two impulse systems in saucer section.
DIMENSIONS: Length, 642.51 meters; beam, 463.73 meters; height, 195.26 meters.
MASS: 4,500,000 metric tonnes.
PERFORMANCE: Warp 9.6 for 12 hours (STD); warp 9.9 for 12 hours Uprated (UPRTD).
ARMAMENT: Eleven type-10 phaser emitters; two photon torpedo launchers.



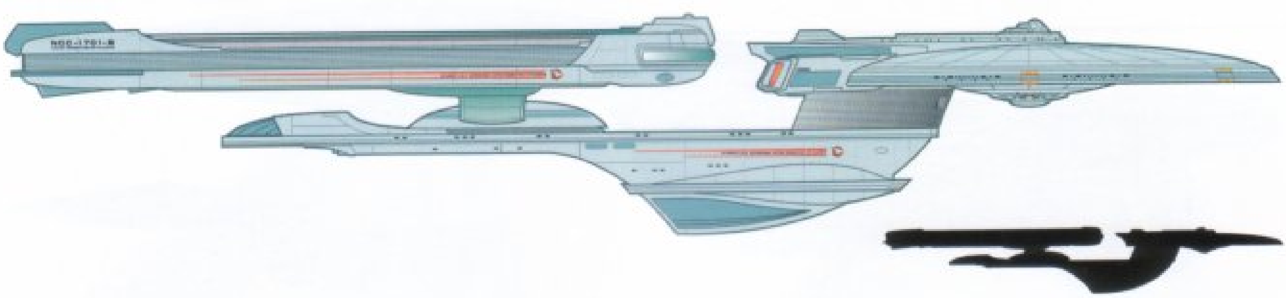
NEBULA-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Explorer.
ACCOMMODATION: 750 officers and crew; 130 visiting personnel; 9,800 person evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 442.23 meters; beam, 318.11 meters; height, 130.43 meters.
MASS: 3,309,000 metric tonnes.
PERFORMANCE: Warp 9.6 for 12 hours (STD); warp 9.9 for 12 hours (UPRTD).
ARMAMENT: Eight type-10 phaser emitters; two photon torpedo launchers.



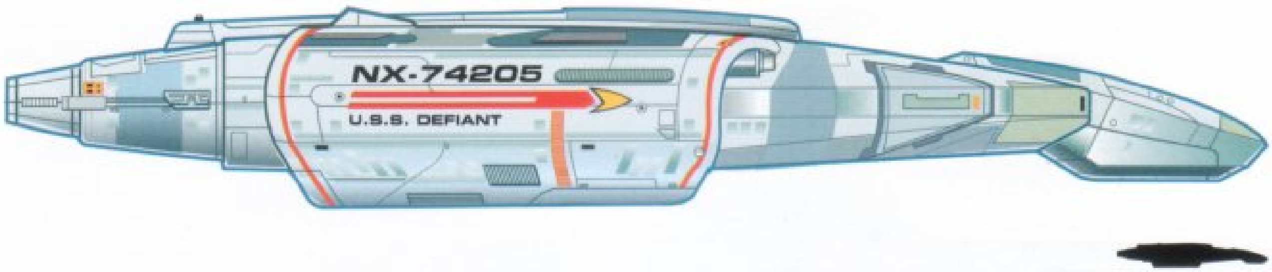
EXCELSIOR-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Explorer.
ACCOMMODATION: 750 officers and crew; 130 visiting personnel; 9,800 person evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 511.25 meters; beam, 195.64 meters; height, 86.76 meters.
MASS: 2,350,000 metric tonnes.



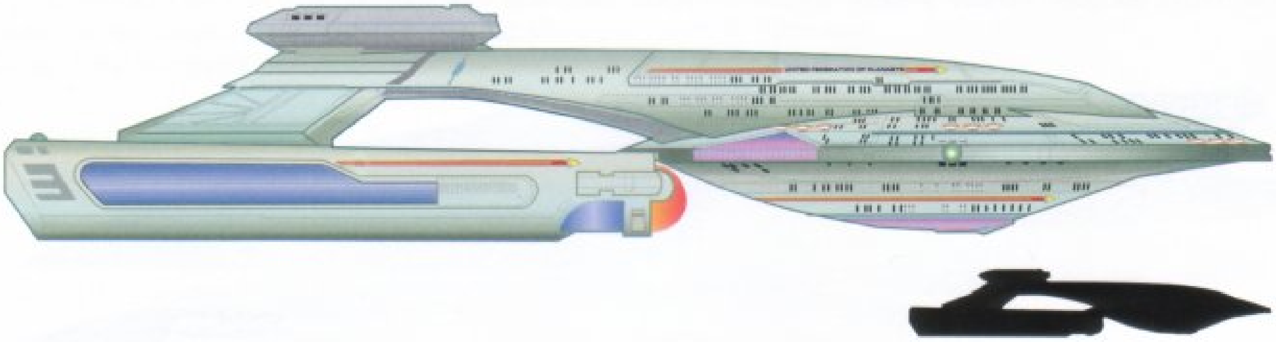
DEFIANT-CLASS STARSHIP (PROTOTYPE)

PRODUCTION BASE: ASDB Integration Facility, Antares Fleet Yards, Antares IV.
TYPE: Escort.
ACCOMMODATION: 40 officers and crew; 150 personal evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; two impulse modules.
DIMENSIONS: Length, 170.68 meters; beam, 134.11 meters; height, 30.1 meters.
MASS: 355,000 metric tonnes.
PERFORMANCE: Warp 9.982 for 12 hours.
ARMAMENT: Four pulse phaser cannons, two torpedo launchers.



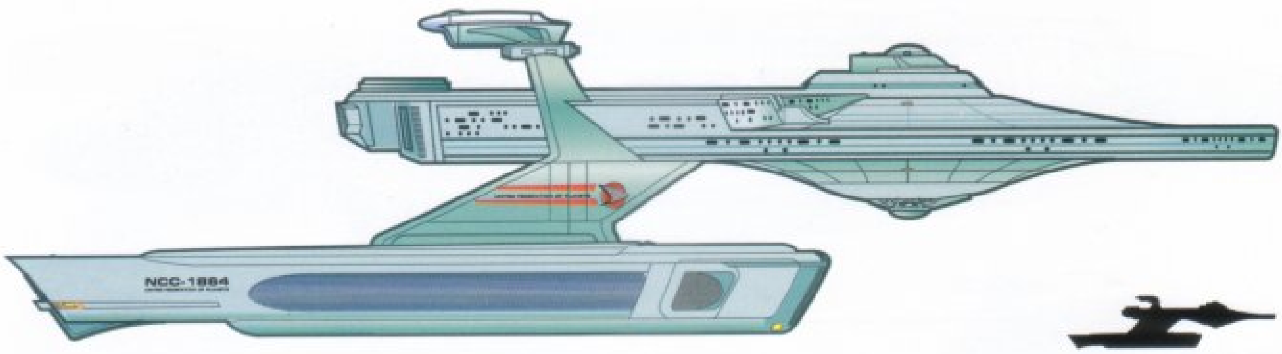
AKIRA-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Facility, Antares Fleet Yards, Antares IV.
TYPE: Heavy Cruiser.
ACCOMMODATION: 500 officers and crew; 4,500 personal evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 464.43 meters; beam, 316.67 meters; height, 87.43 meters.
MASS: 3,055,000 metric tonnes.
PERFORMANCE: Warp 9.8 for 12 hours.
ARMAMENT: Six type-10 phaser emitters; two photon torpedo launchers.



MIRANDA-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Section, Starbase 134 Integration Facility, Rigel VI.
TYPE: Medium Cruiser.
ACCOMMODATION: 220 officers and crew; 500 personal evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 277.76 meters; beam, 173.98 meters; height, 65.23 meters.
MASS: 655,000 metric tonnes.
PERFORMANCE: Warp 9.2 for 12 hours.
ARMAMENT: Six type-7 phaser emitters; two pulse phaser cannons; two photon torpedo launchers.



NORWAY-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Section, Spacedock 1, Earth.
TYPE: Medium Cruiser.
ACCOMMODATION: 190 officers and crew; 500 personal evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 364.77 meters; beam, 225.61 meters; height, 52.48 meters.
MASS: 622,000 metric tonnes.
PERFORMANCE: Warp 9.7 for 12 hours.
ARMAMENT: Six type-10 phaser emitters; two photon torpedo launchers.

SABER-CLASS STARSHIP

PRODUCTION BASE: ASDB Integration Section, Spacedock 1, Earth.
TYPE: Light Cruiser.
ACCOMMODATION: 40 officers and crew; 200 personal evacuation limit.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; two impulse systems.
DIMENSIONS: Length, 364.77 meters; beam, 225.61 meters; height, 52.48 meters.
MASS: 310,000 metric tonnes.
PERFORMANCE: Warp 9.7 for 12 hours.
ARMAMENT: Four type-10 phaser emitters; two photon torpedo launchers.

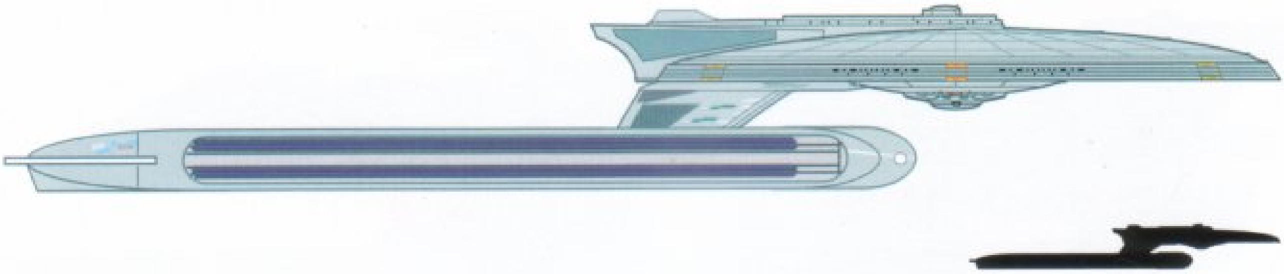
The following spacecrafts were constructed from salvaged components, components in work, and custom assemblies fabricated by the individual fleet yards. Those vessels not destroyed or damaged beyond salvageability were returned to Starfleet bases and yards for rework back to their respective major classes or repaired and returned to service.

INTREPID/CONSTITUTION-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, McKinley Orbital Spacedock, Earth.
TYPE: Medium Cruiser.
ACCOMMODATION: 225 officers and crew.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; two impulse modules.
DIMENSIONS: Length, 444.39 meters; beam, 155.44 meters; height, 87.78 meters.
MASS: 1,300,000 metric tonnes.

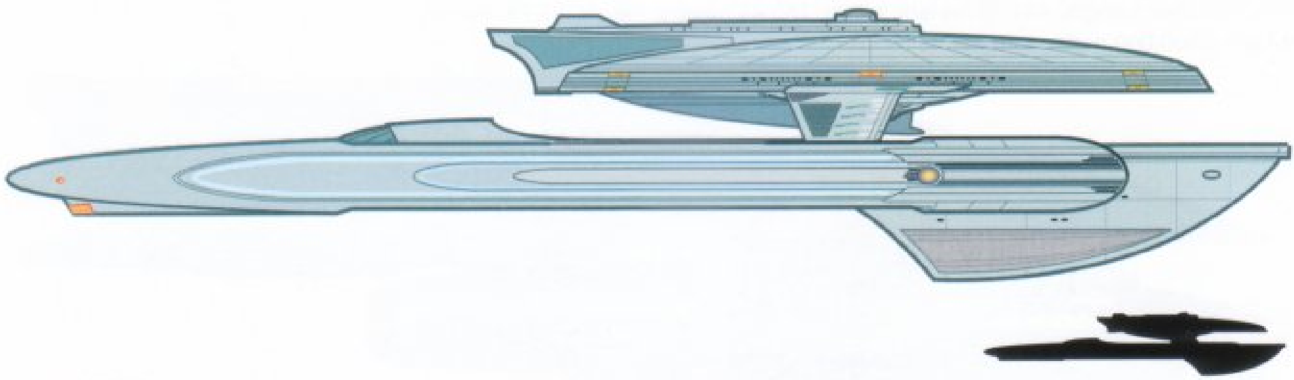
EXCELSIOR-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Medium Cruiser.
ACCOMMODATION: 315 officers and crew.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; two impulse systems.
DIMENSIONS: Length, 381.87 meters; beam, 320.16 meters; height, 78.54 meters.
MASS: 870,000 metric tonnes.
PERFORMANCE: Warp 9.6 for 12 hours.
ARMAMENT: Nine type-9 phaser emitters; two photon torpedo launchers.



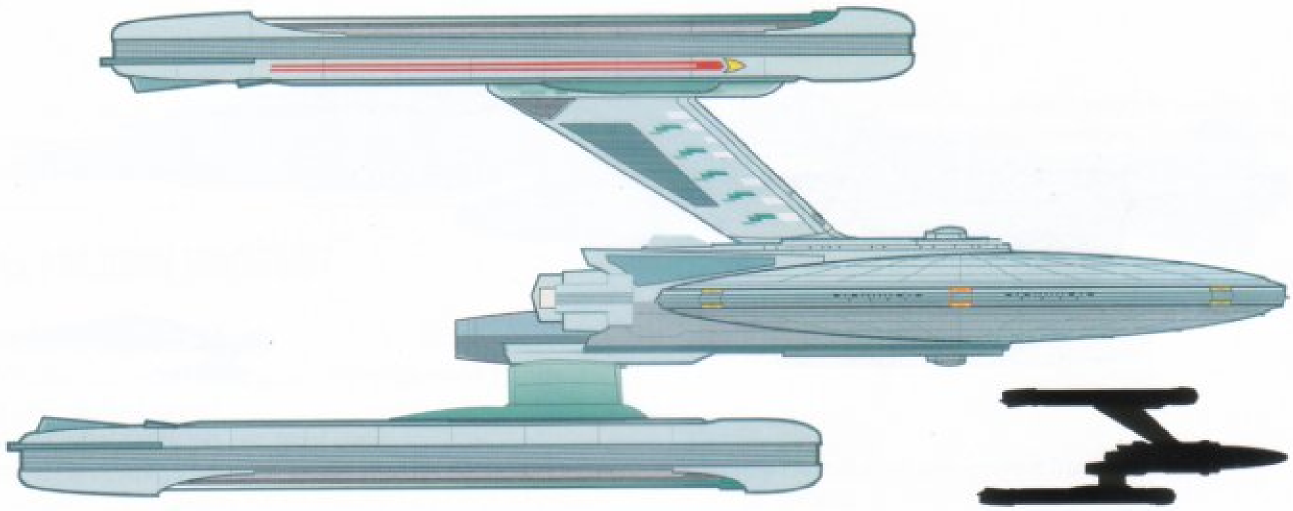
EXCELSIOR/CONSTITUTION-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Medium Cruiser.
ACCOMMODATION: 290 officers and crew.
POWER PLANT: Two 1500 plus Cochrane warp cores feeding two nacelles; four impulse systems.
DIMENSIONS: Length, 383.41 meters; beam, 195.64 meters; height, 148.50 meters.
MASS: 1,270,000 metric tonnes.
PERFORMANCE: Warp 9.75 for 12 hours.
ARMAMENT: Ten type-9 phaser emitters; two photon torpedo launchers.



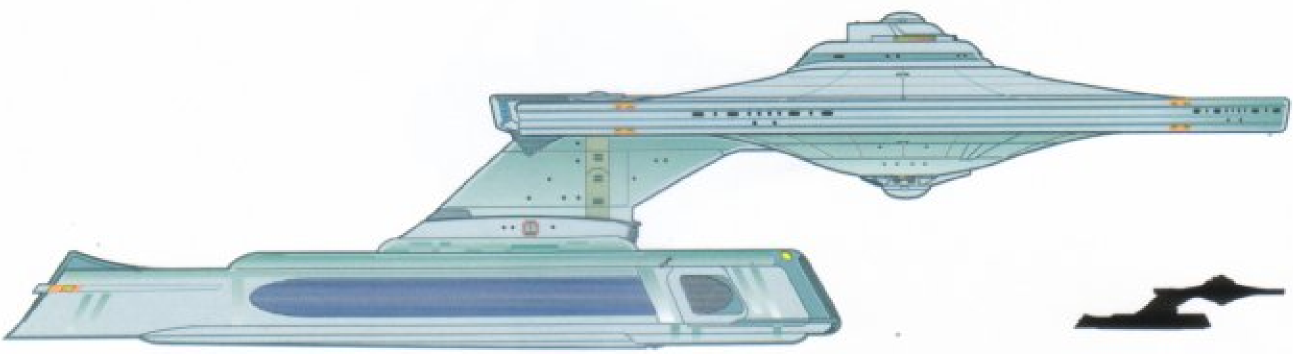
EXCELSIOR-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Medium Cruiser.
ACCOMMODATION: 275 officers and crew.
POWER PLANT: One 1500 plus Cochrane warp core feeding three nacelles; one impulse system.
DIMENSIONS: Length, 288.33 meters; beam, 173.98 meters; height, 74.85 meters.
MASS: 660,000 metric tonnes.
PERFORMANCE: Warp 9.6 for 12 hours.
ARMAMENT: Eight type-9 phaser emitters; two photon torpedo launchers.



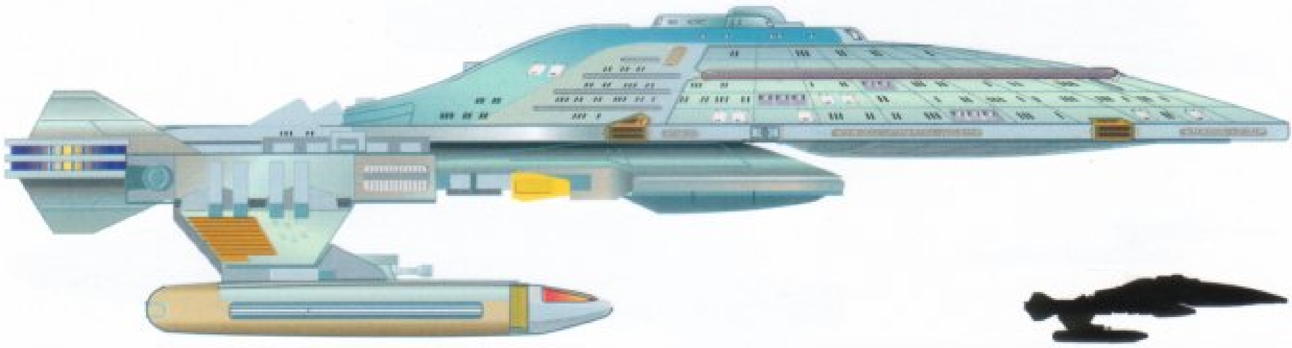
CONSTITUTION-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, McKinley Orbital Spacedock, Earth.
TYPE: Light Cruiser.
ACCOMMODATION: 115 officers and crew.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; two impulse modules.
DIMENSIONS: Length, 364.84 meters; beam, 155.44 meters; height, 93.26 meters.
MASS: 650,000 metric tonnes.
PERFORMANCE: Warp 9.75 for 12 hours.
ARMAMENT: Eleven type-10 phaser emitters; four photon torpedo launchers.



INTREPID-CLASS STARSHIP VARIANT

PRODUCTION BASE: ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars.
TYPE: Light Cruiser.
ACCOMMODATION: 204 officers and crew.
POWER PLANT: One 1500 plus Cochrane warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 402.11 meters; beam, 195.64 meters; height, 58.69 meters.
MASS: 550,000 metric tonnes.
PERFORMANCE: Warp 9.55 for 12 hours.
ARMAMENT: Seven type-8 phaser emitters; one photon torpedo launcher.



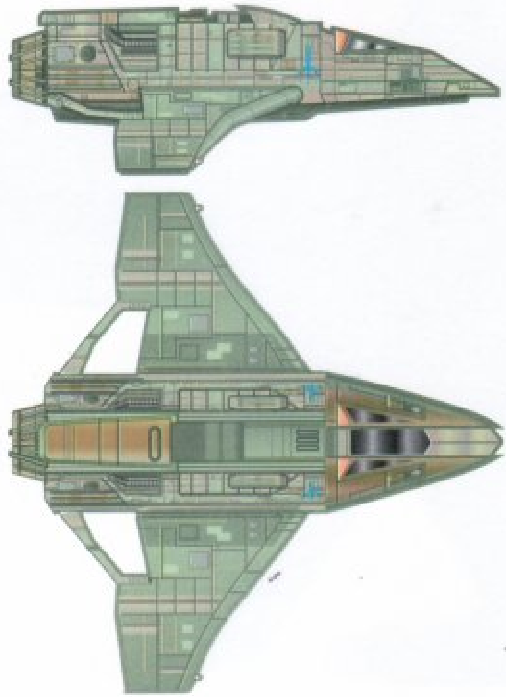
15.0 ALLIED SPACECRAFT

This section deals with the vessels operated by the allied star systems as defined by current United Federation of Planets treaties. Due to the fluctuating nature of Romulan political affiliations, and thus their military intentions, those vessels have been placed with the threat spacecraft descriptions.

15.1 BAJORAN SPACECRAFT

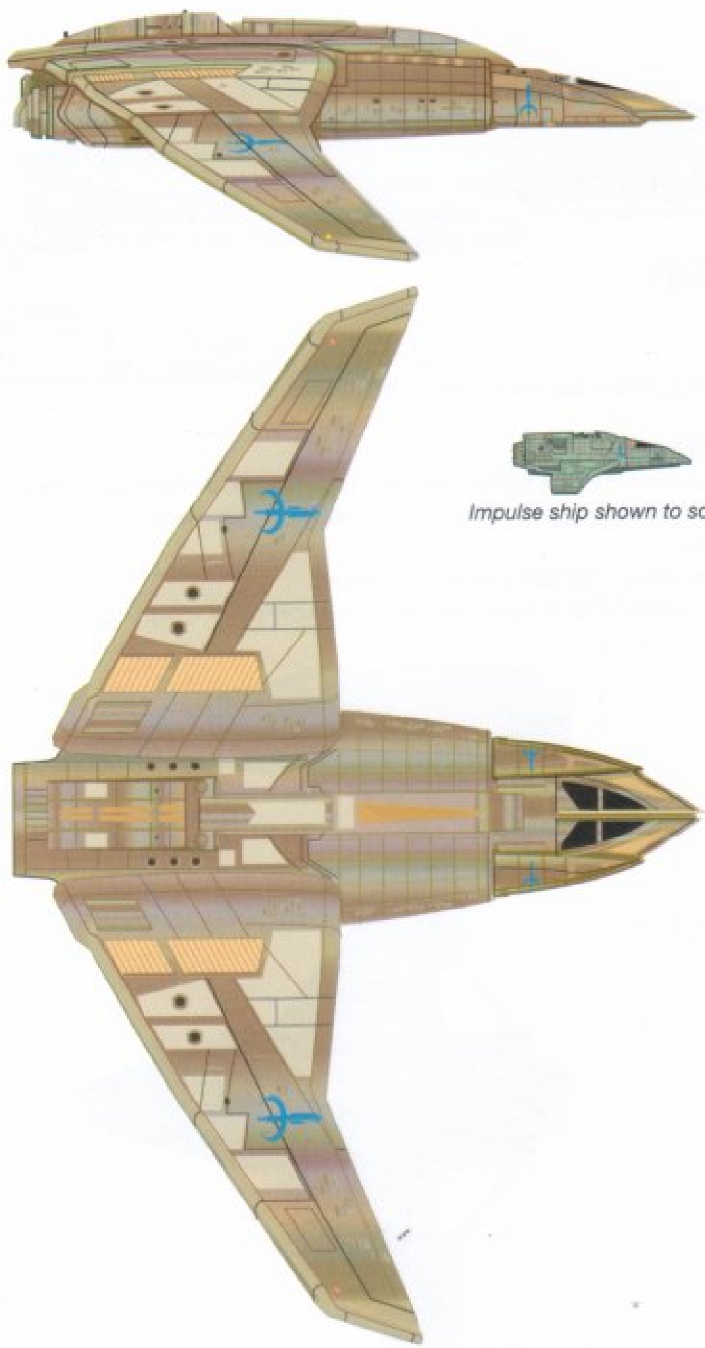
BAJORAN IMPULSE SHIP

PRODUCTION BASE: Bajoran Militia Secured Factory #5.
TYPE: Strike Fighter.
ACCOMMODATION: Two flight crew.
POWER PLANT: One microfusion impulse system (fighter); Coanda-cycle chemical/air-ram system (raider).
DIMENSIONS: Length, 33.10 meters; beam, 33.17 meters; height, 11.23 meters.
MASS: 108.96 metric tonnes.
PERFORMANCE: Maximum delta-v, 15,600 meters per second.
ARMAMENT: Six or more phased polaron beam weapons; possibly other weapons.



BAJORAN ASSAULT VESSEL

PRODUCTION BASE: Bajoran Militia Secured Factory #5.
TYPE: Transport.
ACCOMMODATION: Twelve flight crew; 200+ troops.
POWER PLANT: Four coupled microfusion impulse systems.
DIMENSIONS: Length, 140.72 meters; beam, 221.76 meters; height, 51.76 meters.
MASS: 96,500 metric tonnes.
PERFORMANCE: Maximum delta-*v*, 15,600 meters per second.
ARMAMENT: Six or more phased polaron beam weapons; possibly other weapons.

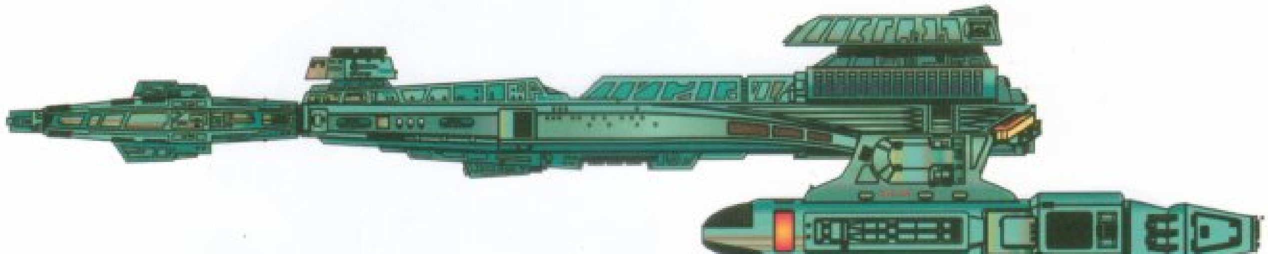


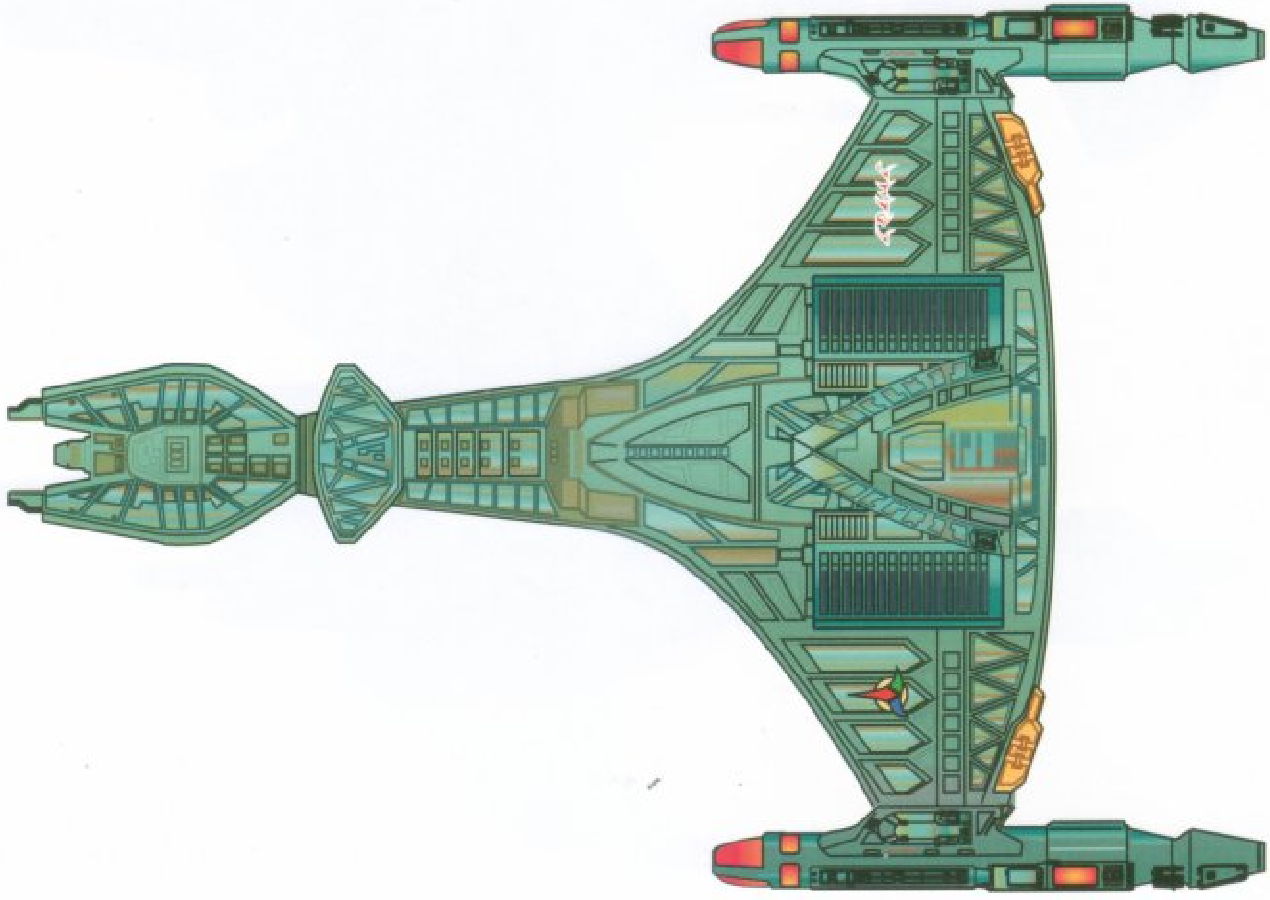
Impulse ship shown to scale

15.2 KLINGON SPACECRAFT

VOR'CHA-CLASS ATTACK CRUISER

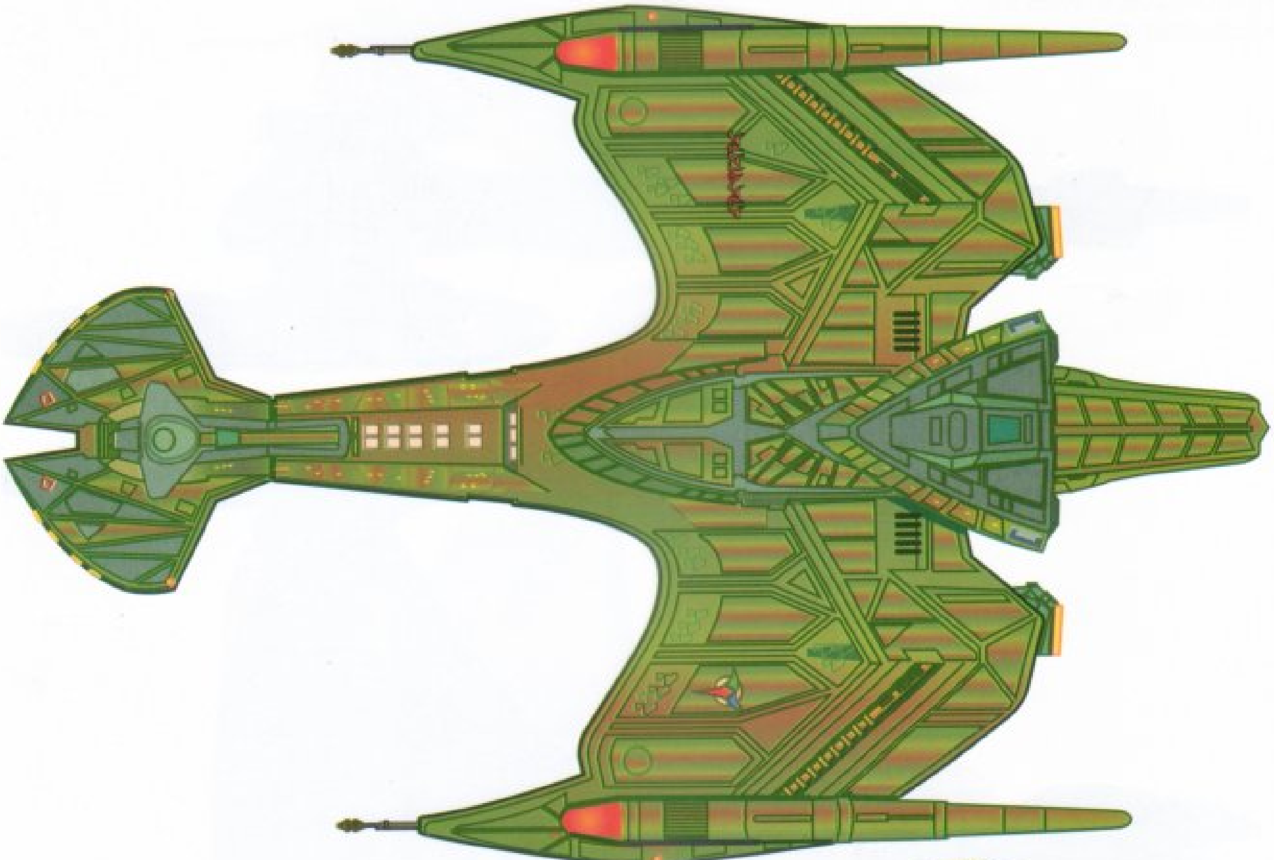
PRODUCTION BASE: Qo'noS Orbital Factory Base.
TYPE: Heavy Cruiser.
ACCOMMODATION: 1,900 plus flight crew and troops.
POWER PLANT: One M/A warp system; two impulse systems.
DIMENSIONS: Length, 481.32 meters; beam, 341.76 meters; height, 106.87 meters.
MASS: 2,238,000 metric tonnes.
PERFORMANCE: Warp 9.6.
ARMAMENT: Eighteen ship-mounted disruptors; one large forward disruptor; three torpedo launchers.





NEGH'VAR-CLASS WARSHIP

PRODUCTION BASE: Qo'noS Orbital Factory Base.
TYPE: Heavy Carrier.
ACCOMMODATION: 2,500 plus flight crew and troops.
POWER PLANT: Two M/A warp systems; four impulse systems.
DIMENSIONS: Length, 682.32 meters; beam, 470.09 meters; height, 136.65 meters.
MASS: 4,310,000 metric tonnes.
PERFORMANCE: Warp 9.6.
ARMAMENT: Twenty ship-mounted disruptors; one large forward disruptor; four torpedo launchers.



B'REL-CLASS BIRD-OF-PREY/K'VORT-CLASS CRUISER

PRODUCTION BASE: Qo'noS Orbital Factory Base.

TYPE: Scout (*B'rel)*; Cruiser (*K'Vort*). Common planform, scaled up 4.3 times for cruiser.

ACCOMMODATION: 12 plus flight crew and troops (*B'rel*); 1500+ flight crew and troops (*K'Vort*).

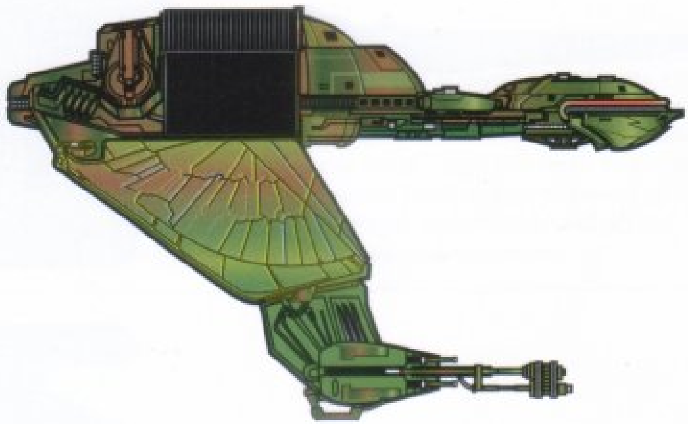
POWER PLANT: One M/A warp system; two impulse systems.

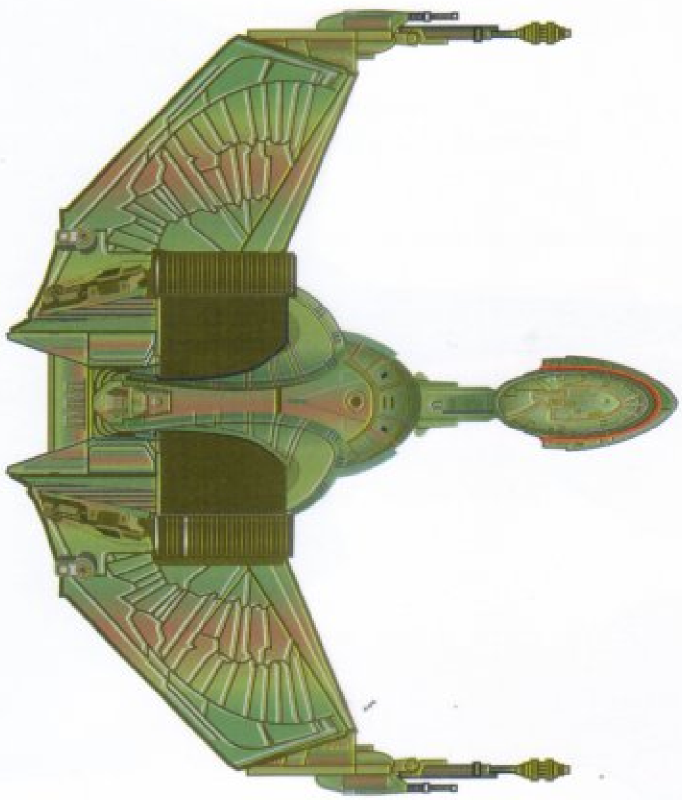
DIMENSIONS: Length, 157.76 meters; beam, 181.54 meters; height, 98.54 meters (*B'rel*). Length, 678.36 meters; beam, 780.62 meters; height, 423.72 meters (*K'Vort*)).

MASS: 236,000 metric tonnes (B'rel), 1,890,000 metric tonnes (*K'Vort*)

PERFORMANCE: Warp 9.6 (*B'rel* and *K'Vort*).

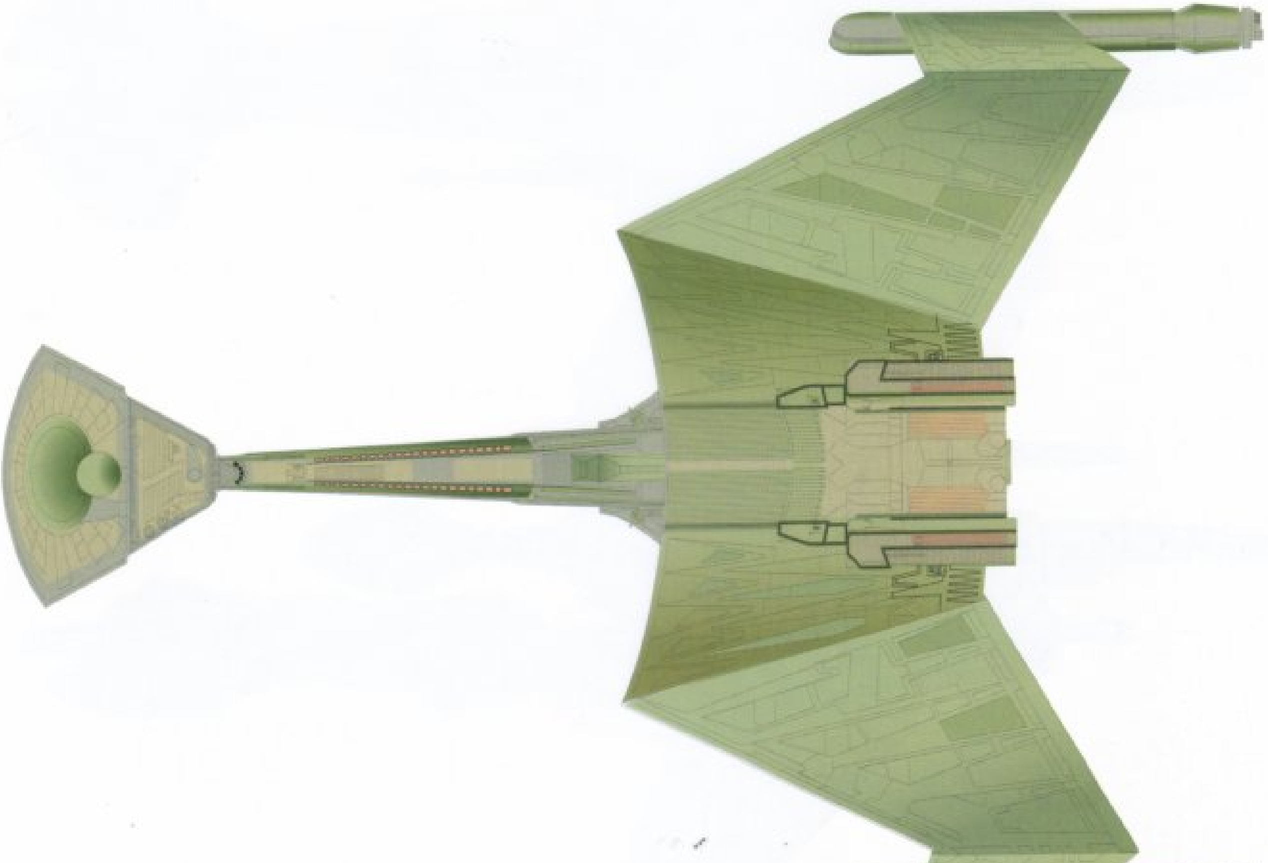
ARMAMENT: Two ship-mounted disruptor cannons; one torpedo launcher (*B'rel*). Four ship-mounted disruptor cannons; two torpedo launcher (*K'Vort*).





K'T'INGA-CLASS BATTLE CRUISER

PRODUCTION BASE: Qo'noS Orbital Factory Base.
TYPE: Heavy Cruiser.
ACCOMMODATION: 800 plus flight crew and troops.
POWER PLANT: One M/A warp system; two impulse systems.
DIMENSIONS: Length, 349.54 meters; beam, 251.76 meters; height, 98.41 meters.
MASS: 760,000 metric tonnes.
PERFORMANCE: Warp 9.6.
ARMAMENT: Six ship-mounted disruptors; two torpedo launchers.



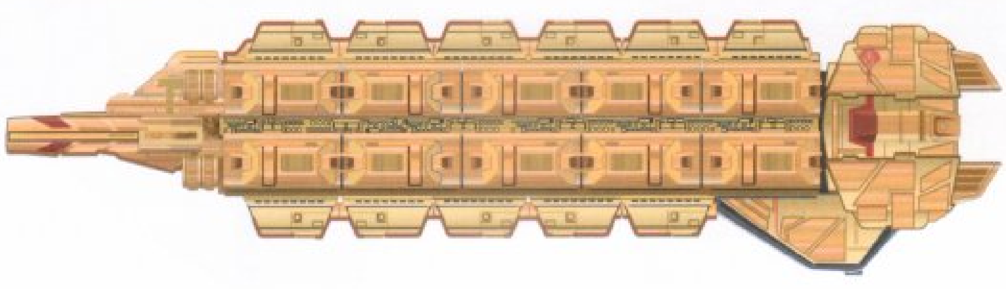
16.0 THREAT FORCE SPACECRAFT

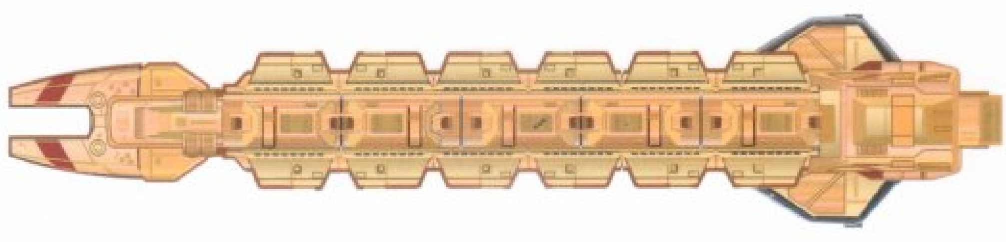
All threat spacecraft specifications have been compiled from Starfleet intelligence-gathering efforts involving direct sensor readings, captured units, simulations, and other undisclosed analysis techniques. For security reasons, all listed values should be considered as estimates. In the case of the Jem'Hadar battle cruiser, disregard all previous Starfleet analyses related to vehicle orientation within the standard galactic plane. Please see updated mission briefs 3516.8/b-f. The Cardassian freighter is thought to be assembled from the same cargo bay units that make up the Terok Nor docking ring. One interesting note about the Cardassian fighter is that the basic planform seems to have been adapted from that of the *U.S.S. Defiant*, particularly in the forward hull notch, bridge morphology, and aft hull assembly. Starfleet is of the opinion that some classified design documentation may have been compromised.

16.1 CARDASSIAN SPACECRAFT

CARDASSIAN FREIGHTER

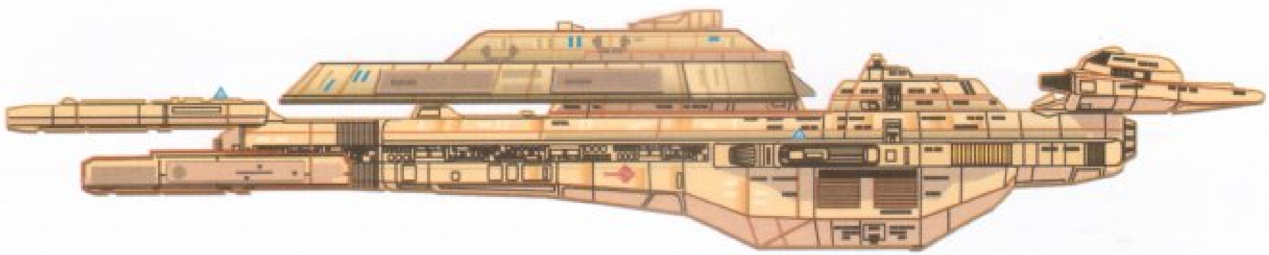
PRODUCTION BASE: Cardassia Prime Orbital Three Assembly Facility.
TYPE: Freighter.
ACCOMMODATION: 30 plus flight crew.
POWER PLANT: One M/A warp system; two or more impulse systems.
DIMENSIONS: Length, 255.65 meters; beam, 55.13 meters; height, 63.21 meters.
MASS: 1,340,000 metric tonnes (est.).
PERFORMANCE: Warp 6.5 (observed).
ARMAMENT: Four or more spiral-wave disruptors; one medium aft disruptor wave cannon; possibly other weapons.

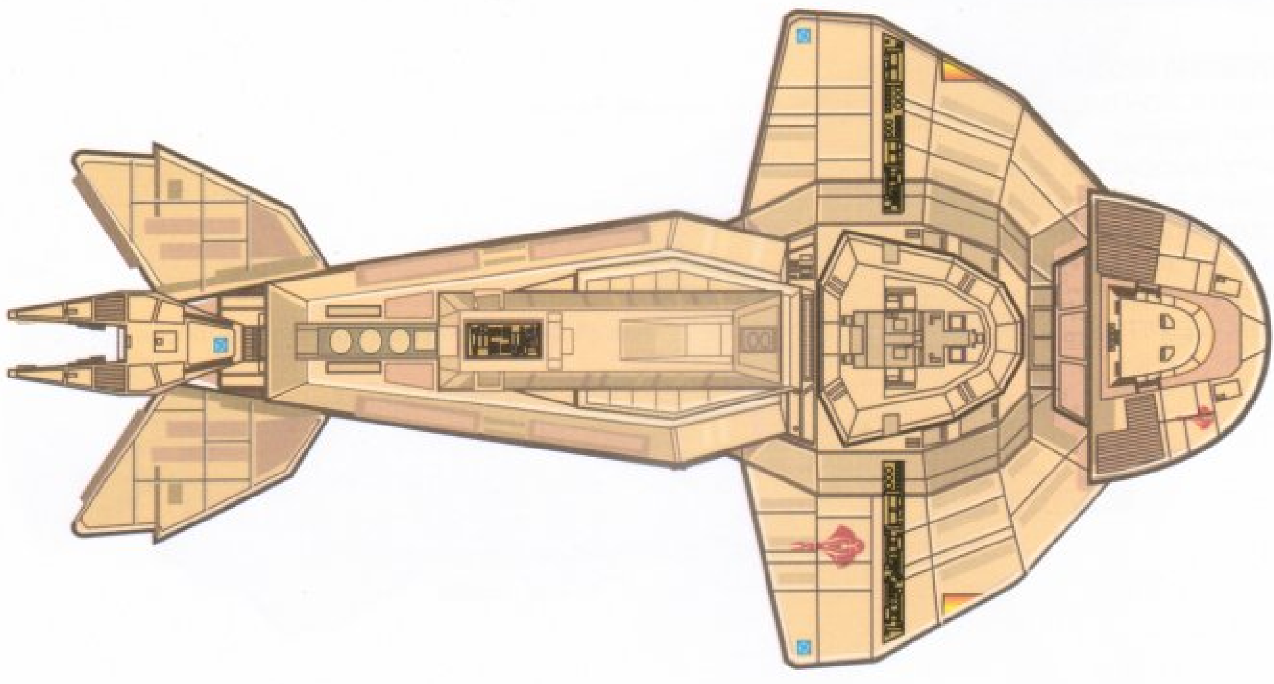




GALOR-CLASS WARSHIP (VARIANT)

PRODUCTION BASE: Cardassia Prime Orbital Three Assembly Facility.
TYPE: Heavy Cruiser.
ACCOMMODATION: 500 plus flight crew and troops.
POWER PLANT: One and possibly two M/A warp systems; two or more impulse systems.
DIMENSIONS: Length, 371.88 meters; beam, 192.23 meters; height, 70.13 meters.
MASS: 2,230,000 metric tonnes (est.).
PERFORMANCE: Warp 9.6 (observed).
ARMAMENT: Eight or more spiral-wave disruptors; one large aft disruptor wave cannon; possibly other weapons.





GALOR-CLASS ATTACK CRUISER

PRODUCTION BASE: Cardassia Prime Orbital Three Assembly Facility.

TYPE: Medium Cruiser.

ACCOMMODATION: 300 plus flight crew and troops.

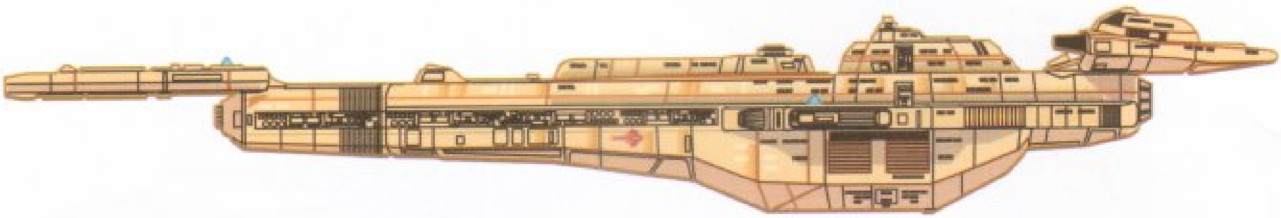
POWER PLANT: One and possibly two M/A warp systems; three or more impulse systems.

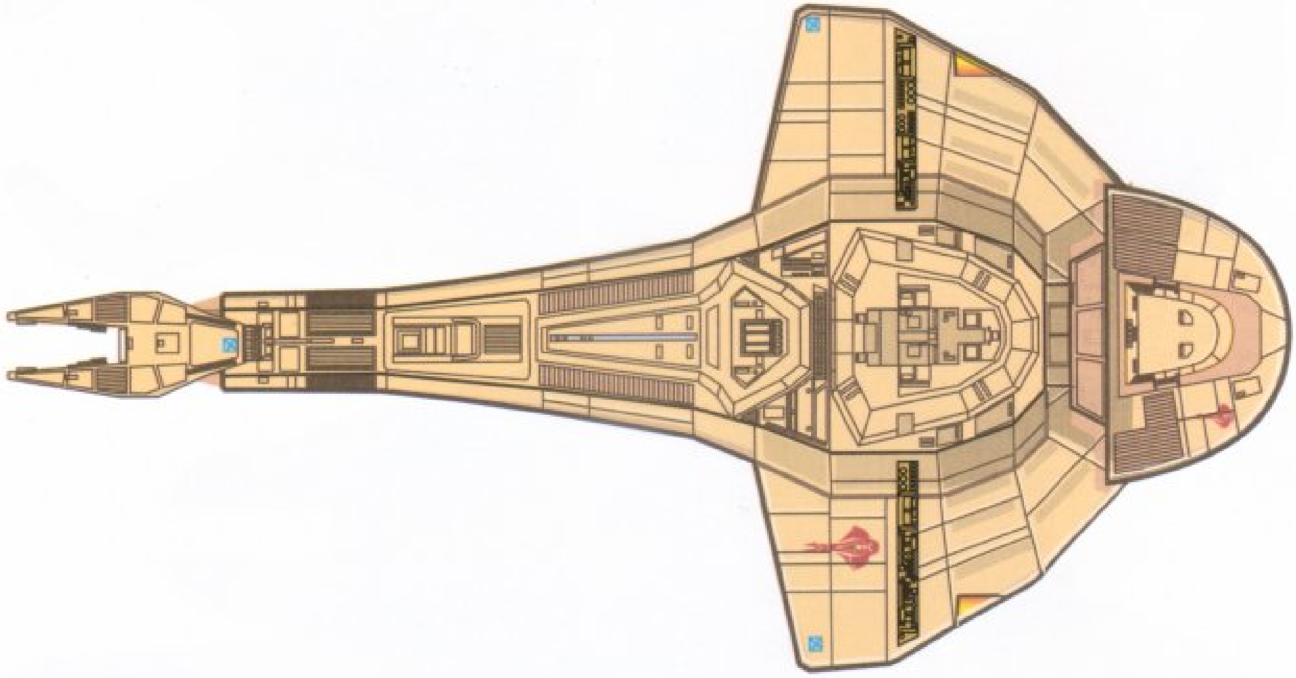
DIMENSIONS: Length, 371.88 meters; beam, 192.23 meters; height, 59 meters.

MASS: 1,678,000 metric tonnes (est.).

PERFORMANCE: Warp 9.6 (observed).

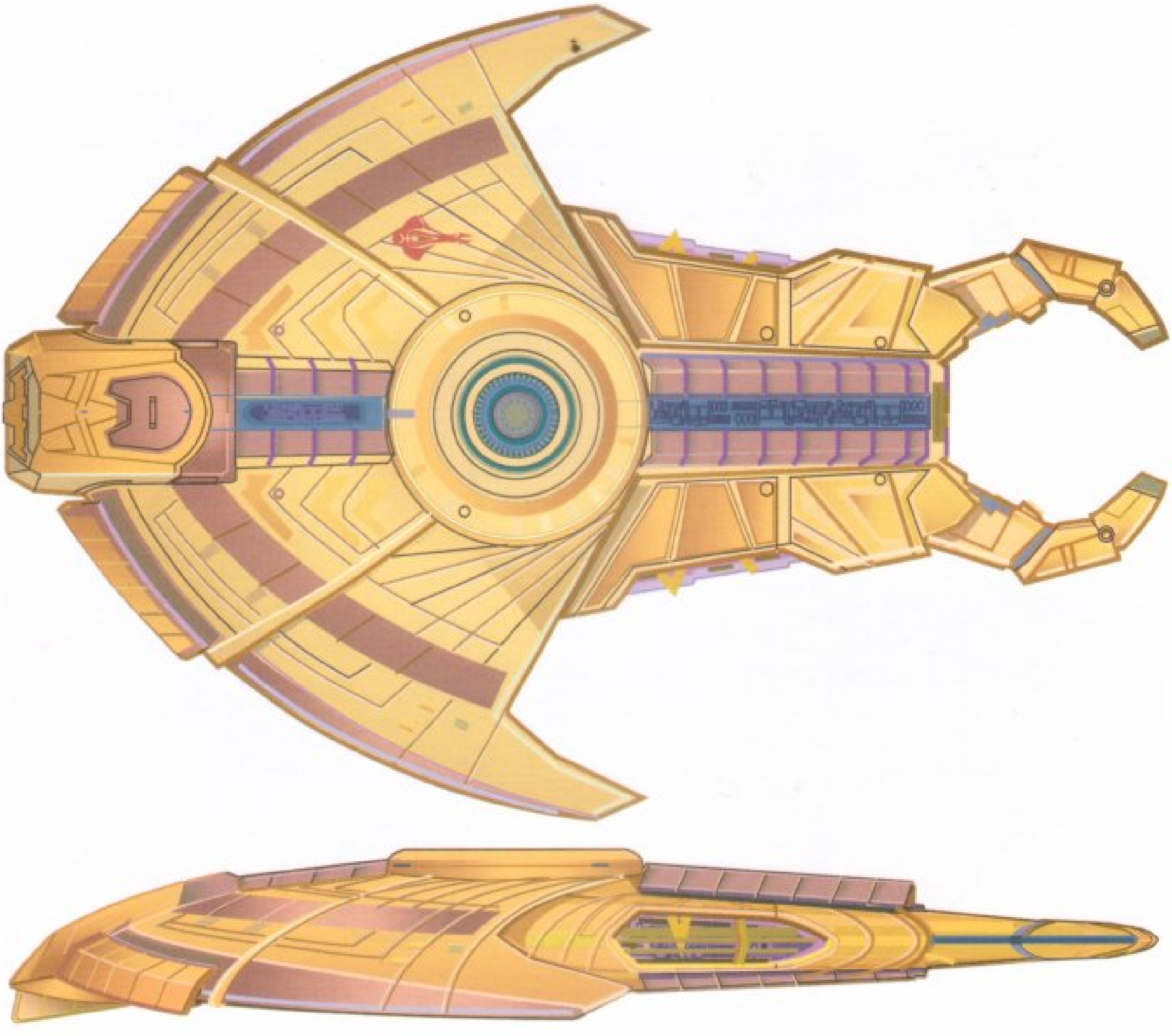
ARMAMENT: Eight or more spiral-wave disruptors; one large aft disruptor wave cannon; possibly other weapons.





CARDASSIAN FIGHTER

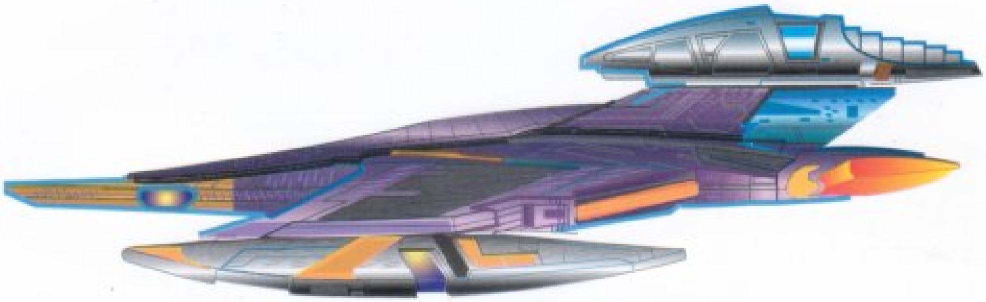
PRODUCTION BASE: Cardassia Prime Orbital Three Assembly Facility.
TYPE: Strike fighter.
ACCOMMODATION: 30 plus flight crew.
POWER PLANT: One and possibly two M/A warp systems; one or more impulse systems.
DIMENSIONS: Length, 85.78 meters; beam, 60.14 meters; height, 12.43 meters.
MASS: 120,000 metric tonnes (est.).
PERFORMANCE: Warp 9.5 (observed).
ARMAMENT: Four or more spiral-wave disruptors; one medium aft disruptor wave cannon; possibly other weapons.



16.2 JEM'HADAR SPACECRAFT

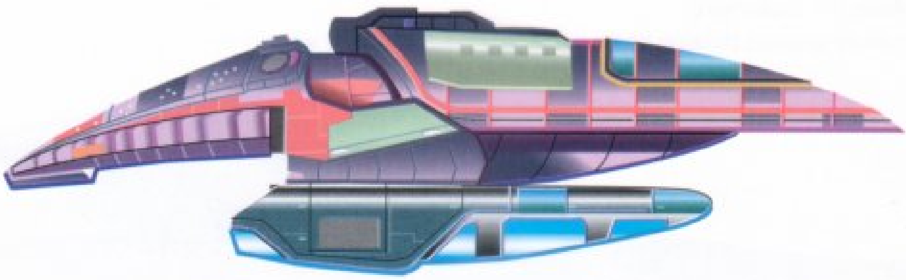
JEM'HADAR BATTLE CRUISER

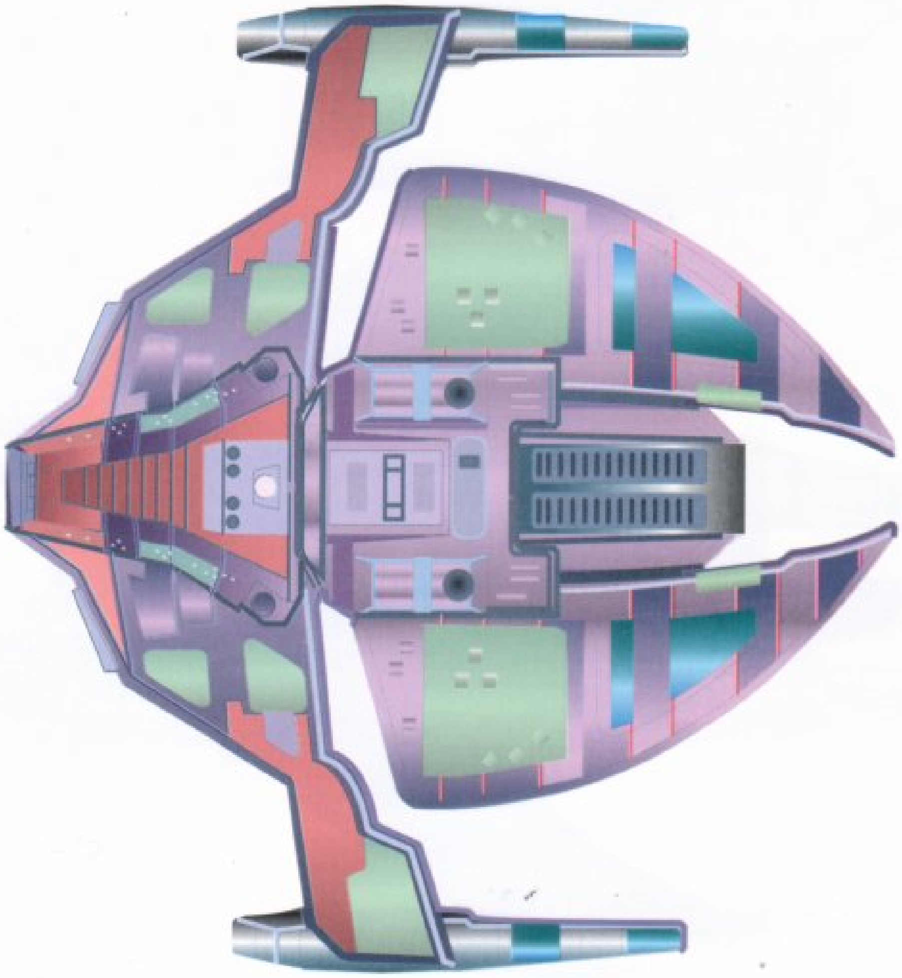
PRODUCTION BASE: Unknown; Gamma Quadrant.
TYPE: Heavy Cruiser.
ACCOMMODATION: 2,500 plus flight crew and troops (est.).
POWER PLANT: One and possibly two M/A warp systems; two or more impulse systems.
DIMENSIONS: Length, 639.75 meters; beam, 568.44 meters; height, 204.97 meters.
MASS: 4,215,000 metric tonnes (est.).
PERFORMANCE: Warp 9.6 (observed).
ARMAMENT: Six or more phased polaron beam weapons; possibly other weapons.



JEM'HADAR ATTACK SHIP

PRODUCTION BASE: Unknown; Gamma Quadrant.
TYPE: Strike Fighter.
ACCOMMODATION: 12 plus flight crew and troops.
POWER PLANT: One M/A warp system; one impulse system.
DIMENSIONS: Length, 68.32 meters; beam, 70.02 meters; height, 18.32 meters.
MASS: 2,450 metric tonnes.
PERFORMANCE: Warp 9.6.
ARMAMENT: Three phased polaron beam weapons.

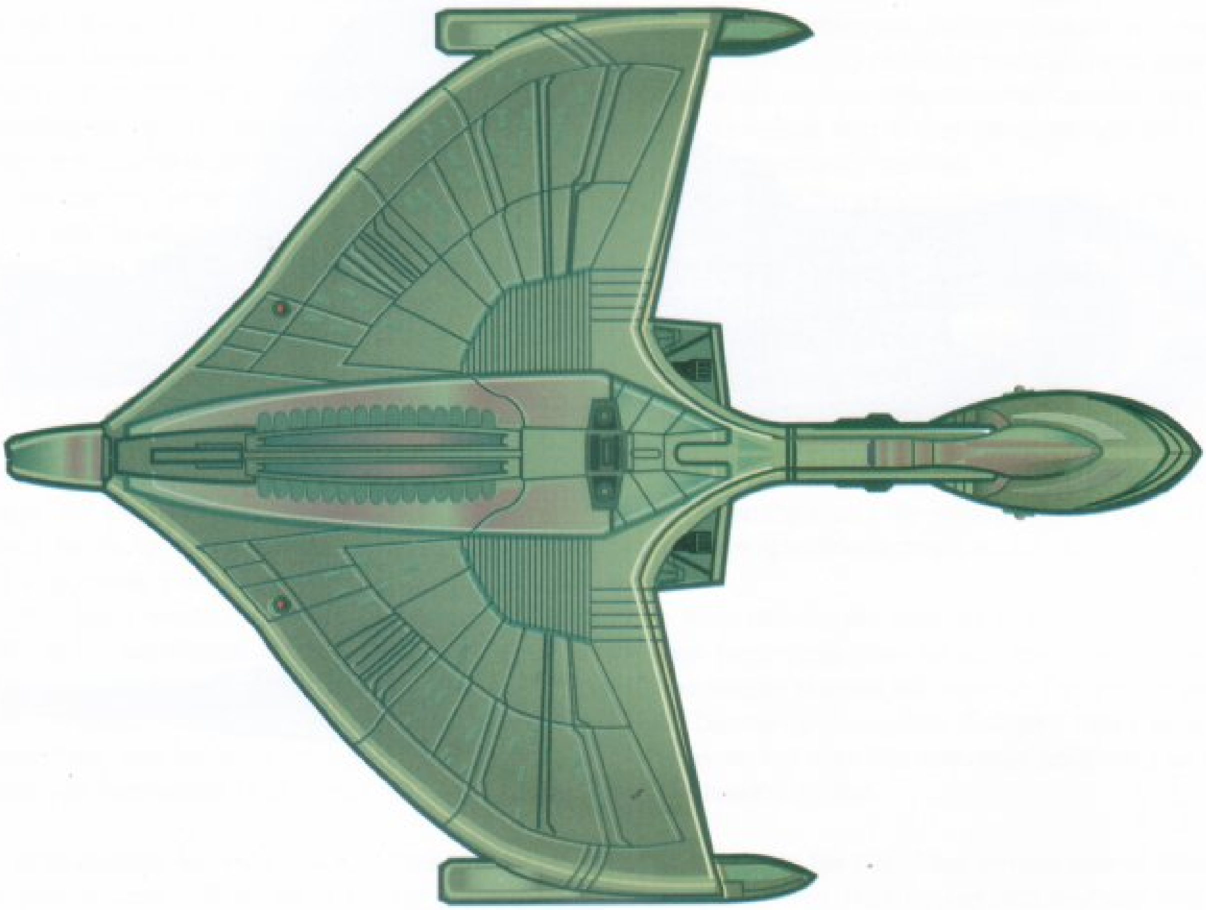




16.3 ROMULAN SPACECRAFT

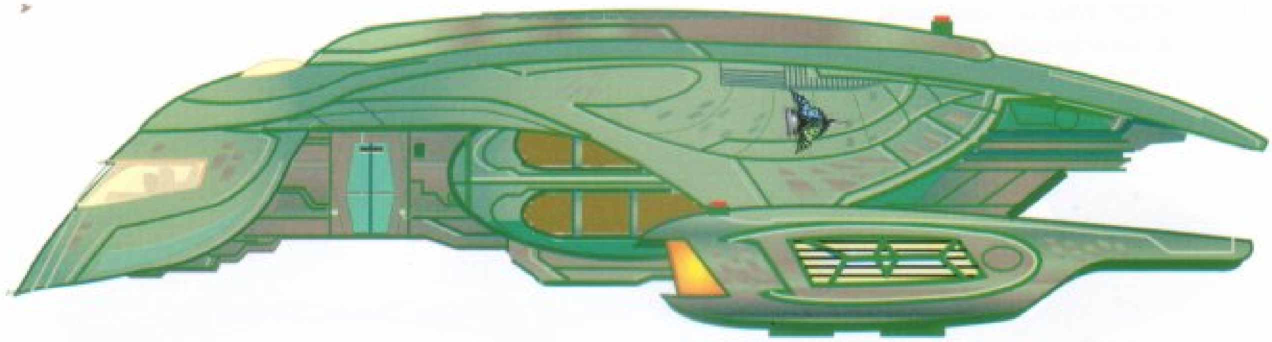
D'DERIDEX-CLASS WARBIRD

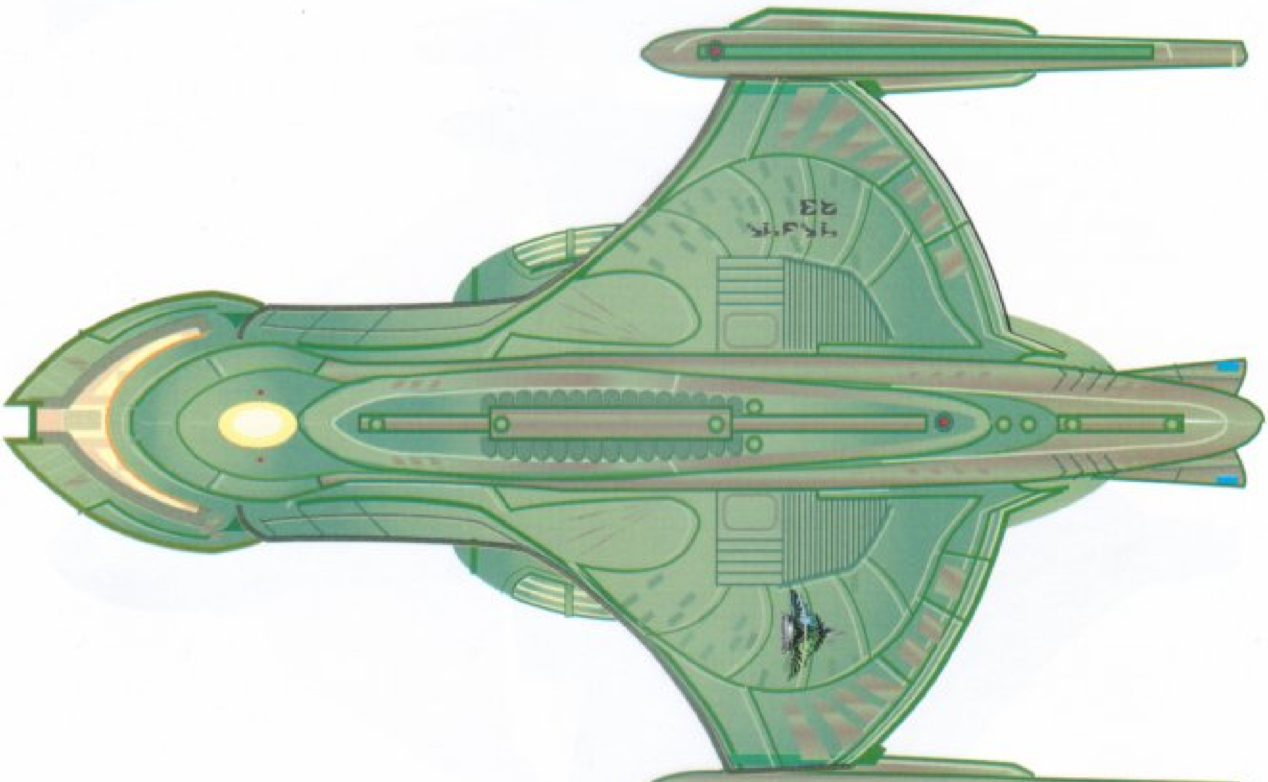
PRODUCTION BASE: Unknown; Romulan Star Empire.
TYPE: Heavy Cruiser.
ACCOMMODATION: 1500 plus officers, crew, and troops.
POWER PLANT: One artificial singularity-drive warp core feeding two nacelles; two impulse systems.
DIMENSIONS: Length, 1,041.65 meters; beam, 772.43 meters; height, 285.47 meters.
MASS: 4,320,000 metric tonnes (est.).
PERFORMANCE: Warp 9.6 (observed).
ARMAMENT: Six ship-mounted disruptors; two photon torpedo launchers.



ROMULAN SHUTTLE

PRODUCTION BASE: Unknown; Romulan Star Empire.
TYPE: Long-range warp shuttle.
ACCOMMODATION: 15 plus officers, crew, and troops (est.).
POWER PLANT: One artificial singularity-drive warp core feeding two nacelles; one impulse system.
DIMENSIONS: Length, 24.23 meters; beam, 15.98 meters; height, 6.57 meters.
MASS: 142.31 metric tonnes (est.).
PERFORMANCE: Warp 9.6 (observed).
ARMAMENT: Six ship-mounted disruptors; two photon torpedo launchers.





ACKNOWLEDGMENTS

The authors wish to acknowledge a number of individuals and organizations whose efforts have brought the series to life. We thank Rick Berman, Michael Piller, and Ira Steven Behr for creating and continuing *Star Trek: Deep Space Nine* and allowing us to tinker with its science and technology. We also thank Ronald D. Moore, Hans Beimler, René Echevarria, Robert Hewitt Wolfe, Bradley Thompson, David Weddle, and the many freelance writers who have spun tales of new places, new life-forms, and new conflicts in the galaxy. Our thanks to all of the production staff at Paramount Pictures who have brought *Deep Space Nine* to the screen each week, including Peter Lauritson, David Livingston, Steve Oster, Robert della Santina, J.P. Farrell, Terri Potts, and Heidi Smothers.

Turning the dialogue and descriptions into real places begins with our colleagues in the art department, and the authors duly acknowledge the work of Randy McIlvain, Ricardo Delgado, Jim Martin, Mike Okuda, Denise Okuda, Jim Van Over, Anthony Fredrickson, Tony Bro, Fritz Zimmerman, Joseph Hodges, and Nathan Crowley. We thank Tom Arp, Greg Medina, and their crew for transforming plywood and paint into tritanium; Laura Richarz and her set decorating crew for the cool furniture and various widgets; and cool Joe Longo for providing the hand props that we believe really do perform as designed, and all that weird Klingon food. NAS Miramar's infamous Johnny Hawk for his *U.S.S. Defiant* and *Danube*-class emblems.

We can say without contradiction that most of this book would not have been possible without the people who made the largest pieces of technology real, the model makers and visual effects crews. We applaud the work of Tony Meininger's Brazil Fabrication and Design Model Shop. Among their plastic and aluminum off-spring are Deep Space 9, the *Danube*-class runabout, and the *U.S.S. Defiant*. Since so many cross-production models have become part of the *Deep Space Nine* scenario, we must give a big thumbs-up to veteran model maker Greg Jein for his many starships and props over the years, including the new buildup of the original *U.S.S. Enterprise* NCC-1701 and Deep Space Station K-7, and many of Greg's ships made "The Sacrifice of Angels" possible. For the filming of these miniatures and the creation of their computer-generated counterparts, we thank visual effects wizards Dan Curry, Gary Hutzel, David Stipes, and David Takemura. Our appreciation to Image "G," Digital Magic, Composite Image Systems, Pacific Ocean Post, and the other members of the visual-effects family for their ability to make small structures huge, make spaceships zoom about, and create things that aren't really there.

This book would have remained an idea waiting to be born without the support of Margaret Clark, our editor at Pocket Books. Margaret knows far more about book technology than we do about warp drive, and it has been her guidance and knowledge of *Star Trek* that has helped shaped this volume. Our thanks also to Gina Centrello, Kara Welsh, Scott Shannon, Donna O'Neill, Donna Ruvituso, Erin Galligan, Lisa Feuer, and Twisne Fan, who followed through on a production as complex as any *Star Trek* television episode. Our copy editor was Bernadette Bosky, and the book was designed by Jessica Shatan.

In all matters technical, Rick wishes to express his appreciation to his dad, Paul, whose love of architecture and vehicles rubbed off on his kid in not quite the way he expected. Rick figures that anybody who can understand the workings of a Baldwin steam locomotive can understand any machine, including a spaceship. Rick also wishes to thank the late G. Harry Stine for his years of tutelage in the space sciences, beginning with the simplest of model rockets and working up to aerosurfaces and fusion engines. Harry knew Gene Roddenberry and shared Gene's sense of optimism about the future of the human race and the exploration of the universe. If you couldn't tell, that optimism had long ago rubbed off on this author.

Rick thanks his wife, Diane, for her unflagging support, love, and advice. He doesn't believe in astrology but does feel that both watching *Rocky Jones, Space Ranger* as youngsters and both moving to California in 1977 had something to do with their getting together—*besides* Mike and Denise's little experiment. He thanks his son Joshua and daughter Kristen for their unfettered enthusiasm and sense of play and hopes that he can convince them to hold onto that optimism about the future. It is ever so slightly selfish to hope that one of them may someday walk on Mars, but then you never know.

Thanks again to Dan Curry and Gary Hutzel for their time and patience during the design discussions concerning the space station and other miniatures. Dan also provided a wealth of information on the Klingon bladed weapons, not the least of which is his *bat'leth*. Gary provided a constant reminder that much *Star Trek* effects history is fugitive, and that we will not always have a permanent record of the machines we see.

A special note of appreciation to fellow comet-watcher and author André Bormanis for checking the twenty-fourth–century science of this book, as he does for the *Star Trek* television shows and features. One has to wonder, however, where humankind is headed when two science-minded adults scratch their heads about Odo's mass when he transforms into a mouse.

Rick also wishes to thank Herman Zimmerman for his expertise and leadership in all our efforts to bring the *Deep Space Nine* station to fruition. His production design creativity evidenced during the first season of *Star Trek: The Next Generation* has continued unabated into the strange worlds of the Alpha and Gamma Quadrant.

Thanks also to Mike Okuda, the keeper of many answers to technical questions long thought lost since Rick's full-time move to *Star Trek: Voyager*. Mike established the look of these technical manuals back with *Star Trek: The Next Generation* and helped to create many of the systems and operations we consider familiar today.

The best is last, for it is through Doug Drexler that we have the shapes and colors of the technology and history of *Deep Space Nine* to commit to ink and paper. Doug has produced more illustrations for this book than was humanly possibly; therefore, he must be an alien sent here to help us. By all accounts, he's a madman. His work on the *Star Trek Encyclopedia* should be a clue. Rick takes off every hat he's ever worn to Doug for this manual's feast for the eyes.

Doug would like to acknowledge and hug the following people who have touched his spirit and made this book possible:

My dear, sweet, Dorothy Duder, the earth mother who nourishes me with her love and attention. She is both feast for the soul and elixir. She may not know the difference between a warp drive and an EPS conduit, but she certainly understands the tender complexities of the human heart, and for that I am both awed and grateful. I will always strive to be deserving of your affection.

Donna Drexler, who has voyaged with me through many adventures and adversities and is as much a part of who I am today as anyone. My affection for you runs deep as the sea and I will always be there for you, no matter what.

Mike Okuda, my captain my captain and kindred spirit. We grew up half way 'round the world from one another, yet share a common childhood. Thanks for recognizing my passion, thanks for the fantastic opportunities, and especially thank you for your friendship. The past six years have been among the richest of my life.

Denise Okuda, powerhouse and graphics department den mother. It's positively uncanny, but I feel as though we were separated at birth. You and I were the original *DS9* scenic artists and built this city on an ocean of *Coffea arabica*. Neezee, I love you dearly; we are surely brother and sister…friends through time and space.

Jim Van Over. What can I say? You keep me laughing all day. I hate to think what kind of trouble we would have gotten into if we had known one another in elementary school. Man, are we a couple of brats! Jim, you're an amazing talent both in your work and in your irreverence. I love you for that.

Anthony Fredrickson, friend for over thirty-five years. Anthony, we've covered a lot of ground since the seventh grade. Through magazine editing, makeup, and *DS9* you've been there. I want to especially thank you for making my end of this book possible. Thanks, pal.

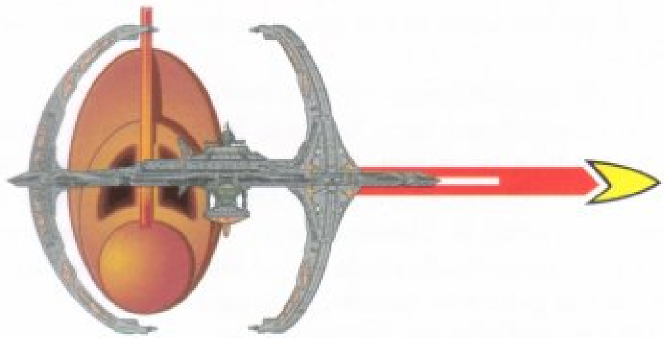
Mike Westmore for opening the portal to the *Star Trek* universe and allowing me to jump in at precisely the right moment. The warm eddies and backwashes of *Star Trek* production landed me exactly where I want to be, and I thank you from the bottom of my heart.

Rick Sternbach, for having the audacity and the impetus to initiate this project. (Sternbach is a techno-deity. Mix with one part Okuda and one part science, and you have a holy trinity that forms the linchpin of *Star Trek* believability.)

Herman Zimmerman, architect of tomorrow, keeper of the aesthetic faith, fearless leader, and art department guru who six years ago said, "...a *makeup artist?*"

And of course Gene Roddenberry, who thirty years ago touched the spirit of a child over two thousand miles away with his optimism, his creativity, and his sense of wonder.

AFTERWORD



The walls are made of wood.

That's the Deep Space 9 that exists on Stages 4, 17, and 18 on the Paramount lot; the one that a group of actors, technicians, artisans, and craftsmen labor on week after week as they struggle to bring twenty-six episodes to life every year. Each set has a personality, a collection of idiosyncrasies that can be endearing or infuriating to a production crew.

We know them intimately. There are people on our production crew who could tell you exactly how many feet of wiring go into Ops or how many layers of paint cover the *Defiant* walls or which props are recycled from *TNG* or where it's safe to take a high fall off the Promenade.

It's a real place to us. We laugh there and sometimes we cry there. It's the proscenium upon which we tell stories of things that never were.

We love our wooden station.

But on the other side of the TV screen lies another Deep Space 9—the one you see each week. The one populated by Starfleet officers, Bajorans, Klingons, and one Cardassian tailor. This station is an illusion. A dream. Not a place made of wood, plastic, rubber, and scavenged *McGyver* parts, but a place of gleaming tritanium, transparent aluminum, computer readouts, and alien devices.

When we watch the show, we tell ourselves that there are all sorts of untold wonders just off-camera. That corridor behind Sisko leads to a part of the Habitat Ring we've never seen. Quark's storeroom holds treasures we cannot imagine. There are enormous hangars somewhere in the Docking Ring loaded with dozens of runabouts. The fabled waste-extraction system must be a marvel of twenty-fourth–century engineering.

This book takes you down those corridors we've never traveled on the show. It lets you see the Deep Space 9 inhabited not by actors but by Starfleet officers. In a way, it confirms what you've known all along: that behind those pine walls lie not nails, glue, and staples, but optical data networks, plasma relays, and deuterium conduits.

So if your mind's eye already fills in most of the details without outside help, does writing a book like this really matter? Is there anything to be gained by spelling out in detail the highways and byways of the central hub or the intricacies of the secondary defense grid?

To me, that answer is a firm, "Yes."

I remember many years ago, when I was just another kid who loved this old show from the '60s called *Star Trek*, I stumbled across a set of Franz Joseph's blueprints of the *Enterprise* in a Fresno bookstore. I snatched them up and couldn't wait to tear them open when I got home. Inside lay a road map to the legendary starship. I could see exactly where Kirk's quarters were located, where Scotty slaved over his poor bairns, and even where Kevin Riley's bowling alley was situated. It validated the dream for me. It told me that the *Enterprise* really did exist, that there was a logic to everything I saw on screen. The blueprints allowed me to follow the action behind the scenes as well as on the screen.

Kirk strides off the transporter pad and heads for the bridge.

"Okay, that means he takes a right out of Transporter Room Two, heads down the corridor, makes a left, then another left before entering the turbolift on his right. The lift travels clockwise around the saucer section, until it hits the spine of the ship, heads toward the bow, then rises vertically near the computer core and sickbay..."

The *Enterprise* blueprints were really cool.

The *Deep Space Nine Technical Manual* is even cooler. The *Enterprise* was big (289 meters long, which is...well...uh...*a lot* of feet, trust me) and we glimpsed only a few decks during the course of the original series. That left a lot of blanks for Franz Joseph to fill in. But Deep Space 9 is enormous (1,451.82 meters in dimension, which is...I won't even try). We've only been able to show you a fraction of the living and working space that theoretically exists on our station and the task of Herman Zimmerman, Rick Sternbach, and Doug Drexler has been a far greater challenge as a result.

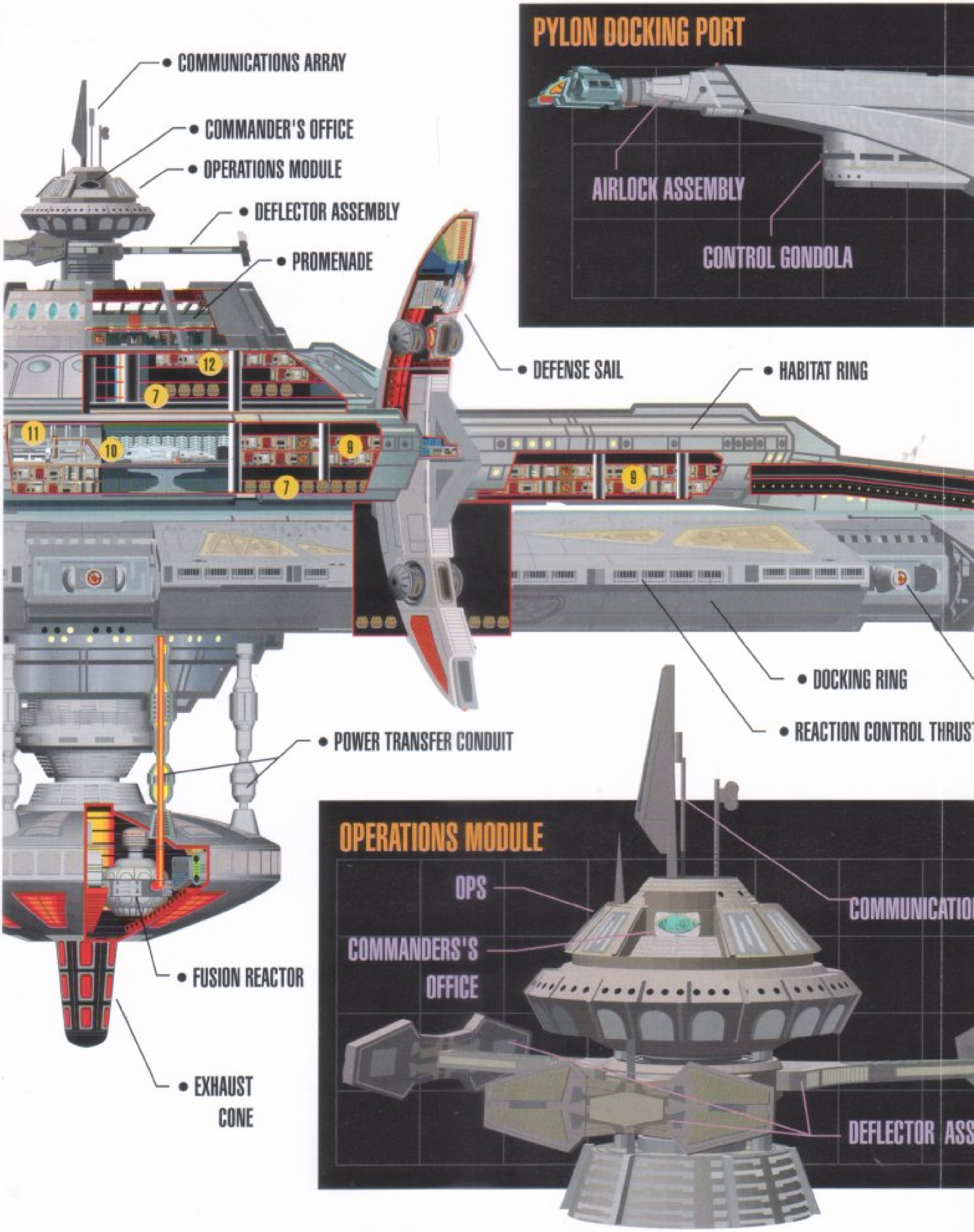
But the rewards are also far greater.

The station you can read about in these pages actually *works*. It makes sense. Perhaps most important of all, it allows you to imagine that there really is a place called Deep Space 9.

And in the end, that's what turns wood into tritanium—your imagination.

Ronald D. Moore
Los Angeles, CA

DEEP SPACE NINE • GENERAL PLANS - ELEVATION V



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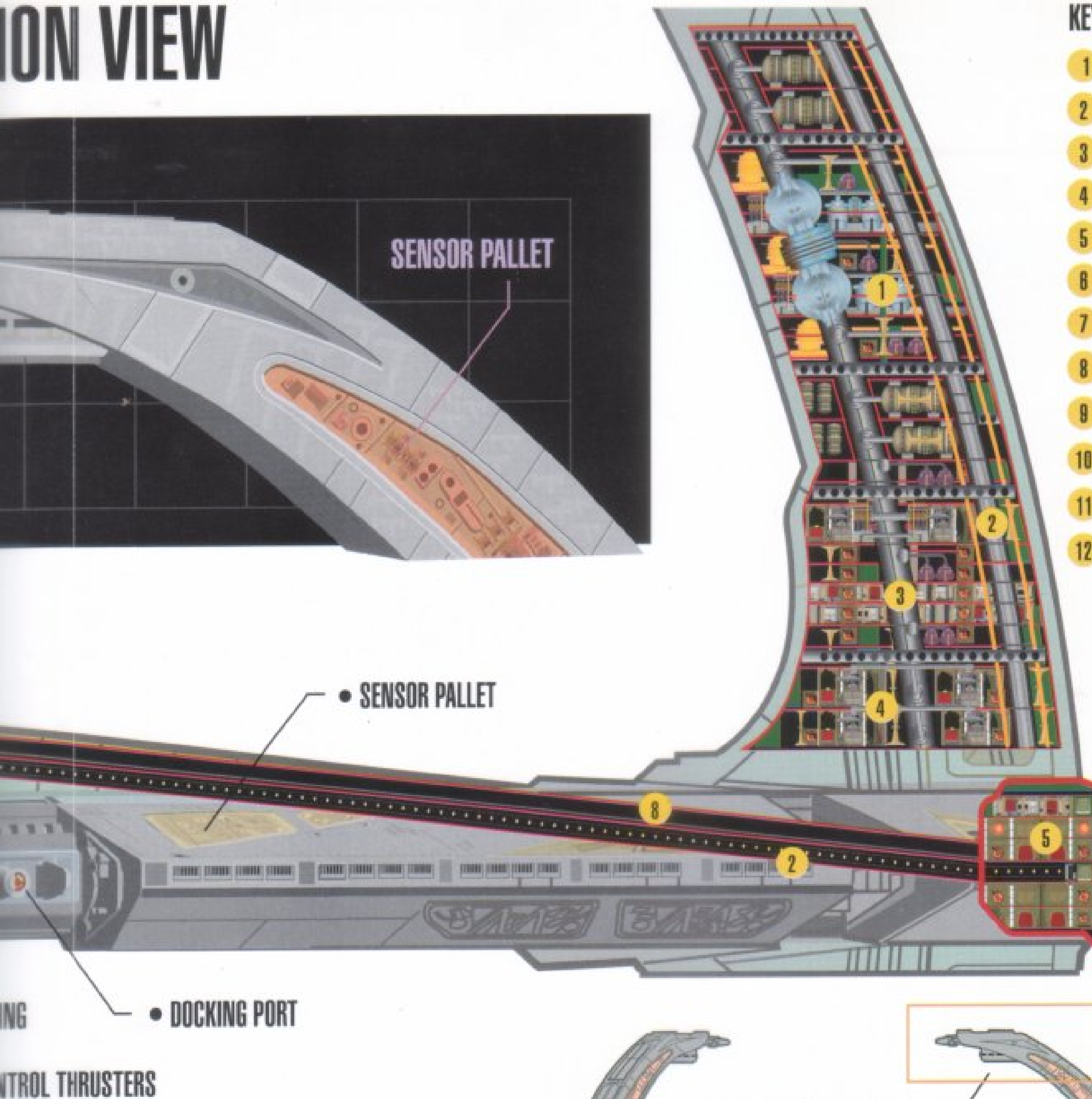
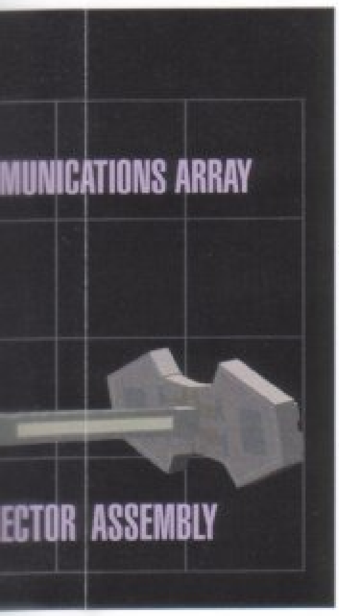
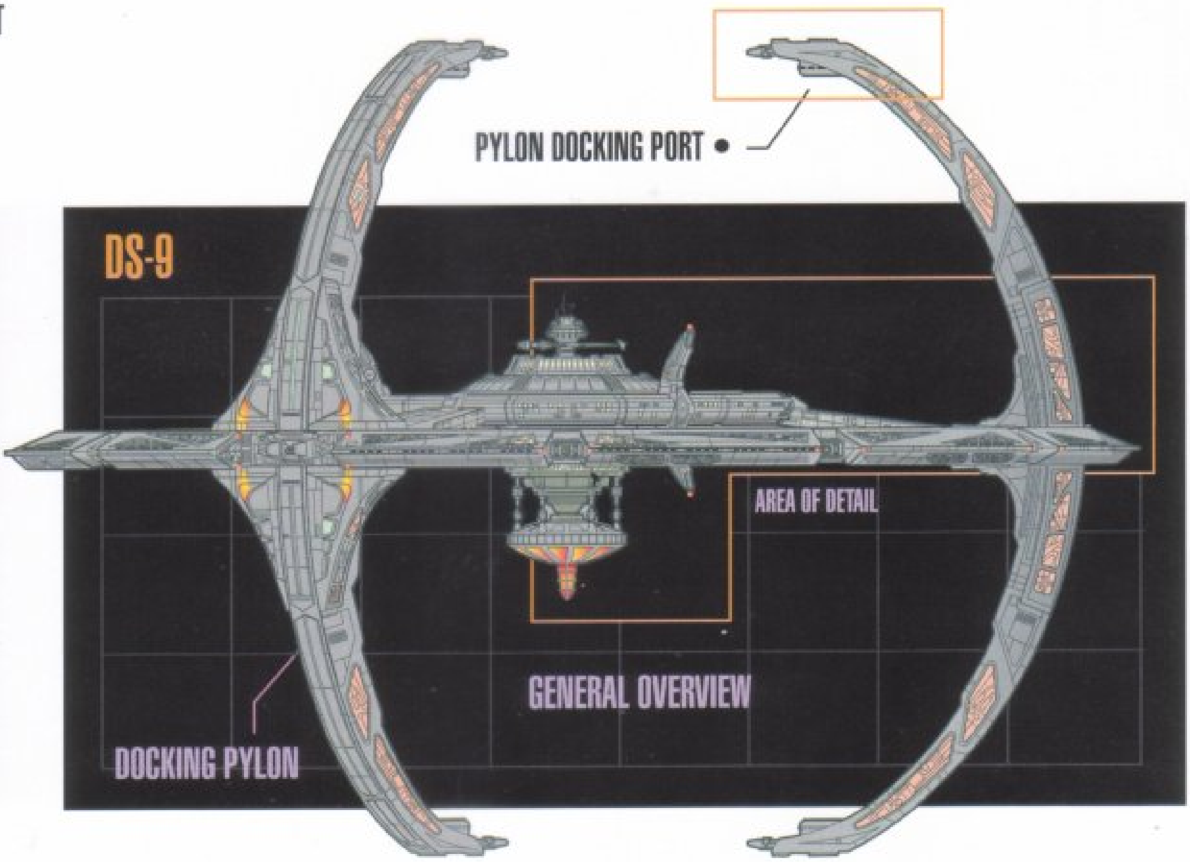


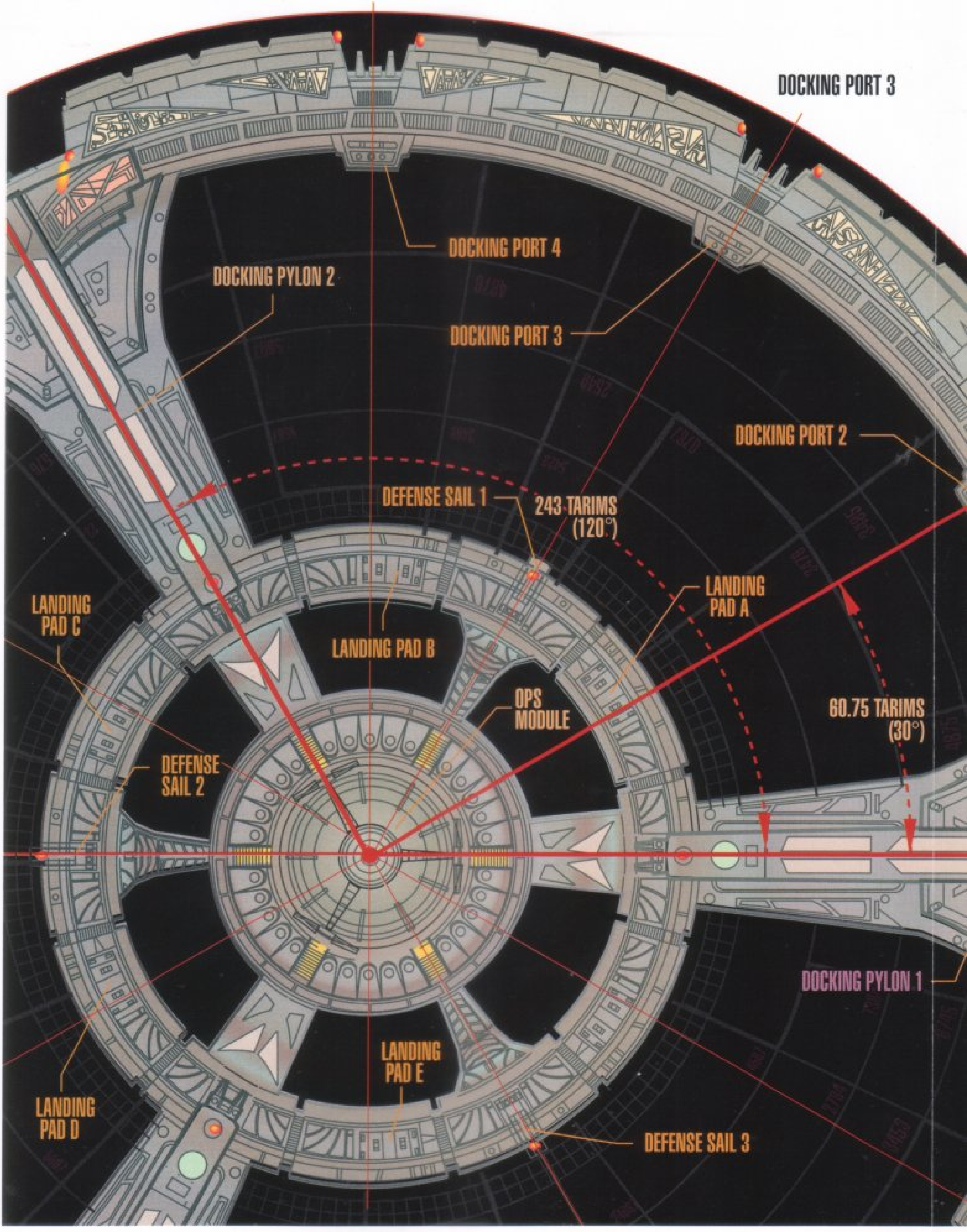
KEY

1. AUTOMATED ORE PROCESSING
2. TURBOSHAFT
3. ORE TUNNEL
4. MANUAL ORE PROCESSING
5. ORE/CARGO BAYS
6. AIRLOCK/DOCKING PORT
7. ESCAPE PODS
8. CARGO TRANSFER AISLE
9. RESIDENTIAL
10. RUNABOUT BAY
11. RUNABOUT SERVICE
12. OFFICE COMPLEX





DEEP SPACE NINE • GENERAL PLANS - DORSAL VIEW



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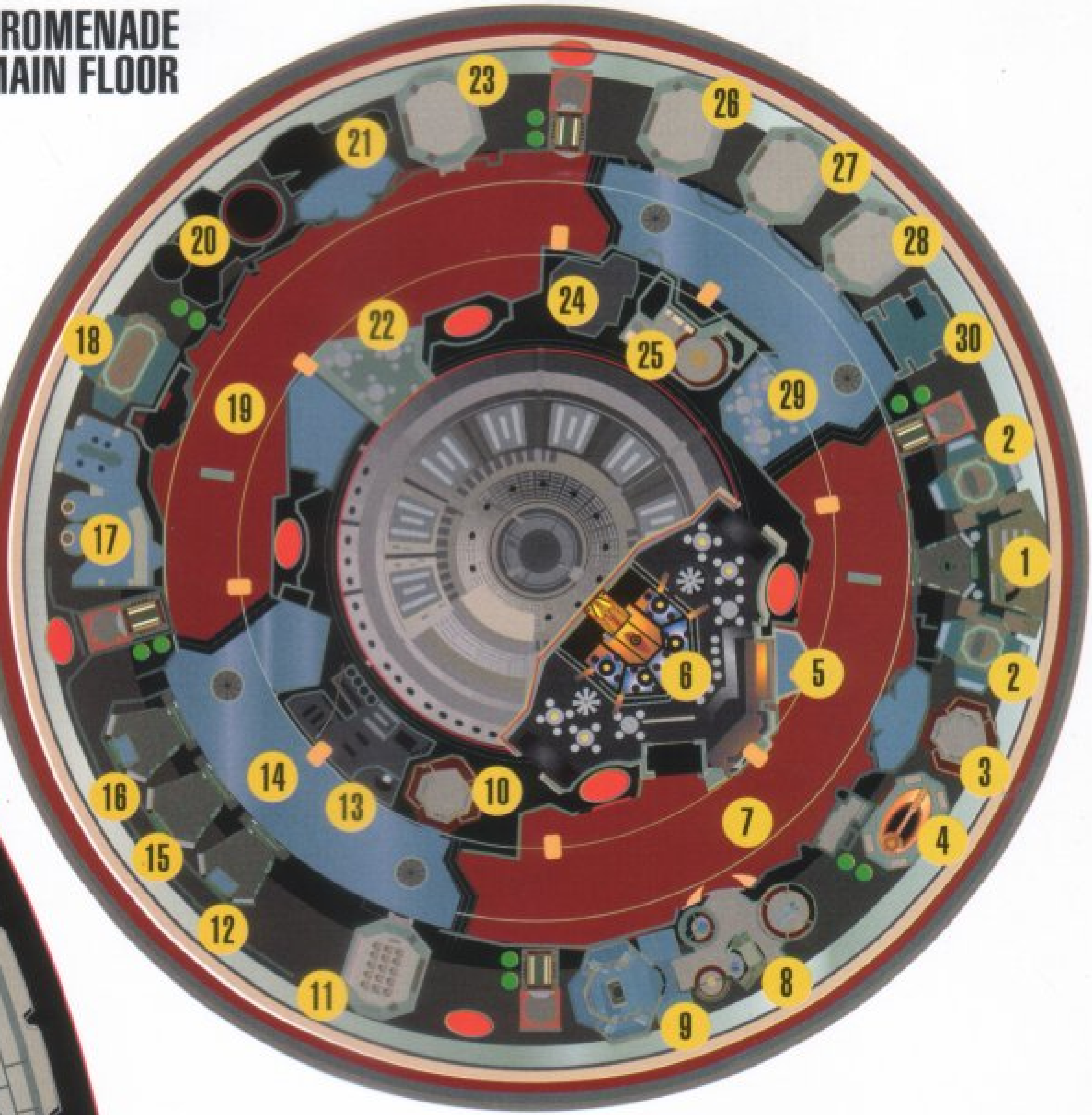
PROMENADE MAIN FLOOR

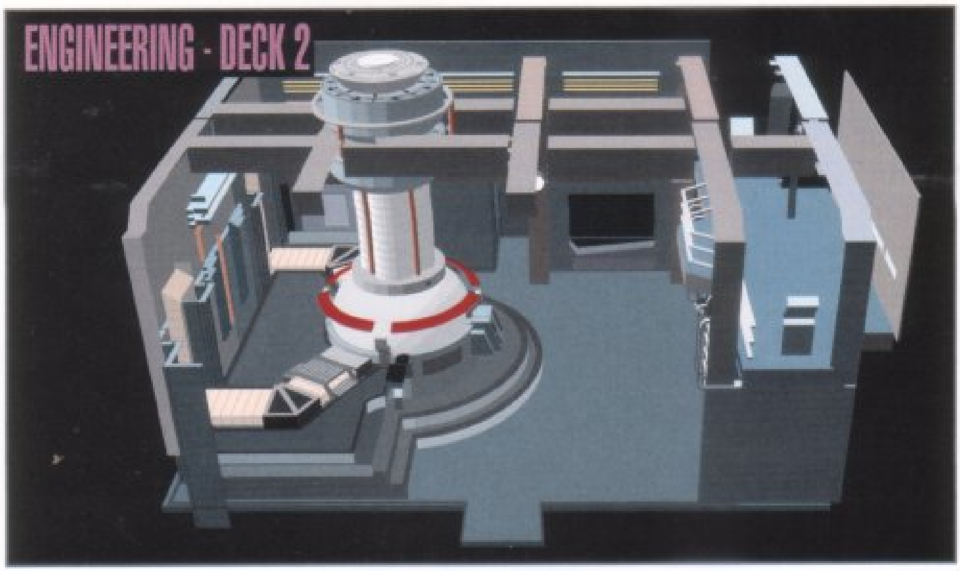


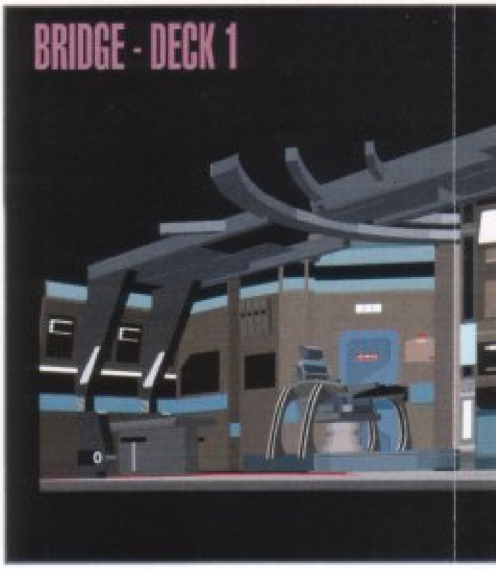
PROMENADE DIRECTORY • 51953.2

1 STATION SECURITY	16 DEL FLORIA'S EVA SUITS
2 SECURITY HOLDING CELL	17 YOYODYNE PROPULSION
3 STATION GIFT SHOP	18 BAJORAN GREENGRÒCER
4 BAJORAN TEMPLE LEVEL 1	19 MAIN FLOOR SOUTH
5 FERENGI CREDIT EXCHANGE	20 DOCKMASTER'S OFFICE
6 QUARK'S BAR/GAMING EST.	21 KLINGON DELI
7 MAIN FLOOR NORTH	22 PUBLIC SPACE
8 INFIRMARY - EXAM/LAB	23 BARBER/BEAUTY SALON
9 SURGERY	24 SHIPPING BROKERAGE
10 SPICAN JEWELERS/GEMS	25 FLORIST
11 SCHOOL/HALL	26 GARAK'S CLOTHIER
12 CAVOR'S GRAVITY SYSTEMS	27 ASAYERS OFFICE
13 VINCÉ'S GYM	28 INTERSTELLAR TRAVEL
14 PLATORM EAST	29 REPLIMAT
15 JUPITER MINING	30 SHIP'S STORE

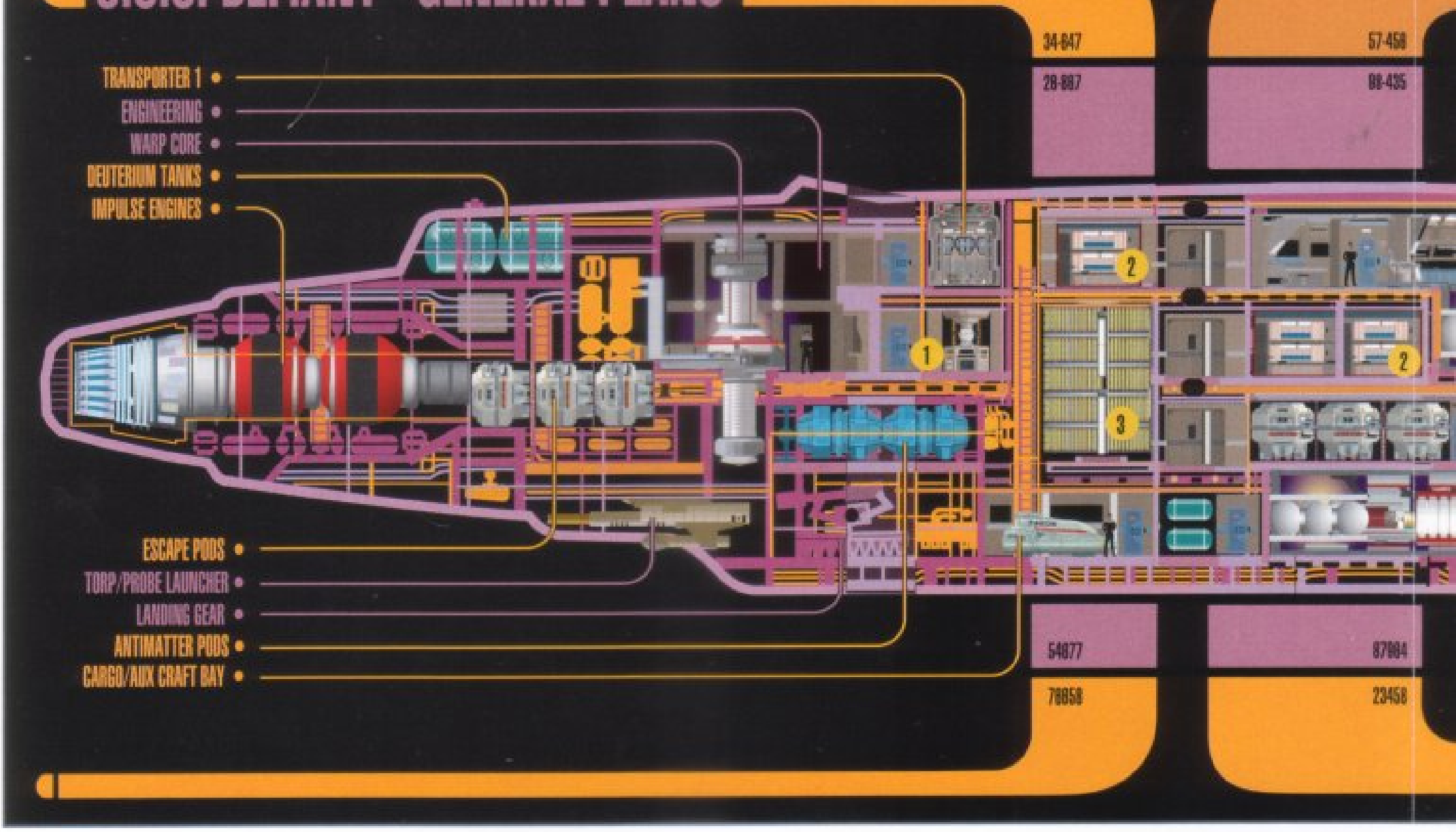
SPIRAL STAIRCASE — TURBOLIFT SHAFT

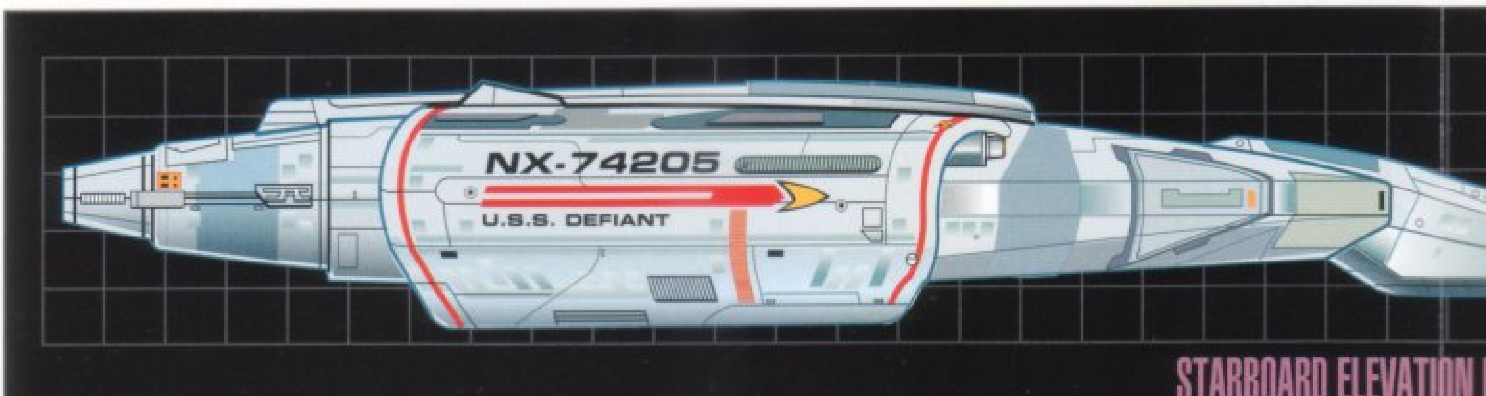
SECURITY GATE/AIRLOCK — STATION DIRECTORY


ENGINEERING - DECK 2

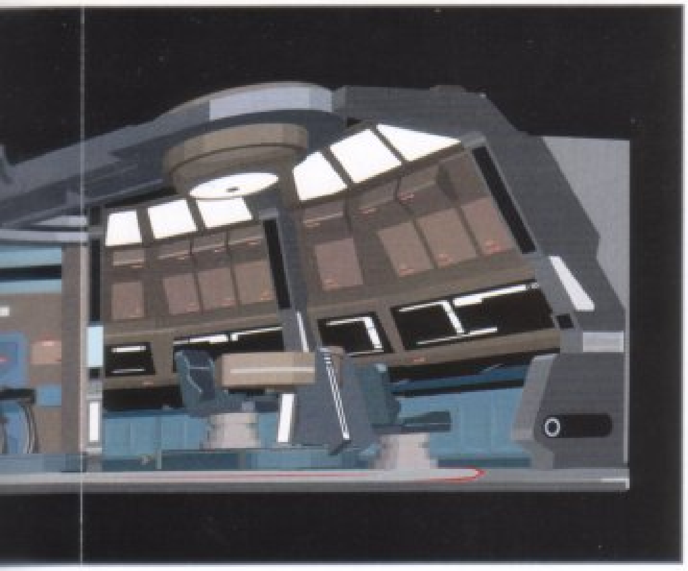

BRIDGE - DECK 1

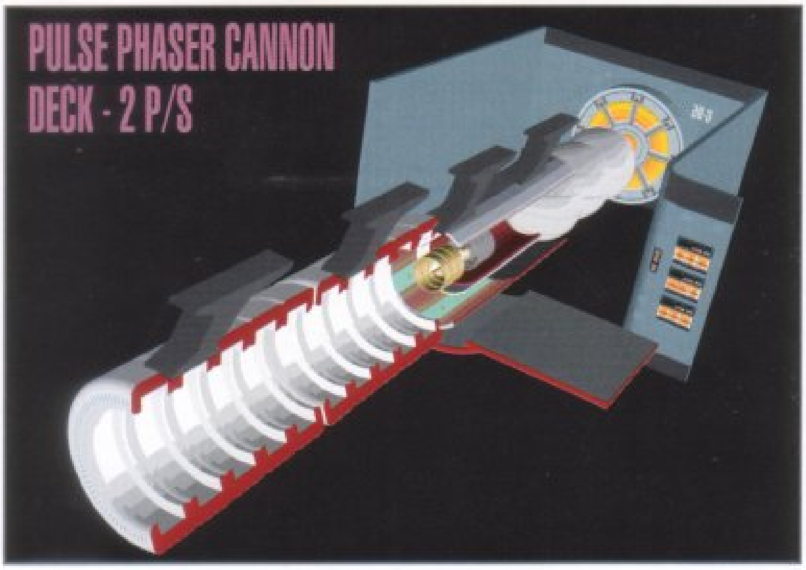
U.S.S. DEFIANT - GENERAL PLANS



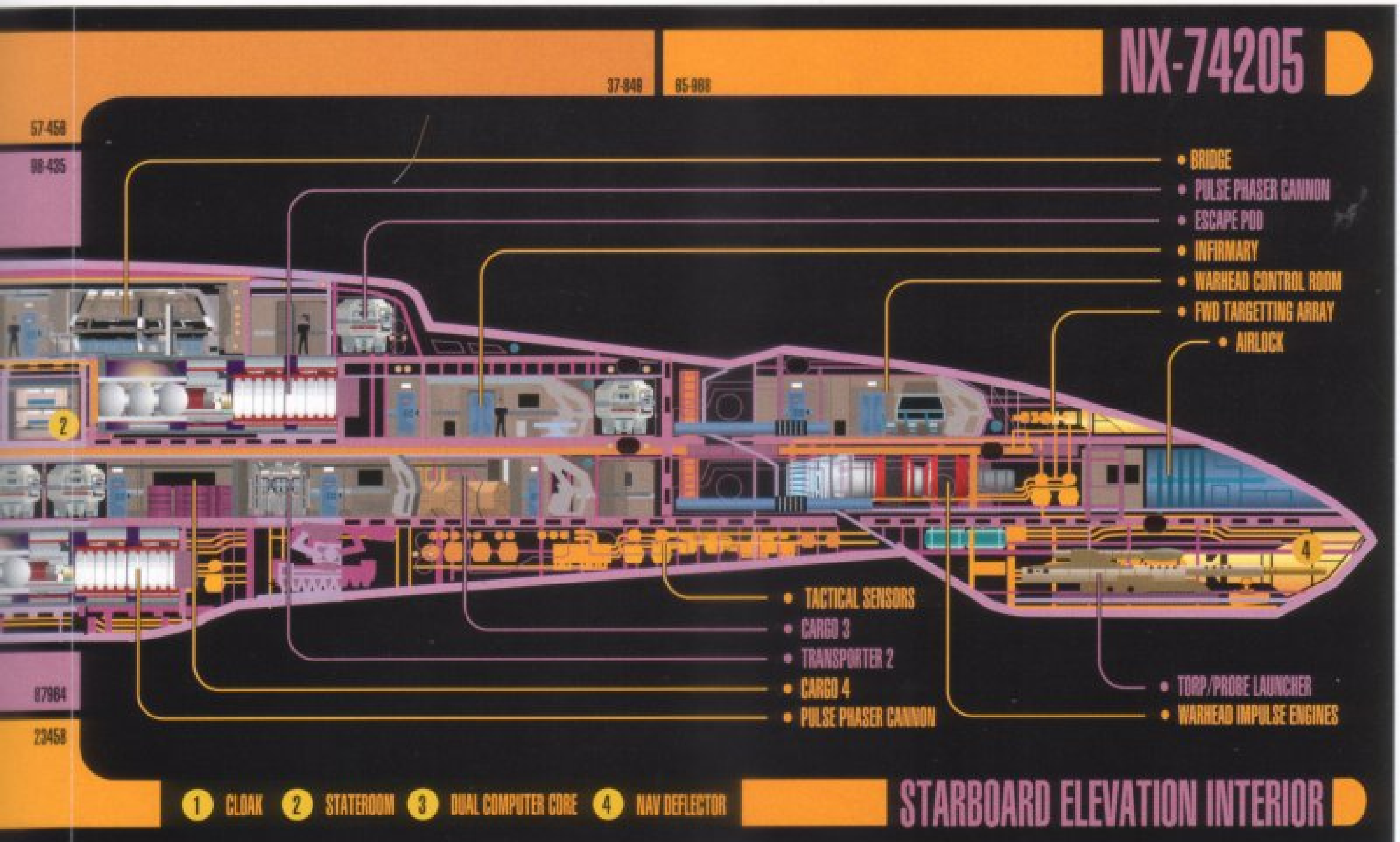


STARBOARD ELEVATION

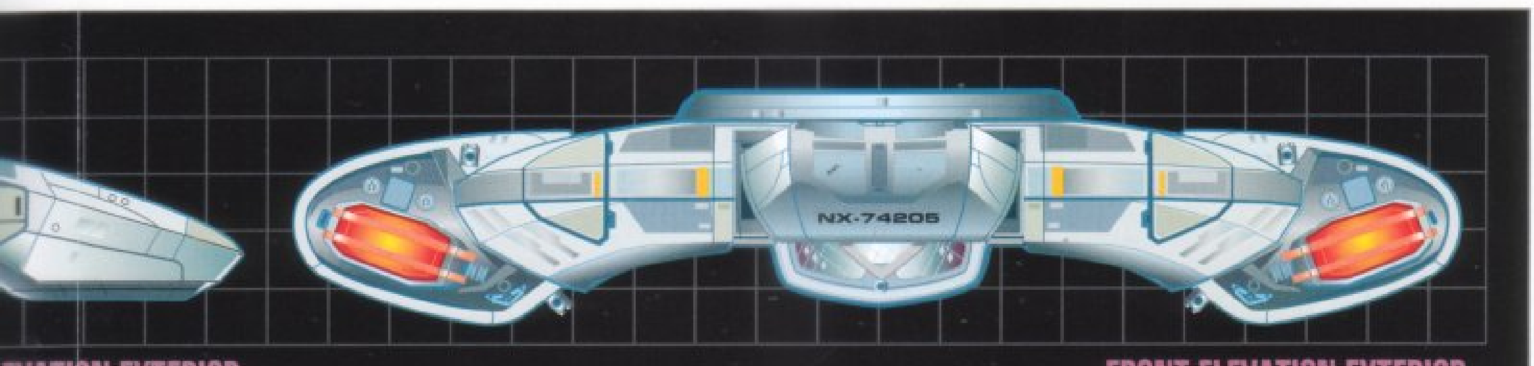




PULSE PHASER CANNON
DECK - 2 P/S

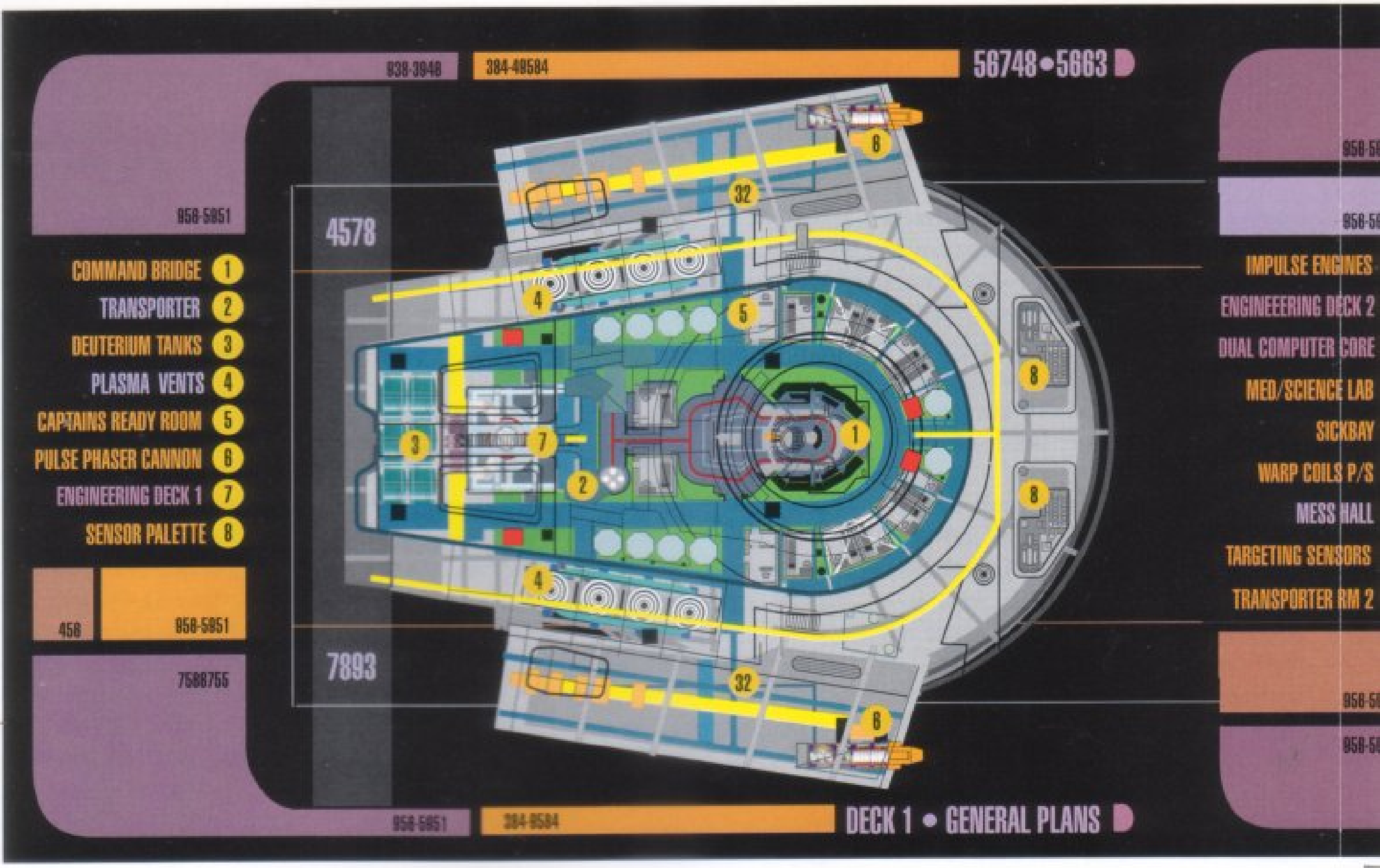


STARBOARD ELEVATION INTERIOR

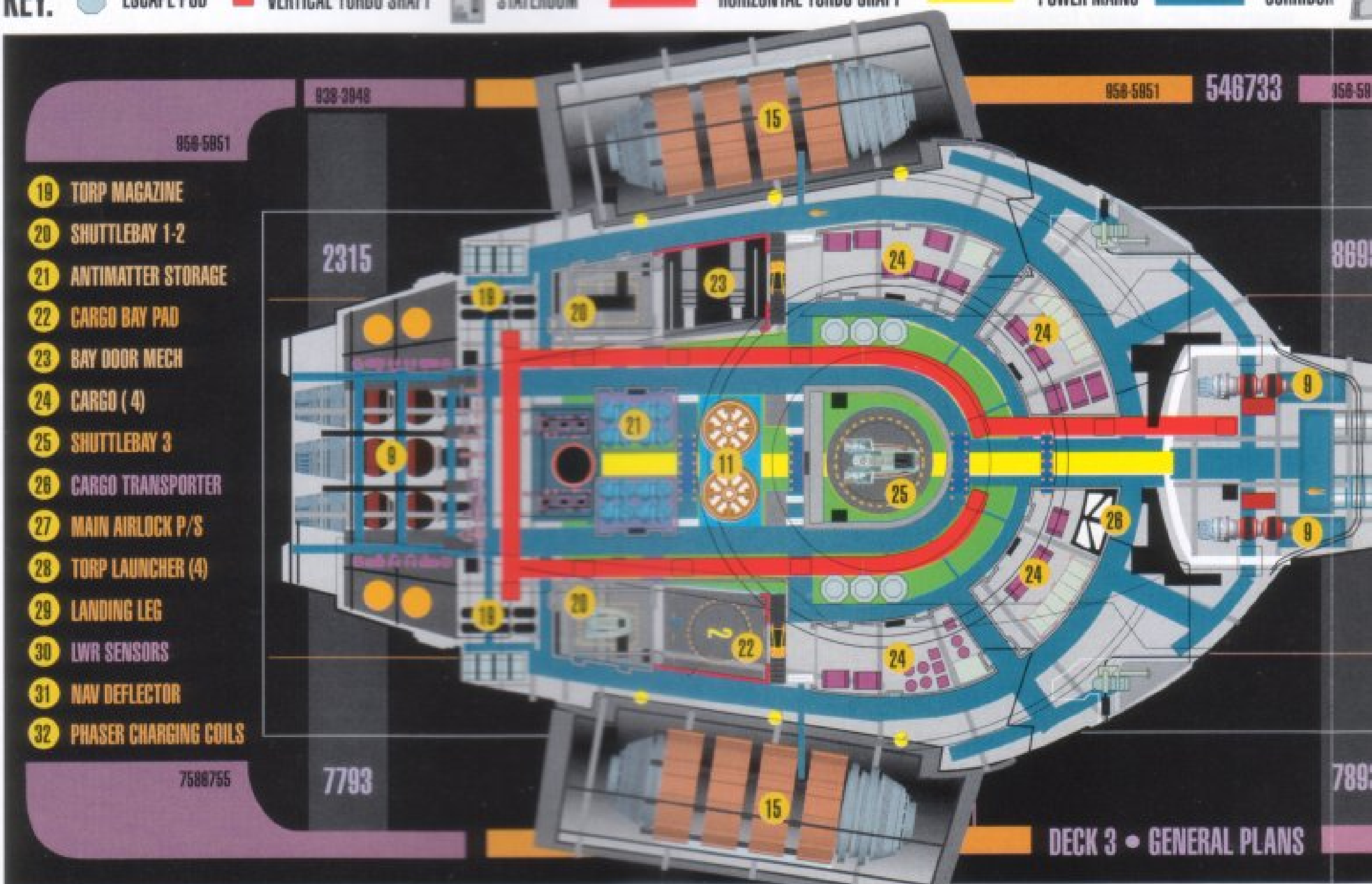


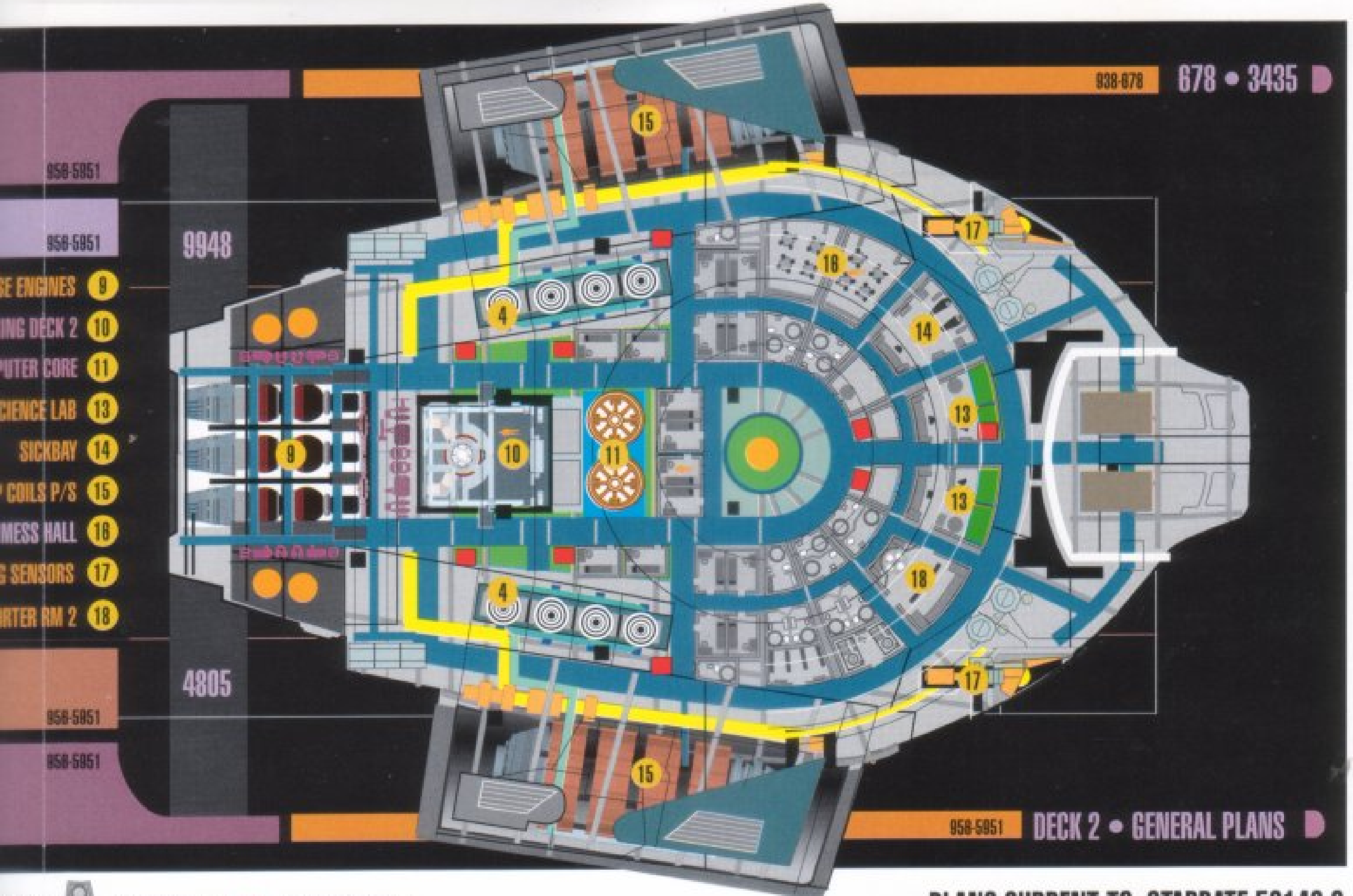
EVATION EXTERIOR

FRONT ELEVATION EXTERIOR



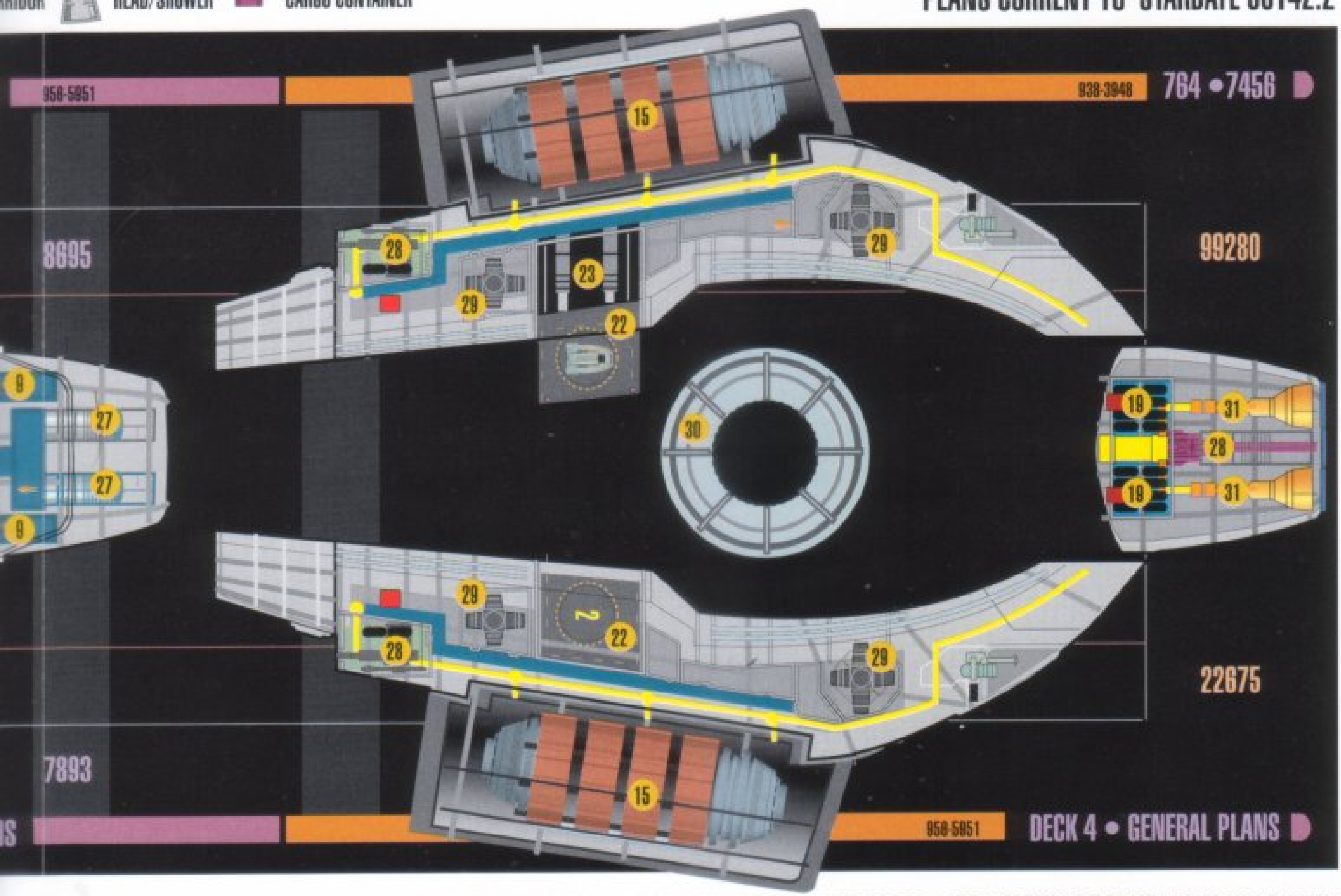
KEY: ESCAPE POD VERTICAL TURBO SHAFT STATEROOM HORIZONTAL TURBO SHAFT POWER MAINS CORRIDOR





RRIDOR HEAD/SHOWER CARGO CONTAINER

PLANS CURRENT TO STARDATE 53142.2



ABOUT THE AUTHORS

Doug Drexler is an Academy Award® winning Makeup Artist who has collaborated with such talents as Al Pacino, Dustin Hoffman, Jimmy Caan, Meryl Streep, and Warren Beatty. His career in the entertainment industry began working for makeup legend Dick Smith on such films as *The Hunger* and *Starman*. He also contributed to *Three Men and a Little Lady*, *The Cotton Club*, *FX* and *Dick Tracy* to name but a few. *Tracy* led to an Oscar® as well as the British Academy Award and the Saturn Award. Two Emmy Award® nominations would follow for three years of work on *Star Trek: The Next Generation.®*

When *Star Trek: Deep Space Nine®* went into production, Mike Okuda (Scenic Arts Supervisor) took a chance on the makeup guy from Brooklyn who wanted to be a designer. Ever since that day over six years ago a constant stream of *Star Trek®* graphics and illustrations have issued forth. "I'm possessed" he explains. Doug's other *Star Trek* credits include *Star Trek Generations™*, *Star Trek: First Contact®*, and the upcoming ninth *Star Trek* feature film.

Doug illustrated the *Star Trek Encyclopedia Updated and Expanded* by Michael and Denise Okuda, the *Star Trek Science Logs* by Andre Bormanis, and he also worked with the Okuda's on the Simon and Schuster Interactive CD-ROM, *Captain's Chair*.

Rick Sternbach currently works as senior illustrator on *Star Trek: Voyager®*. Continuing the technical design work begun in 1987 on *Star Trek: The Next Generation*, Rick is responsible for blueprinting and detailing numerous spacecraft and props, including the *U.S.S. Voyager*, Deep Space 9, and the Klingon attack cruiser. He also serves as a technical consultant to the writing staff. Rick won an Emmy Award® award as an Assistant Art Director and Visual Effects Artist on the PBS series *Cosmos*, and twice won science fiction's Hugo Award for Best Artist. His other media credits include *The Last Starfighter* and *Star Trek: The Motion Picture™*. Rick has illustrated the science fiction writings of Larry Niven, Robert Heinlein, and James White. On the scientific side, his space art has appeared in the pages of *Sky & Telescope*, *Smithsonian*, and *Aviation Week & Space Technology*. Rick is the coauthor with Michael Okuda of the *Star Trek: The Next Generation Technical Manual* and the author of the *U.S.S. Enterprise™ NCC-1701-D Blueprints*.

Herman Zimmerman is well known in Hollywood as one of the industry's most talented and experienced Motion Picture Production Designers. In his twenty years as Art Director and Production Designer, Herman has designed environments and backgrounds for every kind of film and television show.

For the last twelve years, he has been the Production Designer for both *Star Trek: The Next Generation* and *Star Trek: Deep Space Nine*. Herman has also served as Production Designers on four of the most recent *Star Trek* motion pictures: *Star Trek V: The Final Frontier™*, *Star Trek VI: The Undiscovered Country™*, *Star Trek Generations™* and *Star Trek: First Contact*.

Twice nominated for an Academy of Television Arts and Science Emmy Award® and recognized by his peer as an accomplished visual artist, Herman was awarded the first ever *Excellence in Production Design Award* in 1996 by the Society of Motion Picture and Television Art Directors, again for his work on *Deep Space Nine*.

Herman is currently designing the ninth *Star Trek* feature.

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