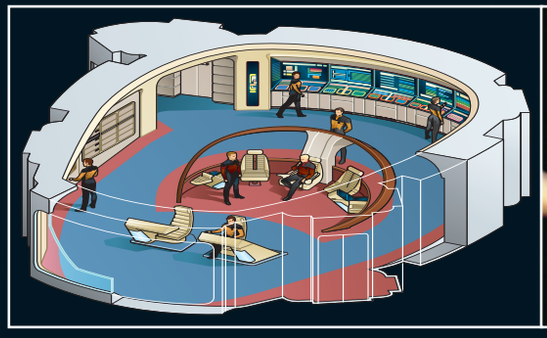
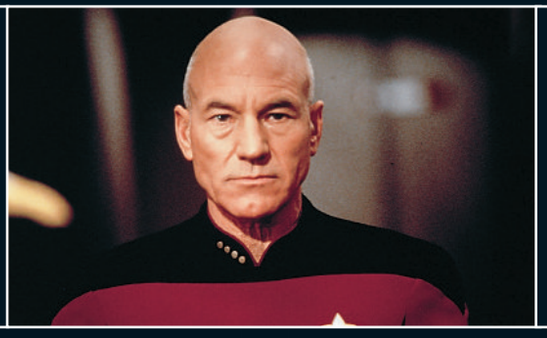
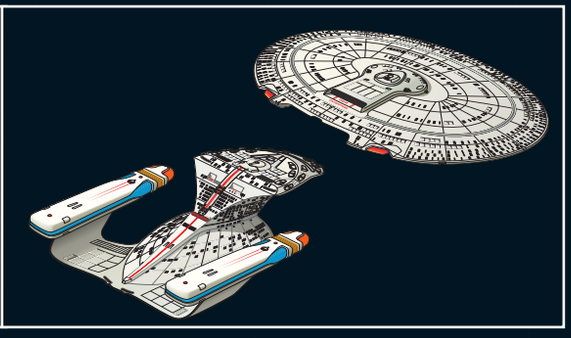
STAR TREK
THE NEXT GENERATION®

THE *U.S.S. ENTERPRISE* NCC–1701–D

ILLUSTRATED HANDBOOK

eaglemoss HERO COLLECTOR

CAPTAIN PICARD'S SHIP FROM ***STAR TREK: THE NEXT GENERATION***


U.S.S. ENTERPRISE
NCC-1701-D

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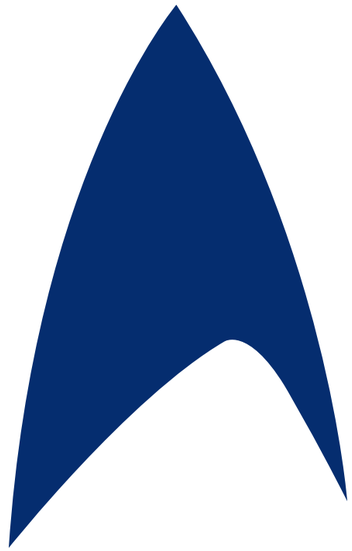

ILLUSTRATED HANDBOOK

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ACKNOWLEDGMENTS

Work on this book began nearly 20 years ago, when the *STAR TREK Fact File*s first started to take form. For those who aren't familiar with it, the *Fact File*s was a massive, heavily illustrated reference work that was delivered in weekly instalments. Over the years it covered every aspect of the *STAR TREK* universe, including the *Enterprise*-D. Everything you will find in here, was originally published there, although we have taken the opportunity to revise and polish it. In particular we'd like to thank the talented team of artists, Stuart Wagland, Ian Fulwood, Peter Harper and more than anyone Rob Garrard, who produced the beautiful illustrations you will find on the following pages. The CG renders in this book were produced by Rob Bonchune and Adam 'Mojo' Lebowitz. Reconstructing the names of the people who wrote the text is beyond us, but the *Fact Files* would never have been possible without the hard work of Jenny Cole, Tim Gaskill, Tim Leng and Marcus Riley.

Inevitably, this book and the *Fact Files* before it draw heavily on the work of Rick Sternbach and Mike Okuda, who created the first *STAR TREK: THE NEXT GENERATION Technical Manual* and various internal tech memos for the *STAR TREK* writers. They led the way and have been instrumental in turning *STAR TREK* into a coherent world. We'd also like to thank Andy Probert, who cared passionately about all the details when he designed the ship in the first place.

We'd like to thank our friends at CBS Consumer Products over the years: Risa Kessler, who has been there from the beginning, Guy Vardaman, Paul Ruditis, Tim Gaskill, and more recently Marian Cordry and John Van Citters.

And as always, we'd like to thank Gene Roddenberry who saw *STAR TREK* as more than a TV show and worked hard to make it a coherent reality, where it's genuinely possible to imagine what happens when you press a button on the bridge.

FOREWORD

STAR TREK has always been more than just a story. It is a world, a place that lives in our imaginations. For some of us that is very important. When we watch Picard and his crew walking through the corridors of the *Enterprise*, we imagine what's behind every door. When the nav officer punches in the coordinates, we want to know exactly how that works. That's something that the makers of *STAR TREK* always recognized. They were careful to make sure that – as long as it was in the service of the story – everything made sense and was as consistent as possible. Because they cared about those things, the *Enterprise* felt like a real place, with real technology and real locations. it was somewhere you could imagine waking up.

This book is an attempt to bring all of that information together and to take you aboard the *Enterprise*-D. Our goal is to explain as much as possible about that world and to illustrate all the key locations and systems. We've tried to be as comprehensive as possible. Inside you'll find isometric illustrations of rare locations such as the control room in the nacelles and the isolation room in sickbay. You'll find explanations of the key technologies including the warp engines and the transporters, as well as more obscure systems such as the inertial dampeners without which everyone on the *Enterprise* would be crushed to a pulp. All written in straightforward English that you won't have to attend Starfleet Academy to understand.

So, turn the pages and step into the 24th century.

DESIGN LINEAGE

The name *Enterprise* is one that has instilled pride and dedication in generations of Starfleet officers for over two centuries. The line of ships to bear that name made historic contributions to space exploration.

Of all Starfleet vessels, the predecessors of the *U.S.S. Enterprise* NCC-1701-D exemplified the ideals of exploration into the unknown depths of the Galaxy. Launched in 2151, the *Enterprise* NX-01 is of significant importance in the development of Earth as the planet's first warp 5 capable starship. Commanded by Captain Jonathan Archer, the NX-01 was an important symbol of Earth's rise as a space-faring civilisation. The NX-01 was decommissioned in 2161.

The *Constitution*-class *U.S.S. Enterprise* NCC-1701 had a special place in the history of Starfleet. Active for over four decades in the 23rd century, this *Enterprise* was at the vanguard of Federation expansion under its commanders – Robert April, Christopher Pike and James T. Kirk. It underwent several major refits during its career and was almost completely rebuilt circa 2270, ending its career as a training vessel under Captain Spock. It was destroyed above the Genesis planet in 2285 after engaging a Klingon bird-of-prey.

The *U.S.S. Enterprise* NCC-1701-A was named to honor the heroic actions of Admiral Kirk and his crew after they saved Earth from the effect of a signal from an alien probe. Taking command of this new *Constitution*-class *Enterprise* as its captain, Kirk and his legendary crew continued the work for which they were so feted. This *Enterprise* played a crucial role in the Khitomer Accords of 2293 shortly before it was decommissioned.

The *Excelsior*-class *U.S.S. Enterprise* NCC-1701-B had a tragic start to its operational career. Under Captain John Harriman, the starship's maiden voyage became an urgent rescue mission which resulted in the death of James T. Kirk. This incident should not be reason to overlook the achievements of this ship and its crew during its lifetime.

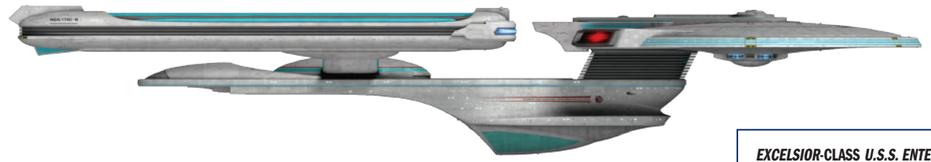
The fifth starship to bear the name *Enterprise* was the *Ambassador*-class *U.S.S. Enterprise* NCC-1701-C. Captained by Rachel Garrett, this *Enterprise*'s actions in 2344 defending a Klingon outpost on Narendra III from attacking Romulan ships was a turning point in peaceful relations between the Federation and the Klingon Empire. The *Enterprise*-C was lost with all hands in the battle, but her sacrifice was honored in the continuing line of starships named *Enterprise*.

NX-CLASS *U.S.S. ENTERPRISE* NX-01
Service: 2151-2161 (10 years)
Captain: Jonathan Archer

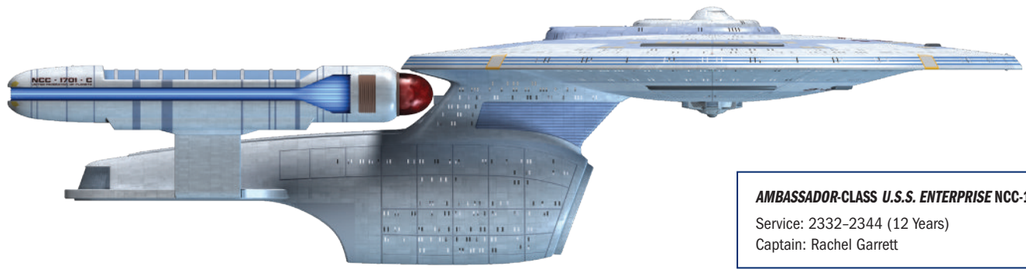
***CONSTITUTION*-CLASS *U.S.S. ENTERPRISE* NCC-1701 (2257)**
Service: 2245–2285 (40 years)
Captain: Christopher Pike

***CONSTITUTION*-CLASS *U.S.S. ENTERPRISE* NCC-1701 (2266)**
Service: 2245–2285 (40 years)
Captain: Christopher Pike, James T. Kirk

***CONSTITUTION*-CLASS *U.S.S. ENTERPRISE* NCC-1701-A**
Service: 2286–2293 (7 years)
Captain: Spock, James T. Kirk



***EXCELSIOR*-CLASS *U.S.S. ENTERPRISE* NCC-1701-B**
Service: 2293–2329 (36 years)
Captain: John Harriman



***AMBASSADOR*-CLASS *U.S.S. ENTERPRISE* NCC-1701-C**
Service: 2332–2344 (12 Years)
Captain: Rachel Garrett

CONSTRUCTION HISTORY

The development of *Galaxy*-class starships such as the *U.S.S. Enterprise* NCC-1701-D took two decades from drawing board to launch, and culminated in the production of the most advanced Starfleet vessels ever built.

The goal of the *Galaxy*-class Starship Development Project, begun in the early 2340s, was to build a new Starfleet flagship from the ground up. The *Galaxy*-class was designed to be a general deep space exploration vessel, a successor to the aging *Oberth*- and *Ambassador*-class ships. The new ships were intended to be the pride of Starfleet and the Federation, and the project provided a series of vessels so powerful and state-of-the-art that they set a whole new standard for future starships. To fulfil this brief, the *Galaxy*-class design history covered a 20 year period of proposals, engineering, research, and construction, culminating in a new Starfleet flagship: the *U.S.S. Enterprise* NCC-1701-D, unveiled in 2363.

2343 | **2344** | **2345** | **2346** | **2347** | **2348** | **2349** | **2350** | **2351** | **2352**

The Advanced Starship Design Bureau commences the testing of mission simulators using basic initial specifications of the *Galaxy*-class ship. At this point, the *Galaxy*-class design is still in an embryonic state of development, but continues to be developed throughout the year.

The engineers working on the *Galaxy*-class Starship Development Project gain their own logo as soon as their work is officially approved.

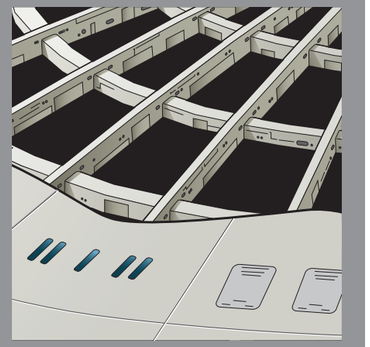
Using prototype frame designs, mass and volume studies are initiated for all internal systems of the new starship. The field is narrowed from 40 to 15 possible designs. Even before the external structure is agreed, the new vessel's computer core and software architecture passes initial tests, referred to as Design Review 0.

By the 2340s, the *Oberth* class is considered to be outdated and in need of replacement.

Official approval is granted for the *Galaxy*-class Starship Development Project, based at the Utopia Planitia Fleet Yards on Mars. The groundwork for the making and testing of this class of ship commences, and plans are drawn up incorporating previous starship designs. At this stage, particular emphasis is placed on the ship's frame, warp and impulse engine systems, computer cores, and hull.

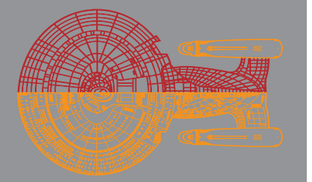
The *Galaxy*-class project aims to provide new, all-purpose deep space exploration vessels, replacing the outdated *Ambassador*-class ships.

Testing of the basic hull materials begins. The hull, or skin, of the *Galaxy*-class starship must provide conduits for several systems, including the structural integrity field (SIF), inertial damping field (IDF), and the deflector shield grid. The engine systems pass their Design Review 0, but problems are projected for planned warp coil materials. At this point, the impulse system design is frozen. The computer design passes Reviews 1 and 2, while the design evolution of the sensor systems continues. Habitation and workspace module designs are frozen, and fabrication of these sections commences. Tests show that the transporter biofilter will need a redesign. Upgrades to the photon torpedoes, using standard casings and launcher facilities, continues. The main deflector design is frozen.



The hull of the new *Galaxy*-class starships is constructed from an external layer of interlaced microfoam duranium filaments over three layers of biaxially stressed titanium fabric.

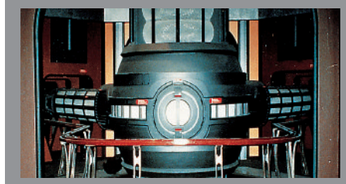
The *Galaxy*-class vehicle frame design and docking latch system passes its Review 0. The alloys to be used for the ship frames are chosen, and the materials are ordered. The warp engine and nacelle designs are frozen, and the nacelle passes Reviews 0 and 1. The warp engine components undergo test fabrication along with the impulse engine components, main computers, and transporter systems. Designs are frozen for the communications systems and tractor beam, but fabrication is delayed in order to undergo further power simulation tests. Following its third redesign, the phaser emitter passes Review 0. Reviews 1 and 2 are waived as fabrication commences. The main deflector power system is redesigned, and construction begins.



The main materials used in the construction of the skeletal structure of *Galaxy*-class starships are tritanium and duranium. Microextended terminium is the primary component of the trusses that make up the secondary framework.

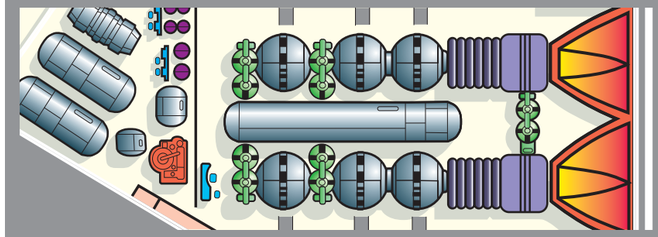
Once the *Galaxy*-class frame and docking system have passed Review 1, fabrication commences on the docking latches. Certain areas of the hull skin are undergoing further development, but the actual design is now frozen. Unfortunately, progress is slowed when the chosen materials for the warp engine fail. The warp nacelles pass Review 2, and construction soon follows. By now, tractor beam systems are also under construction, and final designs for the photon torpedo launcher are frozen. The sensor pallets enter the construction phase, and all auxiliary spacecraft, including the captain's yacht, continue to be developed.

The frame construction of the *Galaxy*-class ships continues, alongside major hardware installations. Soon the hull layers begin to be attached to the frame. The warp engine core is 65 percent complete, and the nacelles pass their Review 3, pending successful fixing of the problems experienced with the coil materials. The impulse engine installation is nearly complete. Computer core construction, carried out offsite, is now 50 percent complete. Primary layers of the habitat modules are installed. Problems with labor scheduling result in a delay in the construction of transporter systems. Changes to the hull skin requires modifications to be made to the tractor beam emitters. Phaser bank installation continues, as do all power and consumables conduits.



The engine core materials problems are finally cleared up and the warp core is completed. When finished, it is installed in main engineering.

A ceremony is thrown at the Mars orbital construction platform Utopia Planitia to mark the gamma welding of the initial frame members. Warp nacelle shells continue construction, but the inner coils remain in a test phase until all problems have been solved. Impulse engine components are test fit within the frame by the middle of the year. At this point, the computer core framing commences. The habitat modules are test fit. The weapons systems, photon torpedoes, and phaser banks are all under construction.



By 2350, impulse engines are test-fit into the *Galaxy*-class ships' frames. When construction is complete, these engines will propel the ship through space at subwarp velocities.

Warp engines system design for the *Galaxy* class is frozen, pending further confirmation following warp nacelle testing later in the year. The impulse engine design also undergoes further fine tuning. The computer cores pass their next two reviews, numbers 3 and 4. The transporter biofilter design is frozen at this stage following redesign, and system fabrication commences. The phaser emitter redesign passes its initial Review 0. The power supply to the main deflector is redesigned to cope with the extra scientific instruments that will be available on this class of ship.

The warp engine core materials problems are fixed, and it is completed. Warp field coil manufacture is temporarily delayed by furnace facility problems, but other facilities proceed to schedule, and preparations are made for early impulse run-up tests; nonflight mock-ups complete their fit checks. The main computer cores are now 80 percent complete. Fifty-five percent of the habitat sections and connecting passages are now installed, as are the temporary gravity generators and the phaser bank, but the electroplasma power supply to the phasers is deferred pending verification of warp engine power levels. The transporter systems, except for the hull emitters, begin to be installed. Photon torpedo magnetic launcher power supplies require reworking.

Habitat sections, such as the decks that contain the senior officers' private quarters, are more than half completed by this stage.

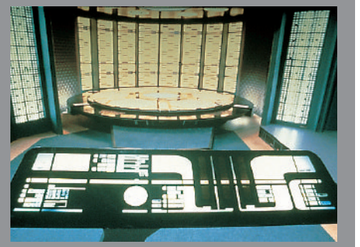
2353

The ship framing and hull construction continue to schedule, as do the docking system latches and pass-through fit checks. Deuterium reactant tanks and the antimatter pod assemblies are delivered for integration into the structure. The warp coils are affected by this, but production of matched coil sets continues. Impulse engine system run-up tests are performed, with the fusion chambers powered up in various combinations. The reaction control system (RCS) thruster assemblies are installed. Two of the computer cores are completed; one is installed in the saucer section, and the other in the battle hull. Completion of the third core is hindered by the availability of isolinear chips. Phaser power flow regulators and conduits are installed. The predicted warp core power tap is confirmed as accurate. The main deflector piggyback instrument power supply work is complete.

A problem in obtaining isolinear chips hinders the installation of one of the three main computer cores, but many other systems are completed.

2354

The final outer frame of the *U.S.S. Enterprise* NCC-1701-D is completed, but minor design modifications in the forward dorsal section require the addition of added longitudinal members. The warp engine core tests continue, but the impulse engine system is now complete, as are the gravitational systems. The transporter and subspace communications system antennae are modified to make them compatible with deflector shield grid emissions. The ship's Structural Integrity Field is run at low power in an attempt to work out any glitches in the framing structure. The main deflector field's focus test is successful following the repair of the startup. On the starboard side, the pylon phaser bank is swapped with that of the *U.S.S. Yamato* to achieve a better fit. The photon torpedo loader thermal problem reappears and is fixed. Fifty percent of the sensor pallets are now installed.



The transporters undergo modifications to ensure their compatibility with other systems aboard the ship, such as the deflector shields.

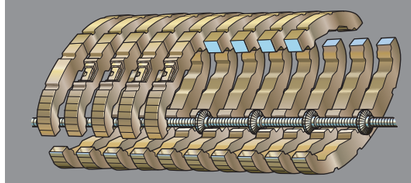
2355

Scans of the hull skin show up some unacceptable welds; a two percent rework is required to rectify the problem. The imbedded defensive shield grid in the hull skin is unaffected by the problem. The warp engine core begins low-power testing, and reaches the energy equivalent of warp 2. Warp nacelles await delivery of suitable coil assemblies. Impulse testing continues to schedule, and the RCS thruster software is fixed. Unfortunately, the third computer core is delayed for two more years. This affects subsequent versions of the *Galaxy*-class ship. Habitat layers are now 70 percent complete. Auxiliary craft including shuttlecraft, lifeboats, and work pods arrive for integration tests. A photon torpedo loader thermal expansion anomaly is solved.

Small, auxiliary craft assigned to the *Galaxy*-class vessels are delivered.

2356

The skin of the outer hull of the starship is now 95 percent complete. The warp engine power-up tests have reached a warp 8 equivalent; new warp coils are delivered and installed. The impulse fusion generators perform non-propulsive tests at full power. The third computer core is finally delivered and installed, but additional programming and tests continue. The first habitat module swap-out by transporter is a success; the transporter tests are now complete, as are the final SIF and IDF hookups. The comm system is now 90 percent complete. Impulse power to the phasers is confirmed. Almost a third of the lifeboats have been delivered and integrated. The *U.S.S. Galaxy* is launched from the orbital spacedock under power of maneuvering thrusters.



New warp coils are installed in the *U.S.S. Enterprise*'s nacelles. The ship should now be able to achieve speeds up to warp 8.

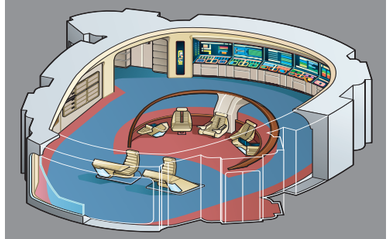
2357

The hull integrity is now complete and all SIF and IDF systems are operational. Warp nacelles are latched on, and readiness is confirmed for flight status. Only final impulse system adjustments remain, but a computer core subspace field shielding problem arises; one third of the ship's power systems are affected by a power-up procedure until a solution is found. The comm system is completed after a minor rerouting to avoid a computer glitch. Remote firing of the photon torpedo system is successful, and the final hookup of the defensive shields is also completed. Sensor pallets are now certified. The *U.S.S. Galaxy* is soon commissioned. The ship is declared warp capable, and therefore deep-spaceworthy. Permission is granted to move it to the edge of the solar system.

The *Galaxy* class's history of space exploration begins as the first ship is moved to the edge of Earth's solar system. The *U.S.S. Enterprise* will soon follow.

2358

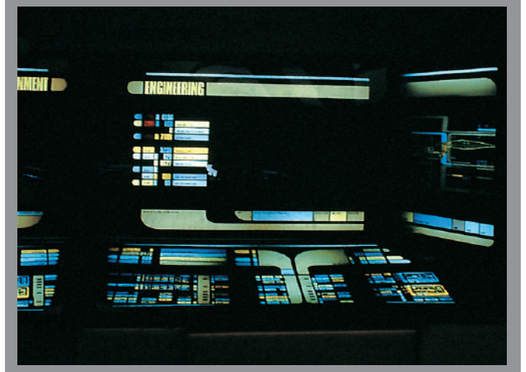
Further tests are conducted on the completed warp and impulse propulsion systems. The rest of the internal spacecraft systems are powered up, while cross-system tests continue. Brand new flight software is installed in all three of the ship's computer cores. An ejectable bridge module is docked. A minimum flight test program crew completes initial training aboard ship. A nonflight test article of the captain's yacht is docked. The *U.S.S. Enterprise* is launched, and leaves the dock on its maneuvering thrusters.



The *U.S.S. Enterprise*'s bridge module is fitted, and a flight test program crew make final checks. The ship makes its first flight, but is still a good few years away from being commissioned.

2359

The flight test crew continues developmental shakedown trials near Mars. The *U.S.S. Enterprise* NCC-1701-D receives continuous performance updates from the *U.S.S. Galaxy*, currently in orbit around Pluto. Various tasks are achieved at this testing phase, including battle simulations and emergency conditions. The warp coils receive their first, nonpropulsive power at a level approximating warp 1. The conditioning of the warp coils continues up to a warp 8 level. Analysis on all levels of performance and components continues. The ship's main computer develops system awareness as it runs through its performance capabilities. The *Enterprise* is now declared deep-spaceworthy and warp-capable. On the hull, yellow warp-stress visibility coatings are applied.



By this stage, the main computer systems on the *U.S.S Enterprise* are fully installed and are developing systems awareness.

2360

The *U.S.S. Enterprise* achieves its first warp flight out of Earth's solar system. It initially suffers vibration during the transition to high warp, but the problem is solved by computer adjustments to the warp geometry control software. Skin reinforcements and frame stiffening are performed during dock layovers. Crew and systems are tested using live-fire phaser and photon torpedoes. Low-level deficiencies in the defensive shield power are overcome by enhanced shield generator designs. All lifeboats and auxiliary spacecraft are now docked, including an operational captain's yacht. The bridge module is also docked.

Final tests are carried out on the *U.S.S. Enterprise*. By now, most systems and modules have been completed.

2361

On 4th October, a special ceremony at Utopia Planitia Fleet Yards marks the commissioning of the new *U.S.S. Enterprise* NCC-1701-D. Two other *Galaxy*-class starships, the *U.S.S. Yamato* and the *U.S.S. Galaxy*, send messages of congratulations.

Captain Donald Varley of the *U.S.S. Yamato*, the *Enterprise*'s sister ship, sends his congratulations over subspace radio. His ship and the *U.S.S. Galaxy* have already been commissioned by this point.

2362

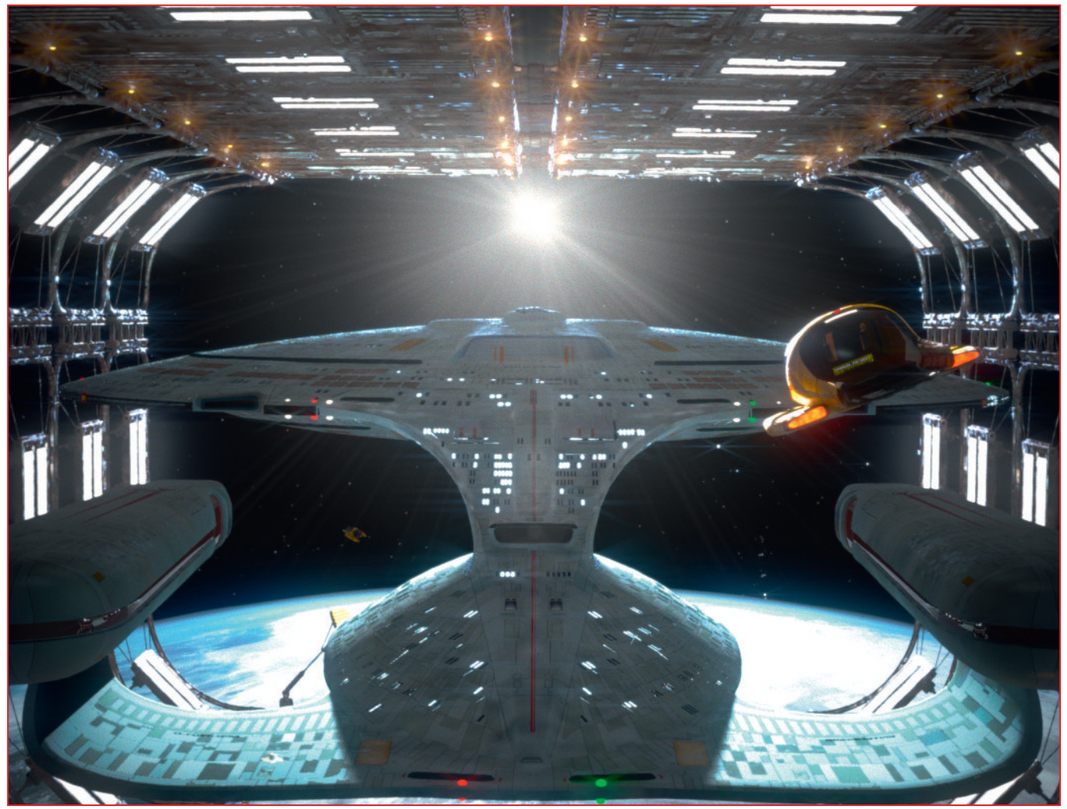
OPERATIONAL HISTORY

The *U.S.S. Enterprise*-D had a distinguished service that saw it become deeply involved in many of the pivotal events of the 2360s, including the first Borg invasion.

Operational from 2363 to 2371, the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D undertook a wide range of missions as the flagship of Starfleet. Shortly after the *Enterprise* successfully completed its shakedown cruise, Captain Jean-Luc Picard took command on stardate 41148 in 2364.

On stardate 41153.7, the *Enterprise* proceeded to Deneb IV to rendezvous with its remaining crew complement and assess the suitability of Farpoint Station for utilisation as a starbase. En route, the ship made first contact with the pan-dimensional entity Q, and was forced to perform a high-warp saucer separation maneuver, among the first in Starfleet history.

The *Enterprise* was present at the first historically documented contact with the Ferengi race in 2364, and later, during an engine upgrade overseen by Starfleet officer Kosinki, the ship exceeded the warp 10 speed barrier. Mission logs indicated this freak occurrence was



The *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D was constructed at the Utopia Planitia Shipyards in orbit around Mars. It was designed to have an operational life of up to 100 years, but the ship only remained in service for 8 years before it was destroyed. However, during that time it accomplished remarkable things.

Captain Jean-Luc Picard assumed command of the *Enterprise*-D in 2364 on Stardate 41153.7 under the orders of Admiral Norah Satie. Lieutenant Yar flew him to ship on a shuttle and he formally took command in a ceremony that took place in Shuttlebay 2. The *Enterprise* then headed to Deneb IV to collect the rest of the crew.

influenced by the presence of a being known as the Traveler. The *Enterprise* docked at Starbase 74 on stardate 41365.9 for routine maintenance and systems upgrade under the supervision of Commander Quinteros. During this layover, the ship was hijacked by representatives of the Bynar, with Captain Picard and Commander William Riker still aboard. Captain and first officer successfully regained control of the ship, with no subsequent punitive action taken against the Bynar, whose actions were deemed non-aggressive.

BORG CONTACT

A further encounter with the Q entity in 2365 led to first contact with the Borg, the biggest single threat to the future of the United Federation of Planets. Thrown 7,000 light years off course, the *Enterprise* found itself in the vicinity of the J-25 system. A first skirmish with a Borg cube vessel led to 18 crew casualties when sections of decks 4, 5 and 6 were cut from the ship's hull. With a loss of shields and warp propulsion, the *Enterprise* narrowly escaped destruction in the face of a relentless new enemy, the ship returned to its point of origin by Q. However, the damage was done, and the Federation had to prepare for future Borg engagement.

In 2366, quick action by the *Enterprise*-D crew on stardate 43510.7 repelled a shipboard incursion by terrorist forces from Rutia IV. Although Captain Picard was abducted as a hostage during the incursion, Lieutenant Commander La Forge removed an explosive device from the warp core. Both Picard and Dr. Beverly Crusher later returned safely to the ship.

Inevitable further hostilities with the Borg were instigated when a Borg cube entered Federation space in 2366. The *Enterprise* intercepted the Borg vessel and engaged it in battle, but suffered heavy damage from a cutting beam that resulted in the evacuation of main engineering. Taking refuge in the Paulson Nebula, the *Enterprise* crew worked on a plan to use the main deflector dish to direct a high energy blast at the Borg cube. With Captain Picard subsumed into the Borg Collective as Locutus of Borg, the plan ultimately failed and the *Enterprise* was left disabled as the cube proceeded to Earth.

On its very first mission, the *Enterprise* encountered the almost omnipotent Q, who put its crew, and all of mankind, on trial.

In late 2364, the *Enterprise* re-established contact with the hostile Romulan Empire, which had not communicated with Starfleet in decades.

The *Enterprise*-D was the first Starfleet vessel to make contact formal contact with the Borg, a cybernetic species that soon launched an all-out attack on the Federation.

Under the command of the field-promoted Captain Riker, the *Enterprise* was unable to reach Wolf 359, where Starfleet took a valiant stand against the Borg. With the fleet all but destroyed, the *Enterprise* was all that stood between the Borg and the future of humanity. A successful operation involving full saucer separation and an away team incursion aboard the Borg cube led to the recovery of Jean-Luc Picard. Picard was successfully severed from the Borg Collective before the cube was destroyed.

ONGOING EXPLORATION

Directly following the *Enterprise* crew's heroic stand against the Borg, the ship proceeded to Earth Station McKinley for a six-week refit before recommencing its ongoing mission of exploration.

Later in 2367, the *Enterprise* received a visit from Dr. Leah Brahms, the acclaimed propulsion specialist who was one of the architects of the *Galaxy*-class's warp system. Brahms's visit coincided with an incident involving an unnamed space-borne species, an offspring of which mistook the *Enterprise* for its mother, attaching itself to the hull and draining power. Lieutenant Commander La Forge and Brahms worked together to safely detach the creature from the *Enterprise* and return it to its own kind before fatal damage was caused.

Tensions ran high during events relating to the succession of the Klingon Chancellor in 2368 and a resulting Klingon Civil War. Intelligence indicated that the House of Duras was receiving assistance from Romulan agents in disrupting the succession. The *Enterprise* acted as command ship in establishing a blockade of starships to prevent cloaked Romulan ships from breaching a networked tachyon grid to bring supplies to their Klingon allies.

MYSTERIES SOLVED

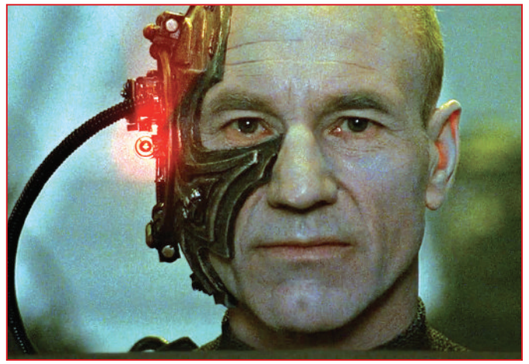
The mystery surrounding the disappearance in 2278 of the *U.S.S. Bozeman* was solved in 2368 when the *Enterprise* became trapped in a temporal phenomenon near the Typhon Expanse, colliding with the *Bozeman* in an endless loop for over 17 days. On breaking the loop – avoiding destruction and the loss of all hands – it became clear the *Bozeman* and its crew had been trapped in the same temporal loop for 90 years.

The *Enterprise* was key in solving a further mystery – along with the fate of one of Starfleet's most acclaimed chief engineers – in 2369 when the ship investigated a distress call from the lost *U.S.S. Jenolan*. The *Jenolan* had crashed on the surface of a Dyson sphere, and engineer Montgomery Scott had survived for 75 years in the transporter pattern buffers. Scott was later instrumental in helping release the *Enterprise* from the Dyson sphere after it entered the structure to explore its nature and origins.

CAPTAIN JELLICO

Captain Edward Jellico became the third commander of the *U.S.S. Enterprise* NCC-1701-D in 2369 on stardate 46358.1 following the reassignment of Captain Picard into a covert mission. Jellico oversaw *Enterprise* operations in preventing a Cardassian invasion of Minos Korva and brokered the safe return of Picard from incarceration, who later resumed command of the *Enterprise*.

During an intense baryon sweep of the *Enterprise* carried out at the Remmler Array on 46682.4, the *Enterprise* was once again the target of terrorist action by a small group



The Borg took control of Captain Picard and used his tactical knowledge to inflict major losses on Starfleet at the Battle of Wolf 359. However, when Picard was rescued, his knowledge of the Borg allowed the *Enterprise* to defeat them.

The *Enterprise* and her crew became deeply involved in the Klingon war of succession and was instrumental in preventing the Romulans from aiding the House of Duras, and thereby ensuring that Gowron became chancellor in 2368.

Captain Edward Jellico briefly assumed command of the *Enterprise* when Captain Picard was sent on an undercover mission in Cardassian space.

The *Enterprise* made an historic discovery when the crew established that all humanoid life forms had a common ancestor that had 'seeded' the Galaxy.

intending to steal toxic trilithium resin during the ship's evacuation period. The attempt was foiled by a lone Captain Picard who had failed to leave the ship before the deactivation of the transporter systems.

An illegal 'phasing' cloaking device that had previously been tested aboard the *U.S.S. Pegasus* by its captain, Erik Pressman, was installed briefly on the *Enterprise*-D in 2370. This allowed the ship to pass through the solid matter of an asteroid while evading Romulan vessels. The *Enterprise*'s use of the device put it among a handful of Federation starships known to have used a cloak.

During the investigation of a comet on stardate 47615.2, the *Enterprise* came under threat from an unusual and invasive virus transferred from the ancient archive of the D'arsay culture. Taking over Lieutenant Commander Data, the virus converted matter into ancient stone artefacts Reports from the incident indicated that an aqueduct had appeared on deck 12. The virus was deactivated and the ship – and Data – were returned to their normal state.

END OF SERVICE

The *Enterprise*-D's operational service came to a sudden end later in 2371 during the crew's involvement with the activities of Dr Tolian Soran and his investigations into the phenomenon known as the Nexus. The *Enterprise* engaged in hostilities near Veridian III with a Klingon bird-of-prey under the command of Lursa and B'Etor of the House of Duras. Although the *Enterprise* bested the Klingon vessel, it sustained heavy damage leading to a warp core breach due to a rupturing of magnetic interlocks.

Commander Riker – in command due to the absence of Captain Picard – ordered full crew evacuation to the *Enterprise*'s saucer section and initiation of separation sequence. The saucer was able to pull away from the main drive section before warp core detonation; the drive section was completely destroyed and the resultant shock wave hit the retreating saucer. With helm control offline, the saucer fell rapidly into the atmosphere of Veridian III, plummeting to earth. Although some stabilisation was established via lateral thrusters, this was not enough to halt the saucer's descent and the *Enterprise* crashed heavily into a dense forest area of the planet.

Casualties were minimal in the wake of the forced landing, but the ship was deemed unsalvageable. Captain Jean-Luc Picard and Commander William Riker were the last to leave the flagship. The *U.S.S. Enterprise* NCC-1701-D was taken before her time, but as history has noted, it would not be the last starship to carry the name *Enterprise*.

The *Enterprise* was destroyed in 2371, in orbit around the planet Veridian III. The ship was attacked by a Klingon bird-of-prey, which was able to penetrate her shields and cause a warp core breach. Most of the crew survived and were able to evacuate the ship in the saucer, which crashed on the planet's surface.

ANNOTATED EXTERIOR VIEWS

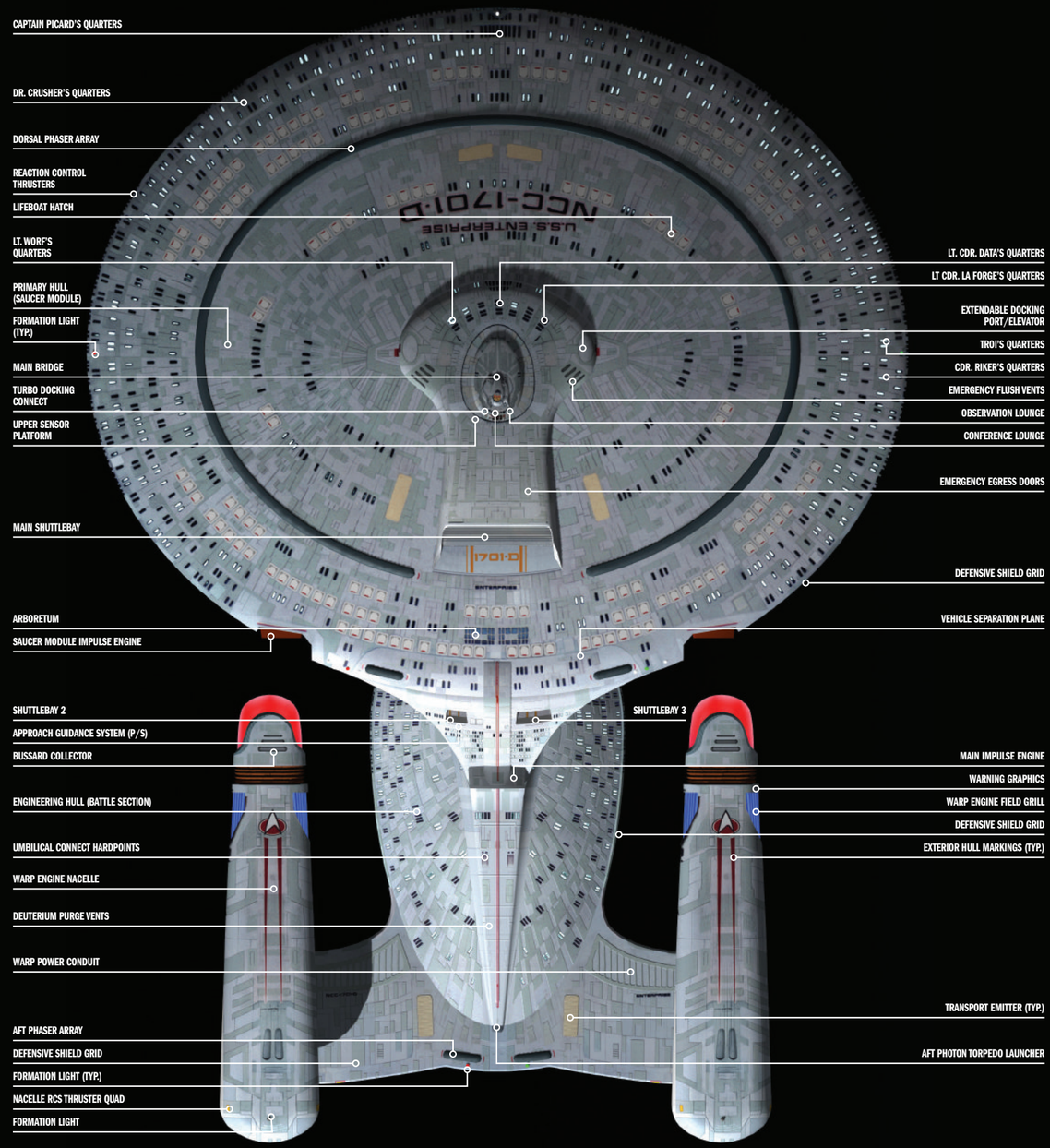
Plan schematics of the *U.S.S. Enterprise* NCC-1701-D reveal an overall aesthetic that pushed the envelope of modern starship design for the next phase of space exploration across the Galaxy.

As can be seen from these dynamic plan views of the *U.S.S. Enterprise* NCC-1701-D, the design of the *Galaxy*-class starship configuration ushered in a new era of starship construction, reflecting advances in technology and new mission criteria. Although the heritage of the *Enterprise*'s design lineage could be clearly seen in the *Galaxy*-class, the plan view displayed a new aesthetic that moved starship design away from a functional, military approach with space combat considerations.

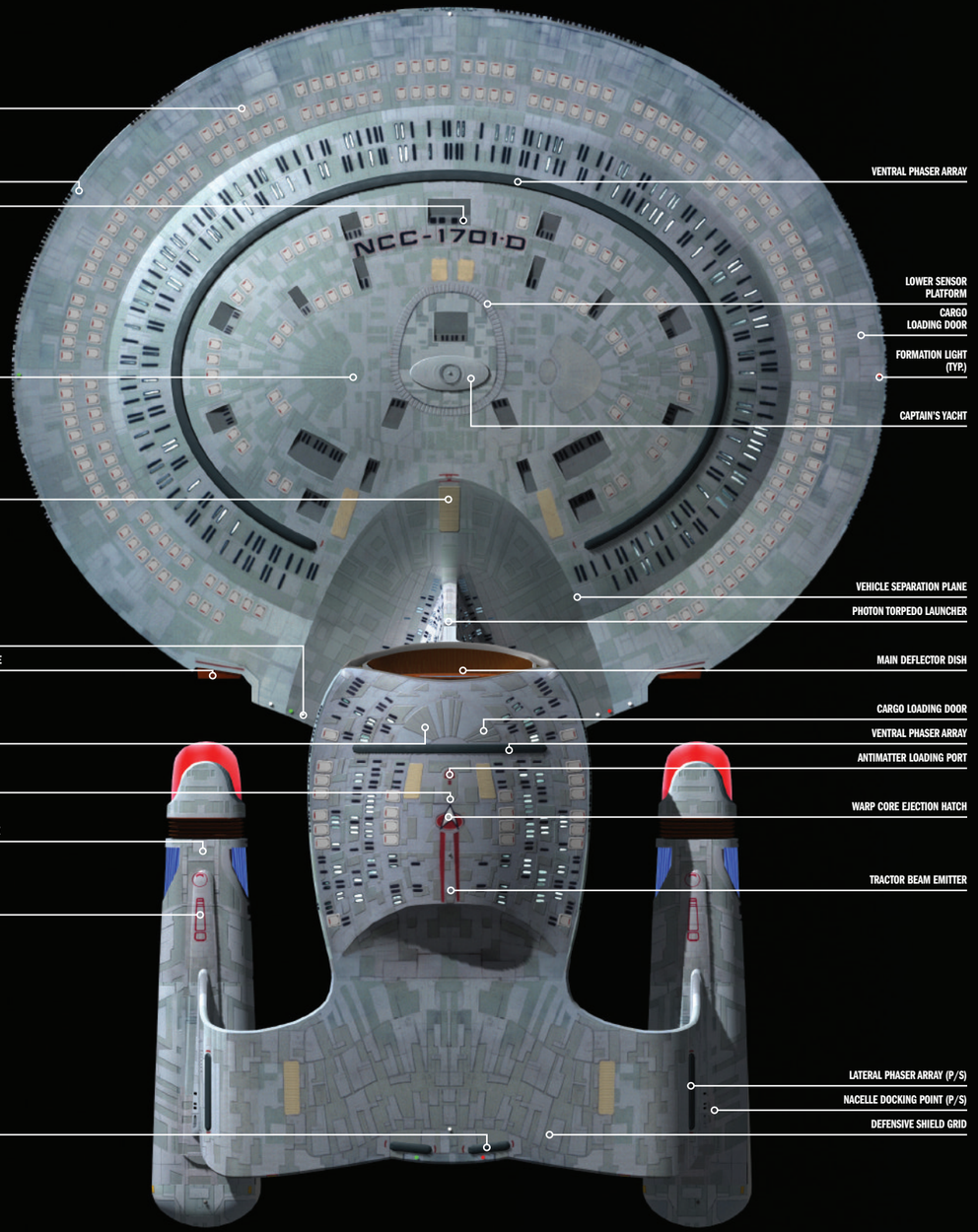
Major innovation could be seen in the design of the saucer section, which took on a larger and more pronounced oval shape as opposed to the predominantly circular designs of the past. This was influenced by Starfleet's new approach to long space voyages that accounted for crew members being accompanied by family members, with the saucer section required to blend comfort with functionality. The 1014-plus crew and family aboard a *Galaxy*-class vessel needed to be accommodated somewhere.

This view of the *Enterprise* also displayed advances in warp drive technology, with the warp nacelles placed at a more benign configuration behind and below the saucer section. The side view showed an overall aerodynamic configuration and also pointed to the need for a more efficient saucer separation sequence and anticipated mission situations when the saucer and the main drive section were required to operate as separate vessels on occasion.

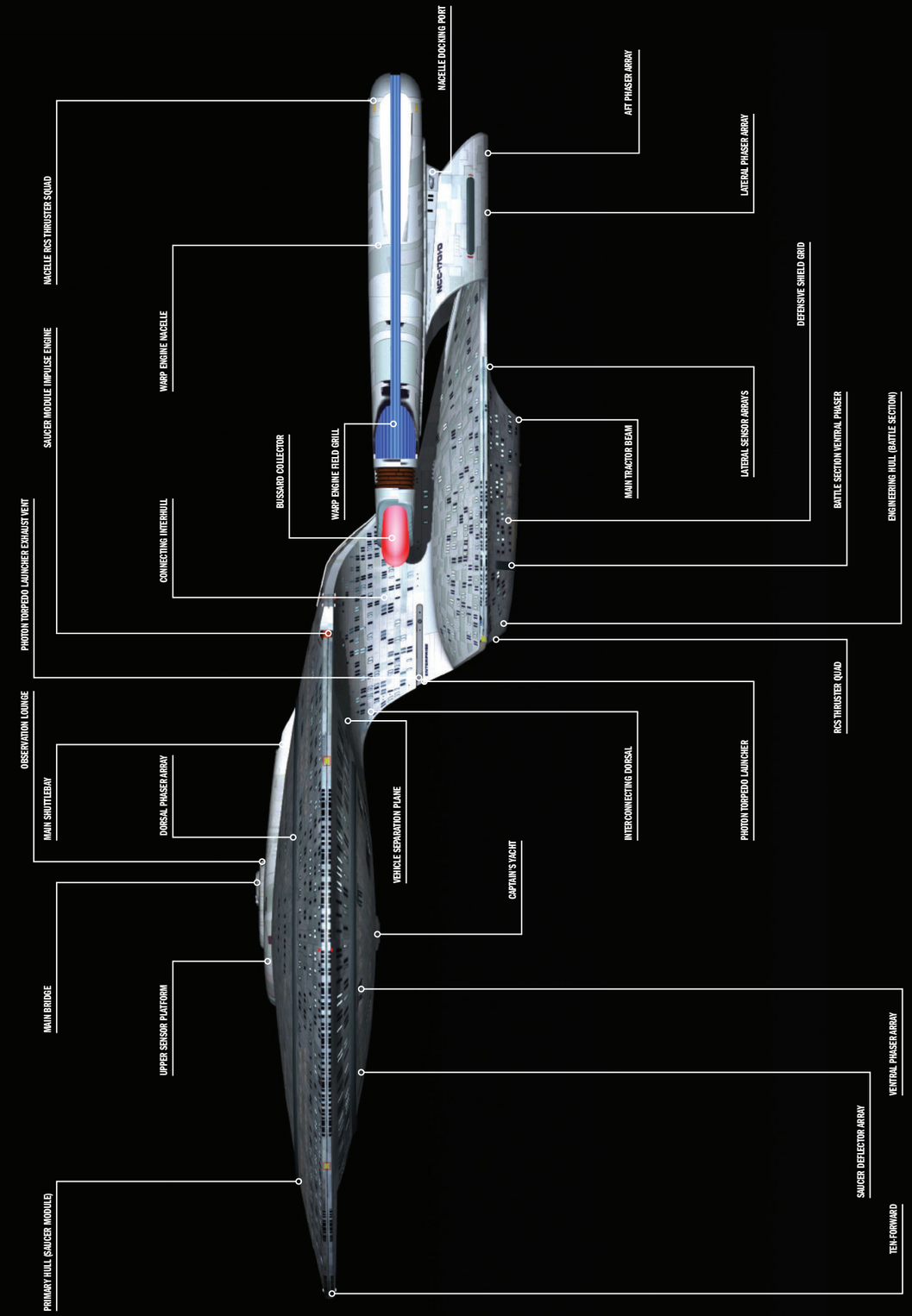
DORSAL VIEW



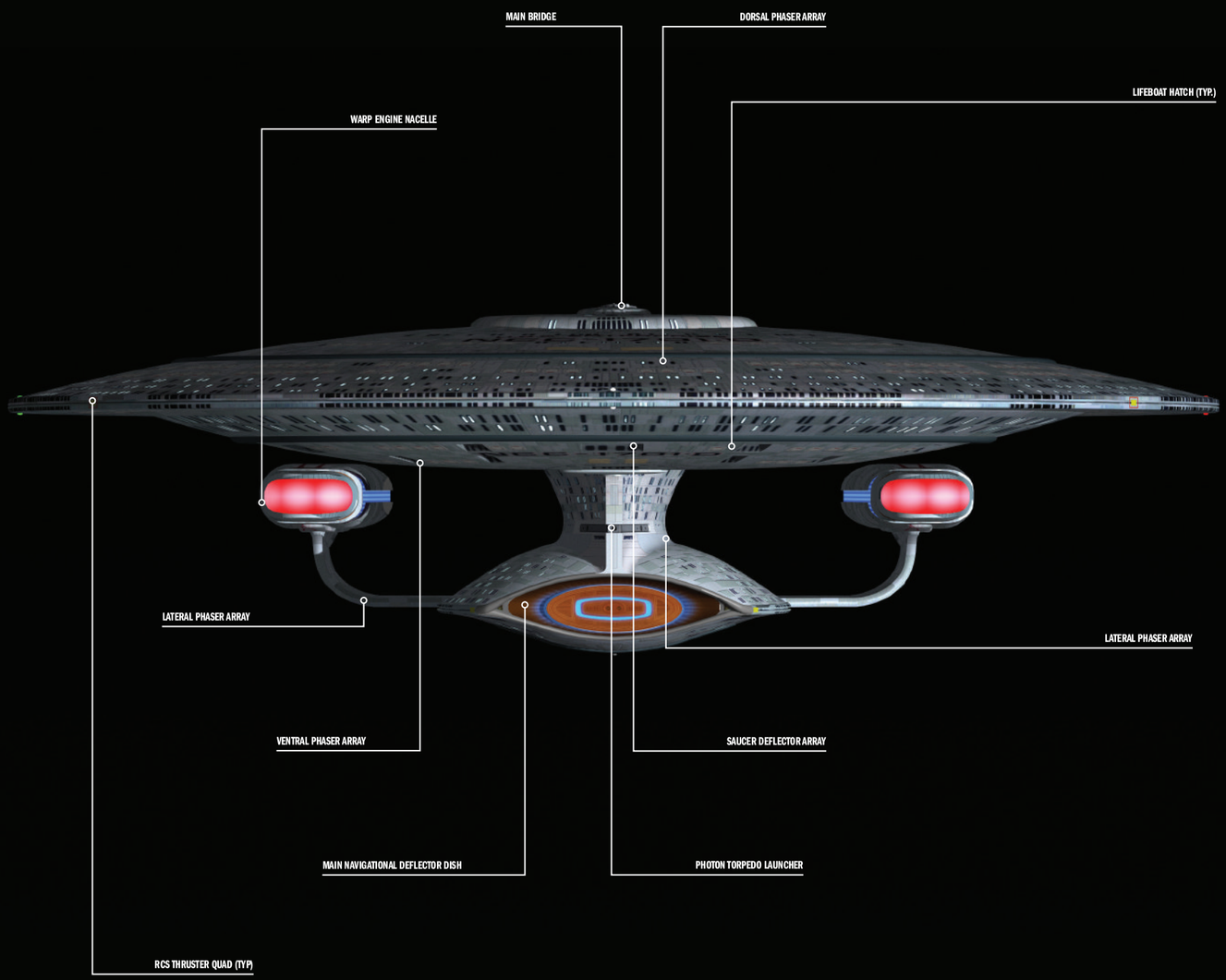
VENTRAL VIEW



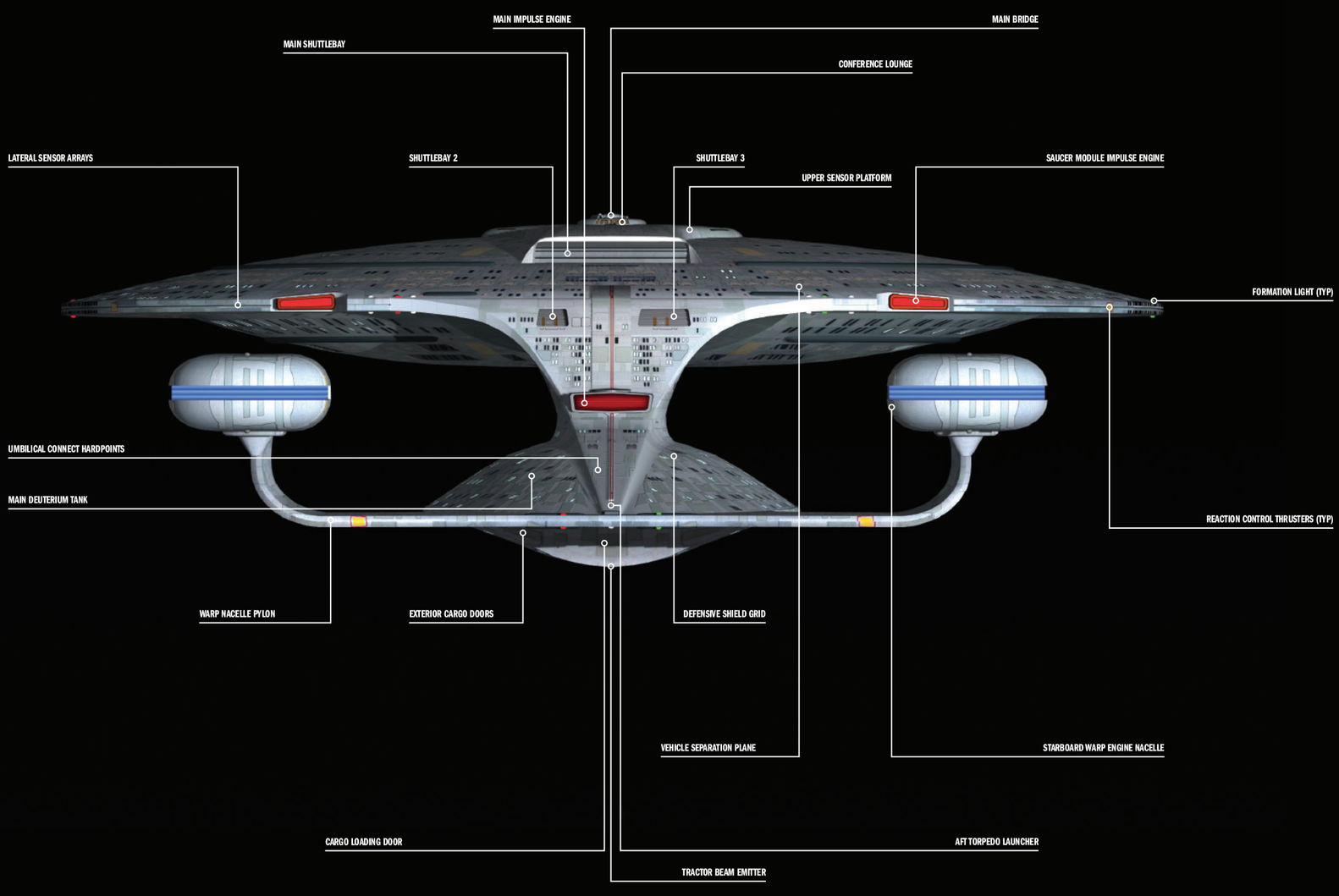
PORT ELEVATION



FRONT ELEVATION



AFT ELEVATION



SKELETAL STRUCTURE

The *U.S.S. Enterprise NCC-1701-D*'s intricate skeletal structure was designed and constructed to cope with the stresses and strains of warp travel.

Commander Orfil Quinteros was in charge of the team that assembled the *U.S.S. Enterprise* NCC-1701-D at the Utopia Planitia Fleet Yards.

The first frame elements of the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D were welded together at the Utopia Planitia Fleet Yards on June 3, 2350; it then took five more years to complete the intricate construction of the starship's entire skeletal structure. The vessel's skeletal elements were constructed from an interlocking series of tritanium/duranium microfilament truss frames and microextruded terminium trusses. The panels of the exterior hull were attached to the main trusses of the skeletal structure by gamma-welded, electron-bonded duranium pins.

Large trusses formed the outer shape of the ship, while smaller ones formed the structure of the interior; the inner hull structure was directly attached to the framework of terminium trusses.

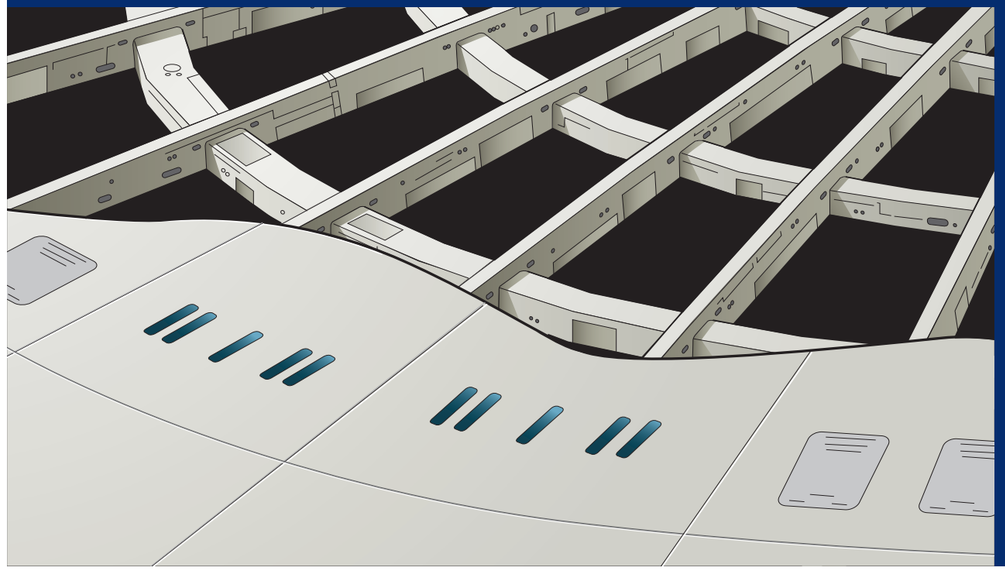
Both frameworks were carefully designed to provide the maximum support while minimizing strain and vibrations that could damage the structure. During flight, the *Enterprise* was further protected by the ship's structural integrity field, without which the vessel would be unable to withstand high acceleration speeds.

DAMAGE LIMITATION

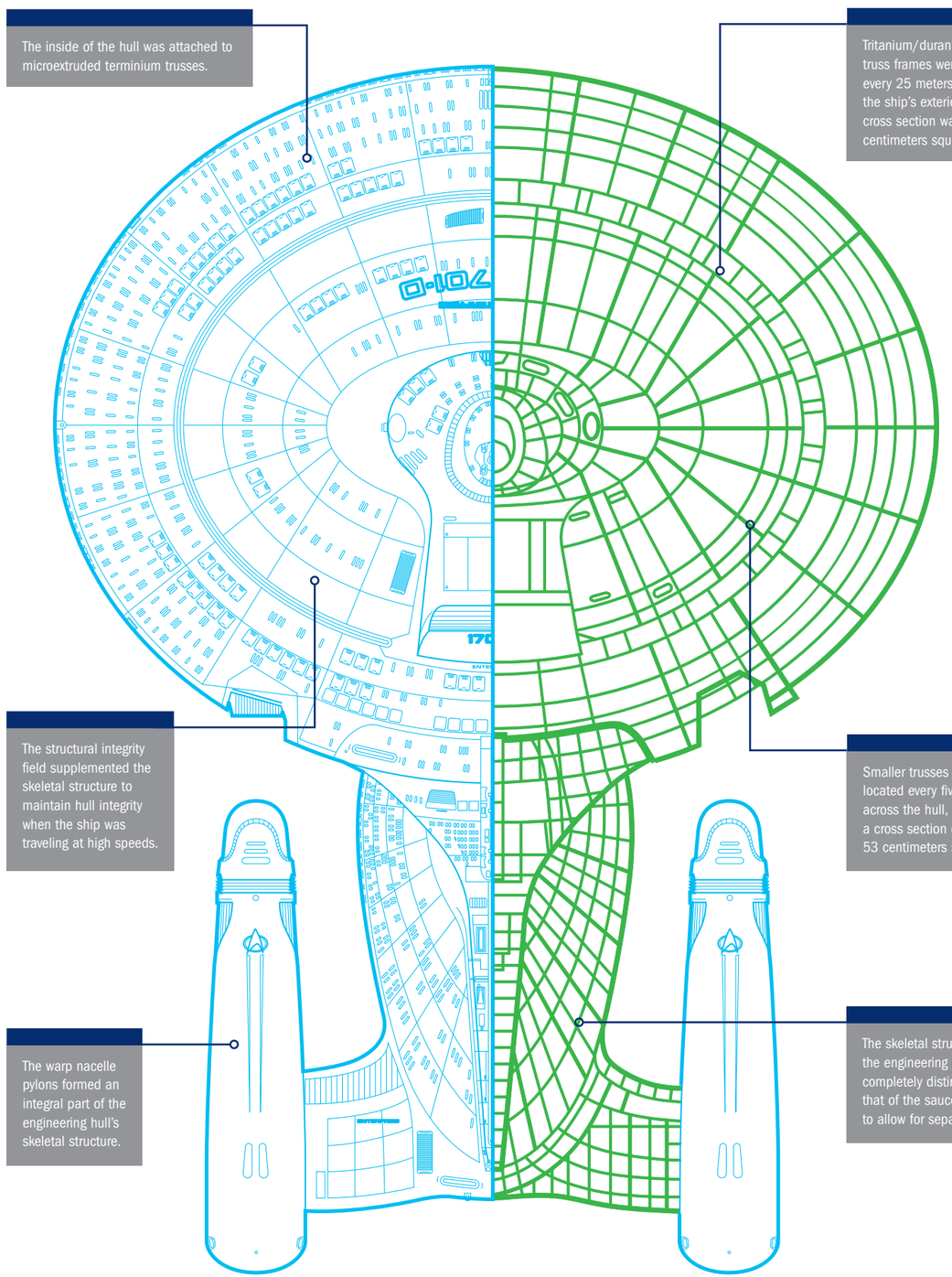
The entire framework was connected in such a way that it was possible to separate and replace small sections if they became damaged, without needing to decommission and remove large sections of the ship. This was especially true, and particularly useful, in the case of the small polyduranium support rods that made up the internal secondary support structure.

COVERING THE FRAMEWORK

The skeletal structure of the *U.S.S. Enterprise* NCC-1701-D was composed of a framework of tritanium/duranium microfilament trusses. The panels of the outer hull were attached to the top of these beams, enclosing the ship.



PHYSICAL STRUCTURE



COORDINATE SYSTEM

The *U.S.S. Enterprise* NCC-1701-D used external and internal coordinates to ensure that any point on the ship could be located easily by all personnel.

The internal and external coordinates of starships were based on a three-dimensional mathematical system of three axes, in which the X axis ran horizontally from port to starboard across the ship, the Y axis ran vertically from dorsal to ventral, and the Z axis ran horizontally from fore to aft.

In the case of the *U.S.S. Enterprise* NCC-1701-D, the accuracy of this system was improved even further as the coordinates were calculated specifically for each of its various operational configurations, i.e. there was one set of coordinates for when the two sections of the *Enterprise* were combined (referred to as the 'docked configuration'), and separate coordinates for the saucer module and the battle section when these components were separated.

The set of coordinates being used was identified by a subtext letter; the docked configuration was identified by a 'D', (XYZD), the saucer module by an 'S' (XYZS), and the battle section by a 'B' (XYZB).

Other major areas of the ship were also given their own specific coordinates, such as the warp nacelles, which were designated by XYZNP for the port nacelle and XYZNS for the starboard nacelle.

MEASUREMENTS

The distance from each point of origin was measured in centimeters. Thus, a point located on the saucer module hull that was 489 centimeters toward starboard, 1034 centimeters toward the dorsal plane, and 1296 centimeters toward the aft edge from the point of origin was represented by the coordinate XYZS 0489, 1034, 1296; the subscript 'S' told the user that this point was calculated from the saucer module, rather than the docked, coordinates.

Inside the ship, an even more accurate series of coordinates came into use, based on a 15-digit code. In addition to the XYZ coordinates, two further sets of numbers were also employed. The coordinate started with a two-digit number, which was the deck number; all coordinates for locations on that deck started with the same digits. The next two digits gave the 'sector' number; the saucer module was cut into 10-degree sections, making a total of 36 sectors.

ENGINEERING SECTORS

In the engineering hull, the ship was divided into 10 sectors, which dissected the ship from fore to aft; zero was the foremost sector, nine was at the aft of the ship. To avoid confusion with the saucer module sectors, the digit '5' was always placed in front of the sector number of the engineering section. In this way, the sectors of the engineering section were designated 50 to 59.

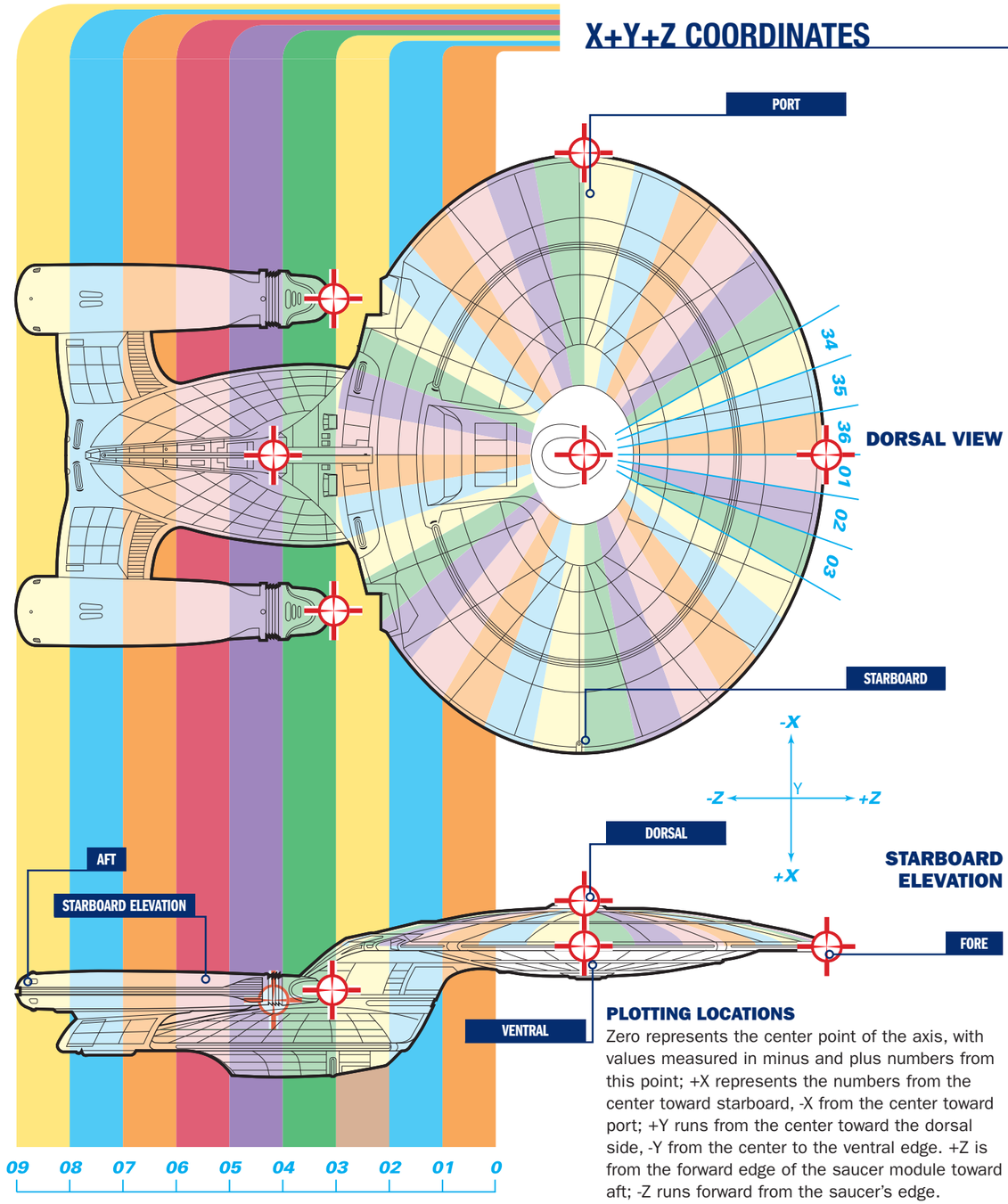
After the two digits representing the sector number, there were two digits for the compartment or station number within the sector. The final nine digits were the XYZ coordinates within the compartment. Thus, a figure of 12-2306-234, 426, 187 represented a location 234 centimeters toward port, 426 centimeters toward dorsal, and 187 centimeters toward aft in compartment six of sector 23, deck 12. Using this system, a Starfleet officer was able to locate any point on the ship from the coordinate number alone, even if they had never before visited that section of the vessel as part of their duties.

The internal and external coordinate systems used on the *U.S.S. Enterprise* NCC-1701-D allowed any point to be described, much like the system of zip codes introduced on Earth in the mid-20th century.

The center point of the main bridge was located at coordinates XYZD0, 3712, 21131. This reveals that it was exactly halfway between port and starboard, 3712 centimeters toward the dorsal surface of the ship, and 21131 centimeters toward the aft.

EXTERNAL COORDINATES

X+Y+Z COORDINATES



PLOTTING LOCATIONS

Zero represents the center point of the axis, with values measured in minus and plus numbers from this point; +X represents the numbers from the center toward starboard, -X from the center toward port; +Y runs from the center toward the dorsal side, -Y from the center to the ventral edge. +Z is from the forward edge of the saucer module toward aft; -Z runs forward from the saucer's edge.

SAUCER SEPARATION

The *U.S.S. Enterprise* NCC-1701-D could separate the saucer section and the main drive, offering more flexibility – and safety for civilians – in emergency situations.

In 2366, while attempting to retrieve Captain Picard from a Borg cube, a field-promoted Captain Riker separated the *Enterprise*'s saucer section as part of the rescue strategy.

When Starfleet vessels first started exploring the unknown regions of space, the crew had no choice but to leave their families behind, sometimes in the knowledge that it would be many years before they would see their loved ones again. As starship design progressed, however, it became possible to install extended living quarters. This allowed Starfleet personnel to bring their spouses and children to live on board with them during lengthy missions in space.

OUT OF HARM'S WAY

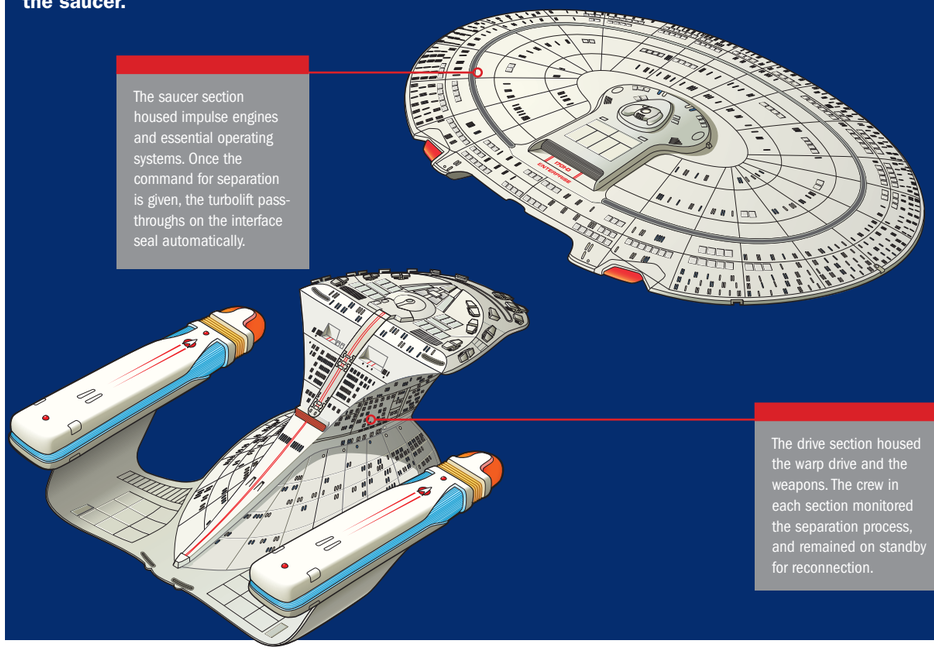
Having so many civilians aboard the ship caused its own inherent problems. While Starfleet officers might have wanted their loved ones close by during missions, they did not want to place them in any danger. For this reason many family ships, such as the *U.S.S. Enterprise* NCC-1701-D, incorporated a very important safety design: a saucer section that could be separated from the rest of the ship.

This allowed the Starfleet crew to go into dangerous situations while their families could be evacuated to the saucer section and taken out of the line of fire.

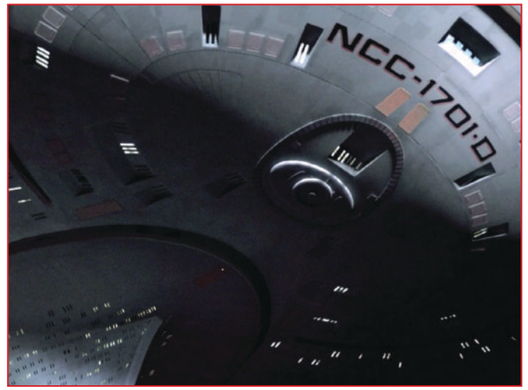
This feature also proved to be a life-saver in the case of a warp core breach. All nonessential personnel could be evacuated to the saucer module, away from the drive section that housed the warp core. As long as the saucer section had time to reach a safe distance, casualties could be kept to a minimum.

INDEPENDENT OPERATION

The saucer and drive section were designed to operate independently, with the commanding officer in charge of the stardrive and a senior officer in charge of the saucer.

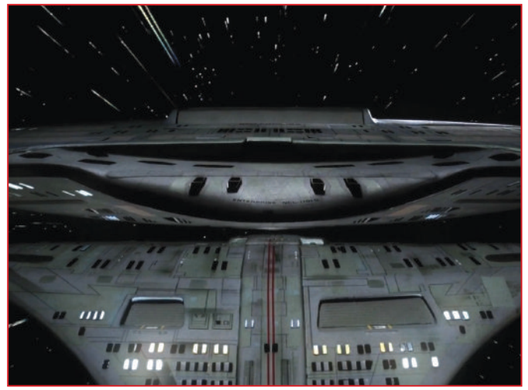


EMERGENCY SEPARATION

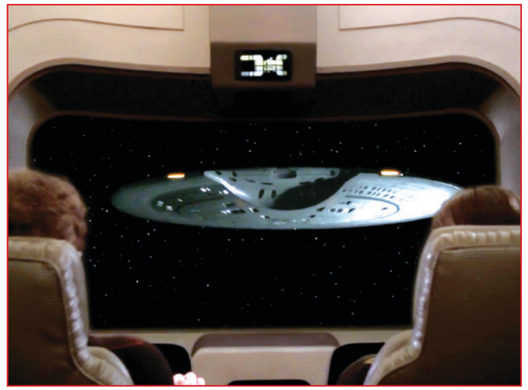


The two parts of the ship were normally held together by 18 docking latches, each of which consisted of two spreading grab plates. The grab plates used energy from the structural integrity field generators.

The separation altered the flight behavior of both sections, but the onboard computers and inertial damping fields ensured that the process was safe and felt as smooth as possible.



The main warp nacelles of the *U.S.S. Enterprise* NCC-1701-D were located on the drive section, but the saucer module was equipped with its own engines which were capable of impulse and low warp speeds.



The saucer section would aim to move away from the drive section as quickly as possible, especially if the separation had been necessitated by a warp core breach which could result in a shockwave.

The drive section was now ready to enter a hazardous situation which would have been unsuitable for the whole ship. In this way, casualties could be minimized and no one was put in unnecessary danger.

Once the danger had passed, the two sections were recombined. If the stardrive was destroyed and the saucer section could not reach a starbase, it could, in extreme situations, land on a planetary surface.

SAUCER LANDING

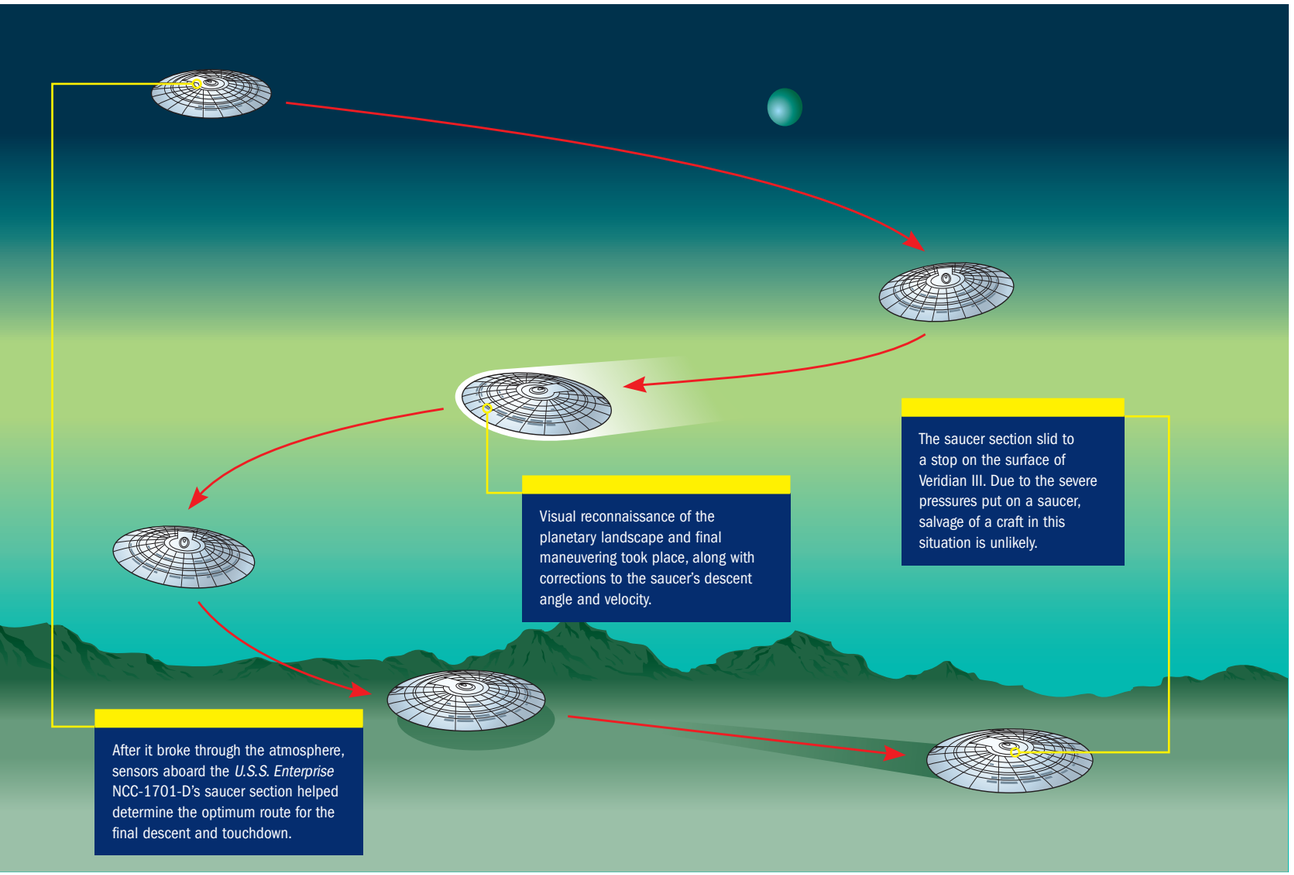
The saucer section of a *Galaxy*-class starship was designed to land safely on a planet's surface in the event of a serious emergency, preserving the life of passengers and crew.

Starfleet personnel were trained to land a saucer module in the event of an emergency. This maneuver was rarely undertaken, as it was performed only in a worst-case scenario when all other options had been explored and exhausted.

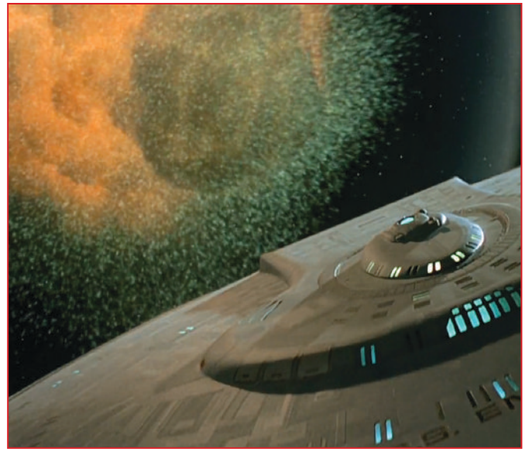
BATTLE DAMAGE

When the *U.S.S. Enterprise* NCC-1701-D was hit by a Klingon bird-of-prey's salvo of torpedoes, a warp core breach destroyed the drive section. The crew survived aboard the saucer section, which made an emergency landing on the planet Veridian III.

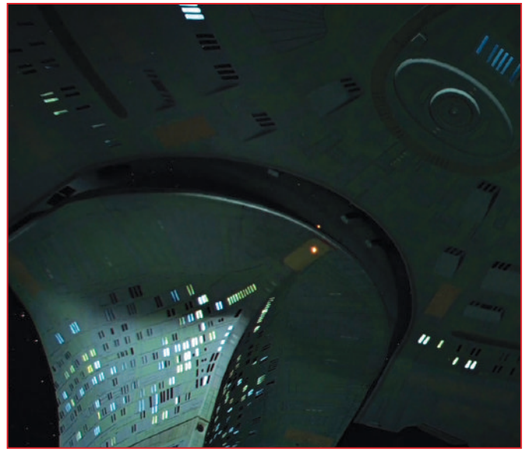
The landing was far from smooth, as the saucer section was caught in a huge shockwave and sent hurtling toward the planet. The saucer hit the ground at speed and ploughed through the landscape; fortunately only minor injuries were sustained by the crew, but the hull was so badly damaged as to be unsalvageable.



CRASH LANDING

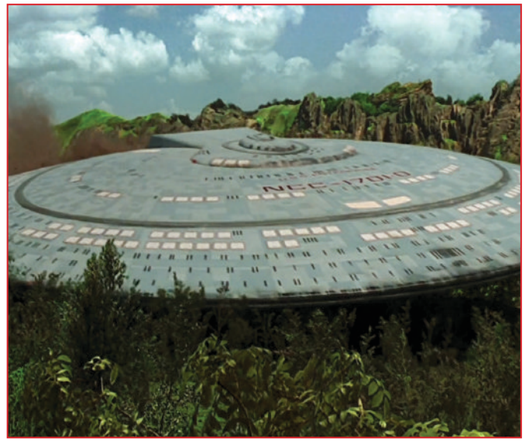


The *Enterprise* received heavy damage during battle with a Klingon bird-of-prey.

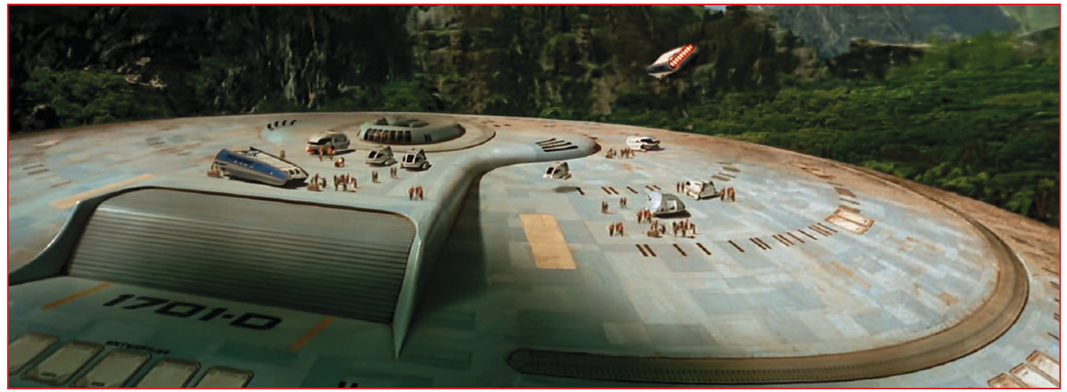


The ship's crew evacuated to the saucer module before initiating separation.

The saucer was flung toward the planet by the shockwave from the drive section.



The saucer remained intact despite hitting the planet's surface at great speed.



After broadcasting an emergency distress call, the crew had to wait for help to arrive.

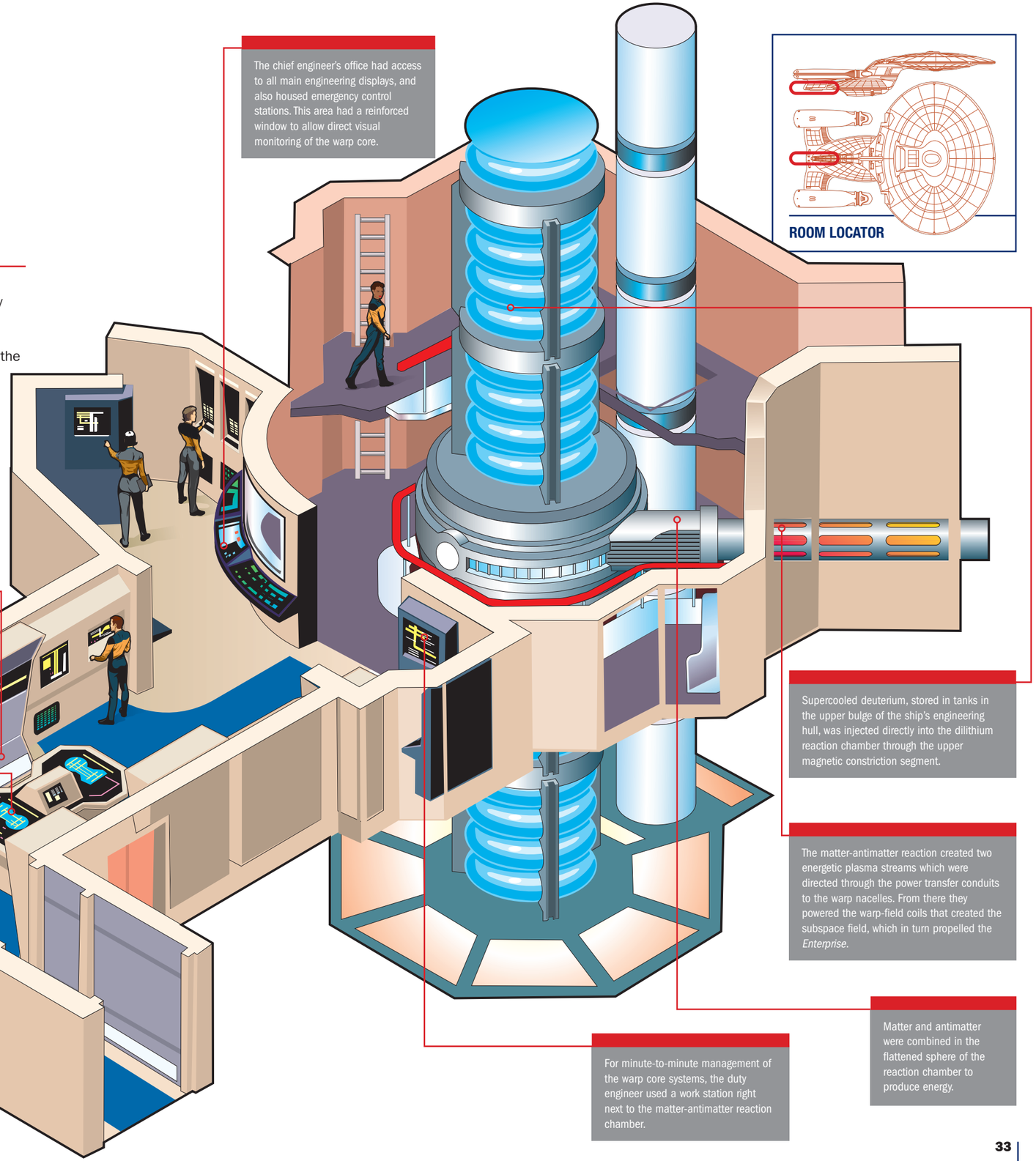
MAIN ENGINEERING

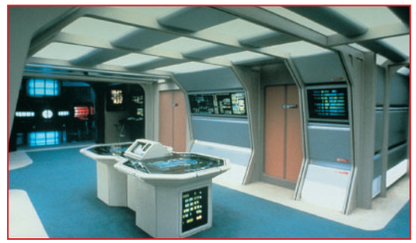
On *Galaxy*-class ships such as the *U.S.S. Enterprise* NCC-1701-D, main engineering was located on deck 36 in the stardrive section and served as the control center for engines and engineering systems.

The *U.S.S. Enterprise* NCC-1701-D's main engineering section was the primary control center for the ship's warp and impulse engines and other related engineering systems. It was located deep inside the stardrive section, ensuring that it enjoyed the maximum protection if the ship was attacked or damaged. In an emergency situation, main engineering could be used as a backup control center, and its work stations could be easily reconfigured to take control of most essential bridge functions.

The warp core ran through the room, which was dominated by the reaction chamber of the matter-antimatter reaction assembly. The area immediately around the warp core was on two levels, and the upper level could be accessed by a ladder or an open lift platform. The area immediately in front of the warp core was designated as the chief engineer's office. A specially reinforced window allowed the chief engineer to visually monitor the warp core; the computer terminals duplicated most of the key displays in main engineering.

In the case of a warp core containment failure, main engineering could be sealed off from the reaction core by two sets of isolation doors. Containment forcefields around the warp core provided a further level of protection, and in extreme situations the entire matter-antimatter system could be ejected into space.





Main engineering was in the heart of the stardrive section and allowed the crew to work in close proximity to the matter-antimatter reaction chamber.

MASTER SYSTEMS DISPLAY

Identifying and responding to system malfunctions was essential to the efficient operation of the ship. The master systems display allowed engineering personnel to be appraised of the *Enterprise*'s status at all times.

The large tabletop-style display panel located in the center of main engineering was known as the master situation monitor, or master systems display; from here the ship's engineers could monitor all of the *U.S.S. Enterprise* NCC-1701-D's operations.

The master systems display console comprised of two octagonal-shaped sections that distinguished its two separate work stations. These two stations were divided by a raised control panel in the center.

MASTER EFFICIENCY

The console could be dual-operated; this allowed individual duty engineers to work on their separate tasks simultaneously, while leaving the larger wall display units within main engineering free for the rest of the department's personnel to work at. In an emergency, the master systems display console could be quickly reconfigured to take command of the flight-control functions of the starship.

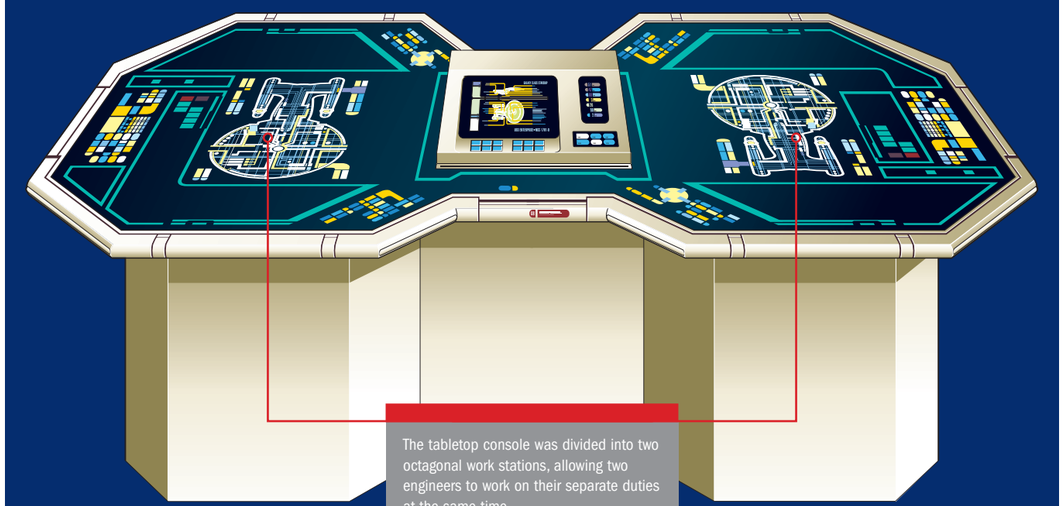
VERSATILE CONTROLS

The console's control functions were extremely versatile; they provided complete diagnostic information and diagrams concerning the general working order of the starship, and the system could also be used to control and oversee any experimental procedures that were being carried out on board.

In the event of an extreme emergency, the console could also be used to activate the autodestruct sequence, although this could be initiated only by the ship's two most senior officers, and not by the engineering staff.

TABLETOP CONSOLE

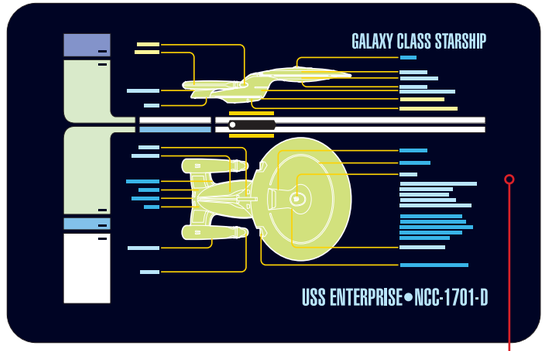
The table unit in the center of main engineering enabled personnel to swiftly appraise the status of core systems and hardware. Any anomalies could be identified and appropriate action taken to resolve the problem.



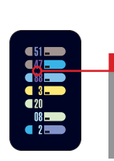
The tabletop console was divided into two octagonal work stations, allowing two engineers to work on their separate duties at the same time.

CENTRAL CONSOLE

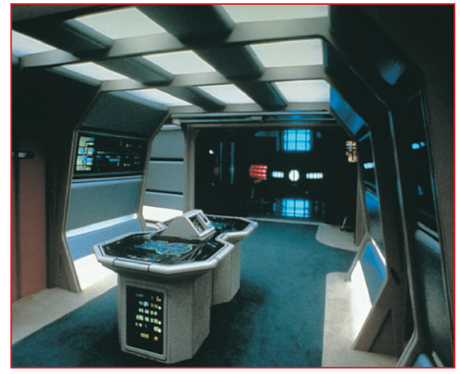
The raised control console in the center of the master systems display could be used for emergency commands such as the autodestruct sequence. For security reasons, the console could identify handprints.



The display in the center of the console showed the status of several key systems. The information on the display was very similar to that shown on the master situation monitor.



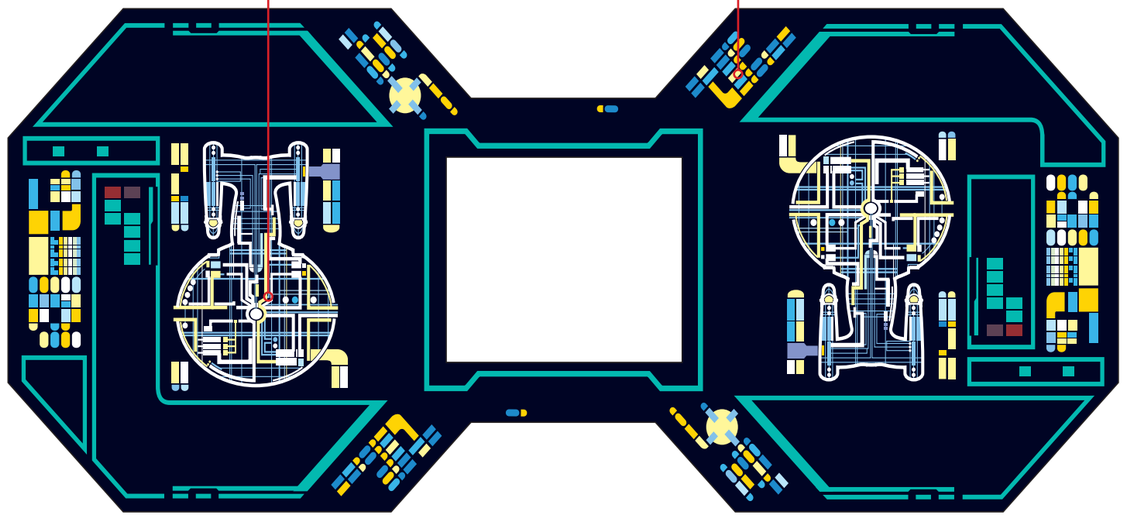
Commands could be entered from the button pads on the side of the console.



The Master Systems Display provided several positions for the engineering crew to work at.

The displays on the console normally showed a schematic of the ship. Personnel could then zoom in to examine any area in detail.

Individual engineers could perform a variety of tasks on the two workstations, leaving the dedicated displays for the remaining staff.



WARP ENGINES

A warp engine works by distorting the space-time continuum, pushing a vessel into subspace and thereby reducing its apparent mass. *Galaxy*-class starships could maintain warp 9.6 for 12 hours.

Once a vessel's effective mass has been reduced, it can overcome the restrictions imposed by Einstein's general theory of relativity ($E=mc^2$ or energy=mass multiplied by the speed of light squared) and accelerate to faster than light speed (c).

Following the model established by Zefram Cochrane, Federation vessels' warp engines accomplish the transition into subspace by using a matter-antimatter reaction to generate a series of warp fields that exert force against one another. The matter-antimatter reaction takes place in the warp core; the warp fields are generated in the nacelles.

A vessel's warp engine rely on three distinct elements: a matter-antimatter reaction assembly (commonly known as the warp core), power transfer conduits, and warp nacelles.

The warp core not only produces power for the ship's propulsion systems, but acts as the vessel's main power generator, supplying energy to all the ship's systems.

In the simplest terms, the warp core works by burning deuterium to create gases, which are then forced together with antimatter in the form of antihydrogen. The reaction is controlled by dilithium crystals to create a plasma stream that is split in two and routed to the warp nacelles.

In the nacelles, the plasma is used to energize the warp field coils, made of verterium cortenide. When this substance is energized, it causes the energy frequencies in the plasma to shift into subspace, creating warp fields.

Warp engines are powered by a matter-antimatter reaction assembly, commonly referred to as a warp core. It generates warp plasma by combining deuterium and antihydrogen in a controlled reaction.

The nacelles combine to create a multilayered warp field that surrounds the ship. Starships crossed the light-speed barrier by manipulating this field.

The field coils in the nacelles were arranged in rows so that they generate separate layers of warp field energy which nest against one another, with each layer exerting a controlled amount of force against its next outermost neighbor. The cumulative force of the nested fields drive the vehicle forward. The effect is known as asymmetrical peristaltic field manipulation (APFM).

ENERGY TRANSFER

As the field layers expand from the nacelles they experience a rapid force coupling and decoupling; they simultaneously transfer energy and separate from the previous layer at velocities between 0.5c and 0.9c. As the fields force couple, the radiated energy makes the transition into subspace, effectively reducing the mass of the spacecraft. This unbalances Einstein's equation and enables a vessel to overcome the restrictions of general relativity; because the ship's mass has been reduced, enough energy can now be generated to accelerate beyond the speed of light.

The warp field coils are energized in sequential order, moving from the front to the back. The more often the coils are energized, the more fields they generate, and the higher the warp speed.

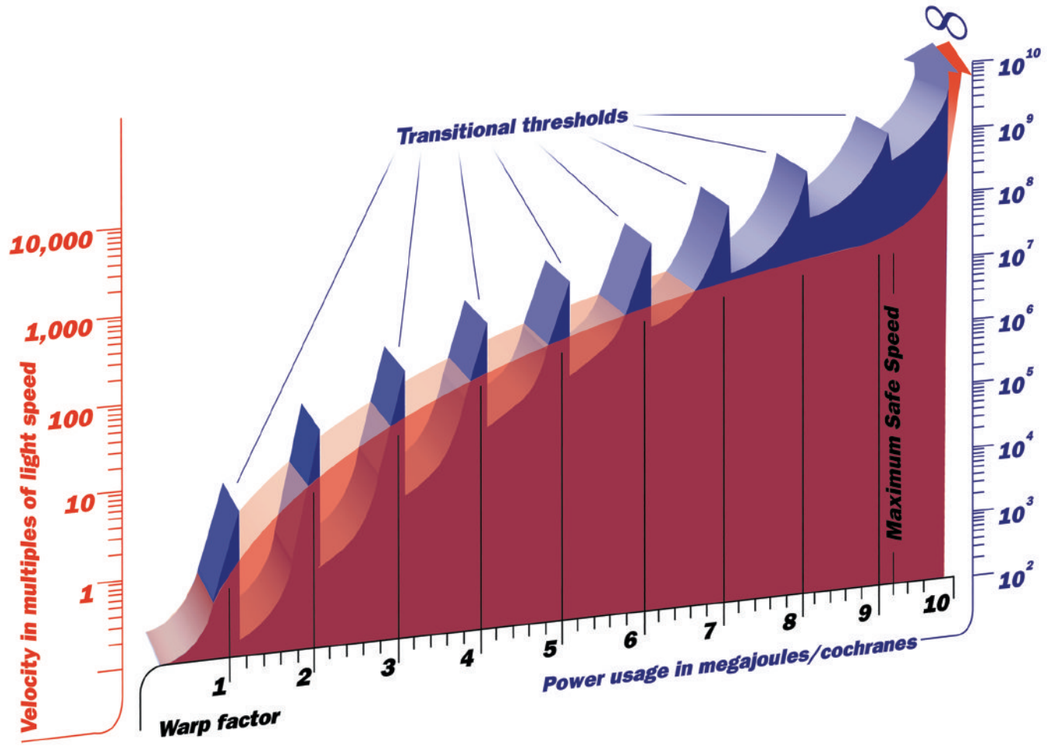
MANEUVERING AT WARP

Most vessels use two warp nacelles so that they can create two balanced fields that interact with one another. Maneuvers can be performed by modifying the warp field geometry, thereby altering the balance of the forces exerted, and modifying the direction of the ship.

Warp fields are measured according to the amount of subspace stress they generate; field stresses are measured in cochranes. Fields that are below warp 1 are measured in units a thousand times smaller called millicochranes. A field of one cochrane or greater is often referred to as a warp field.

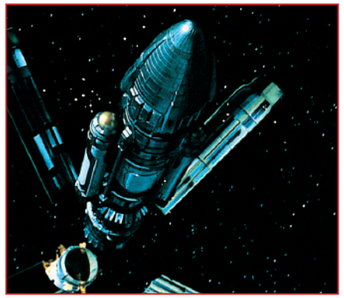
The warp scale has been drawn up so that warp 10 is infinite velocity; in theory any vessel traveling at this speed would occupy every point in the universe at once.

WARP SPEED/POWER

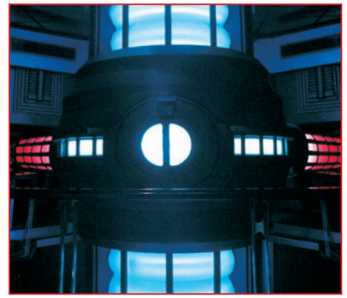


The current warp speed chart has been designed so that warp 1 is the speed of light (c) and warp 10 is infinite velocity. Starfleet used a different chart in the 23rd century; speeds of warp 6 on this old scale correspond to speeds in the region of warp 5. The energy requirements peak as they cross the barriers between warp factors and then lessen before peaking again as they approach the next barrier. The power usage approaches infinity as the graph nears warp 10.

The warp engine on Earth was developed by Zefram Cochrane, a scientist from the 21st century. He revolutionized physics by showing that a ship could travel faster than light by distorting the space-time continuum.



Cochrane completed the first successful warp flight on April 5, 2063. His ship, the Phoenix, made only a tiny warp jump, but it led to humanity's first contact with aliens, and ushered in an era of interstellar exploration.



The matter-antimatter reaction takes place in a chamber in the middle of the warp core. Matter is injected into the chamber from above, and antimatter from below. The reaction is controlled by dilithium, the only substance known not to react with antimatter.

As a warp field approaches the stress needed to achieve this speed, the power requirements rise dramatically and the warp driver efficiency drops.

For many years Starfleet believed it was actually impossible to reach warp 10, but an experimental engine devised by the crew of the *U.S.S. Voyager* NCC-74656 appears to have reached it. Unfortunately, the technology proved to be extremely dangerous and the materials needed to make the engine are not readily available.

Speeds below warp 10 are plotted on an exponential curve. Thus, whereas a ship traveling at warp 1 is travelling at c, a ship moving at warp 4 is traveling at 102c, and a ship flying at warp 9 is traveling at 1516c.

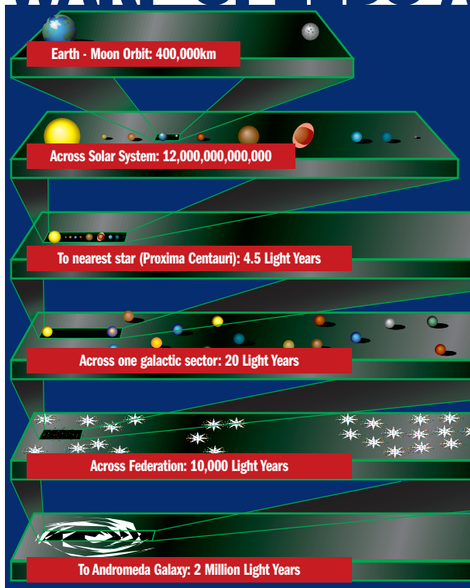
The curve becomes extremely steep in the warp 9.9 range, and enormous increases in speed are needed to progress from warp 9.91 to warp 9.92. In a few rare instances starships have traveled incredible, even intergalactic, distances in a matter of seconds. These journeys probably took place in the warp 9.9999999996 range, but Federation science cannot measure speeds approaching this range.

Crossing the warp speed barrier (i.e. establishing a field of one cochrane) requires a disproportionate amount of energy. Once the warp threshold has been passed, the power needed to maintain the field lessens. Most Federation ships cruise in the warp 6 range and can achieve speeds greater than warp 9 for a limited period. For example, *Galaxy*-class starships can maintain warp 9.6 for 12 hours.

While technological advances continue to push the upper limits of the warp speed scale, the increasing energy requirements are so great that significant improvements appear unlikely. It seems greater speeds will require different technologies.

The shape of the hull has been designed to help it achieve warp speeds and to influence the geometry of the field itself.

WARP SPEEDS ACROSS THE GALAXY



Interstellar travel is only practical because starships can travel faster than the speed of light. Modern warp drives have allowed the Federation to explore a significant proportion of one quadrant, a quarter of the Galaxy.

STANDARD ORBIT

Earth-Moon	42 hours
Across solar system	142 years
To nearest star	558,335 years

FULL IMPULSE

Earth-Moon	5.38 seconds
Across solar system	44 hours
To nearest star	20 years

WARP 1

Earth-Moon	1.34 seconds
Across solar system	11 hours
To nearest star	5 years
Across galactic sector	20 years

WARP 6
(CRUISING SPEED OF NCC-1701-D)

Across solar system	2 minutes
To nearest star	5 days
Across galactic sector	18 days

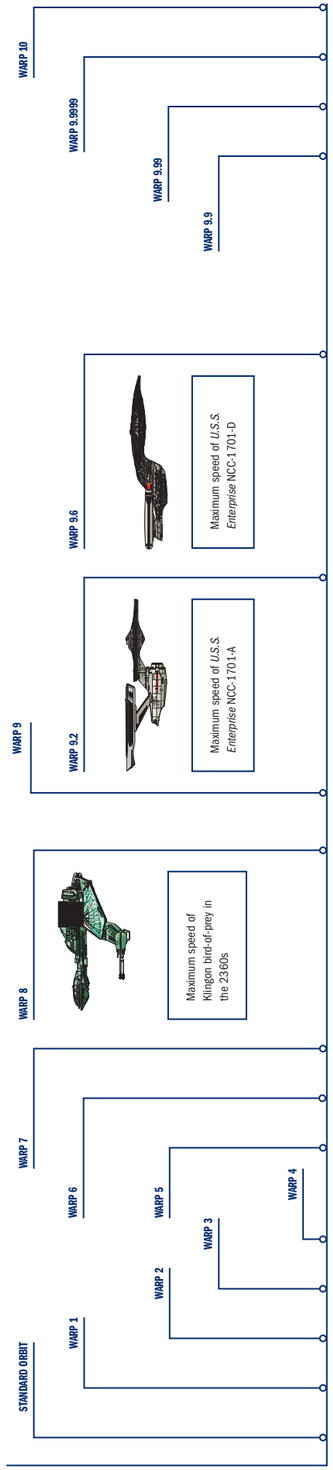
WARP 9.6
(MAXIMUM SPEED OF NCC-1701-D)

Across solar system	20 seconds
To nearest star	22 hours
Across galactic sector	5 years
To Andromeda galaxy	1048 years

WARP 9.9999
(THEORETICAL SPEED, NOT YET ATTAINABLE BY FEDERATION VESSELS)

Across solar system	0.2 seconds
To nearest star	13 minutes
Across galactic sector	52 minutes
Across Federation	18 days
To Andromeda galaxy	10 years

PROPULSION SYSTEMS



SPEED	KILOMETERS PER HOUR	X LIGHTSPEED	EARTH TO MOON 400,000 KILOMETERS	ACROSS SOLAR SYSTEM 12 BILLION KILOMETERS	ACROSS ONE SECTOR 20 LIGHT YEARS	TO NEARBY STAR 5 LIGHT YEARS	ACROSS FEDERATION 10,000 LIGHT YEARS	TO NEARBY GALAXY 2,000,000 LIGHT YEARS
STANDARD ORBIT	9600	< 0.00001	42 hours	142 years	2 million years	558,335 years	1 billion years	223 billion years
FULL IMPULSE*	270 million	0.25	5.38 seconds	44 hours	80 years	20 years	40,000 years	8,000,000 years
WARP FACTOR 1	1 billion	1	1.34 seconds	11 hours	20 years	5 years	10,000 years	2,000,000 years
WARP FACTOR 2	11 billion	10	0.13 seconds	1 hour	2 years	6 months	1,000 years	200,000 years
WARP FACTOR 3	42 billion	39	0.03 seconds	17 minutes	6 months	46 days	257 years	51,282 years
WARP FACTOR 4	109 billion	102	0.01 seconds	7 minutes	2 months	17 days	98 years	19,608 years
WARP FACTOR 5	230 billion	214	0.006291 seconds	3 minutes	1 month	8 days	47 years	9,346 years
WARP FACTOR 6	421 billion	392	0.003426 seconds	2 minutes	18 days	5 days	26 years	5,102 years
WARP FACTOR 7	703 billion	656	0.002050 seconds	1 minute	11 days	3 days	15 years	3,049 years
WARP FACTOR 8	1.10 trillion	1,024	0.001313 seconds	39 seconds	7 days	2 days	10 years	1,953 years
WARP FACTOR 9	1.62 trillion	1,516	0.000887 seconds	26 seconds	5 days	28 hours	7 years	1,319 years
WARP FACTOR 9.2	1.77 trillion	1,649	0.000816 seconds	24 seconds	4 days	26 hours	6 years	1,213 years
WARP FACTOR 9.6	2.05 trillion	1,909	0.000704 seconds	20 seconds	4 days	22 hours	5 years	1,048 years
WARP FACTOR 9.9	3.27 trillion	3,053	0.000440 seconds	13 seconds	2 days	14 hours	3 years	655 years
WARP FACTOR 9.99	8.48 trillion	7,912	0.000170 seconds	5 seconds	22 hours	5 hours	1 year	235 years
WARP FACTOR 9.9999	214 trillion	199,516	0.000007 seconds	0.2 seconds	52 minutes	13 minutes	18 days	10 years
WARP FACTOR 10	Infinite	Infinite	0	0	0	0	0	0

In theory, a starship at warp 10 would occupy all points in the universe simultaneously, though this speed barrier has been broken once, in extraordinary circumstances.

*Full impulse is equal to 1/4 lightspeed.

WARP PROPULSION SYSTEM

The *Enterprise*-D's warp propulsion system relied on the efficient operation of the matter/antimatter reaction assembly, and the resulting reaction to create the energetic plasma that powered the warp nacelles.

The warp propulsion system of the *Enterprise*-D went through several stages of development during the planning phase of the *Galaxy*-class. The final propulsion specifications were ultimately locked at providing a normal cruising speed of warp 6 until fuel exhaustion, a maximum cruising speed of warp 9.2, and the ability to maintain a top speed of warp 9.6 for 12 hours.

WARP REACTOR

At the heart of the *Enterprise*'s warp propulsion system was the matter/antimatter reaction assembly (M/ARA), often referred to as the warp reactor, warp engine core, or main engine core. This crucial system was broken down into four subsystems: reactant injectors, magnetic constriction injectors, matter/antimatter reaction chamber, and power transfer conduits.

The matter reactant injector (MRI) was located on deck 30 at the top of the assembly, with the antimatter injector located on deck 42 at the opposite end of the M/ARA. The MRI was a conical structure measuring 5.2x6.3m and contained six redundant cross-fed sets of injectors. The MRI received supercold deuterium directly from the primary deuterium tank, which was pre-burned in a gas-fusion process before being driven into the upper magnetic constriction section. Conversely, the antimatter injector outwardly looked similar to the MRI, but due to the hazards of injecting antihydrogen, its operation was much different. Internally it comprised three pulsed antimatter gasflow separators to break down the injection of antihydrogen into manageable packets, which were then boosted from the separators via injector nozzles into the magnetic constrictor segments.

The *Enterprise*-D had a normal cruising speed of warp 6. The *Galaxy*-class ship could accelerate to warp 9.6 according to mission requirements.

The upper and lower magnetic constriction segments (MCS) provided crucial structural support for the matter/antimatter core and maintained a pressured environment for correct operation of the core, while aligning the incoming streams of matter and antimatter ahead of combination within the matter/antimatter reaction chamber.

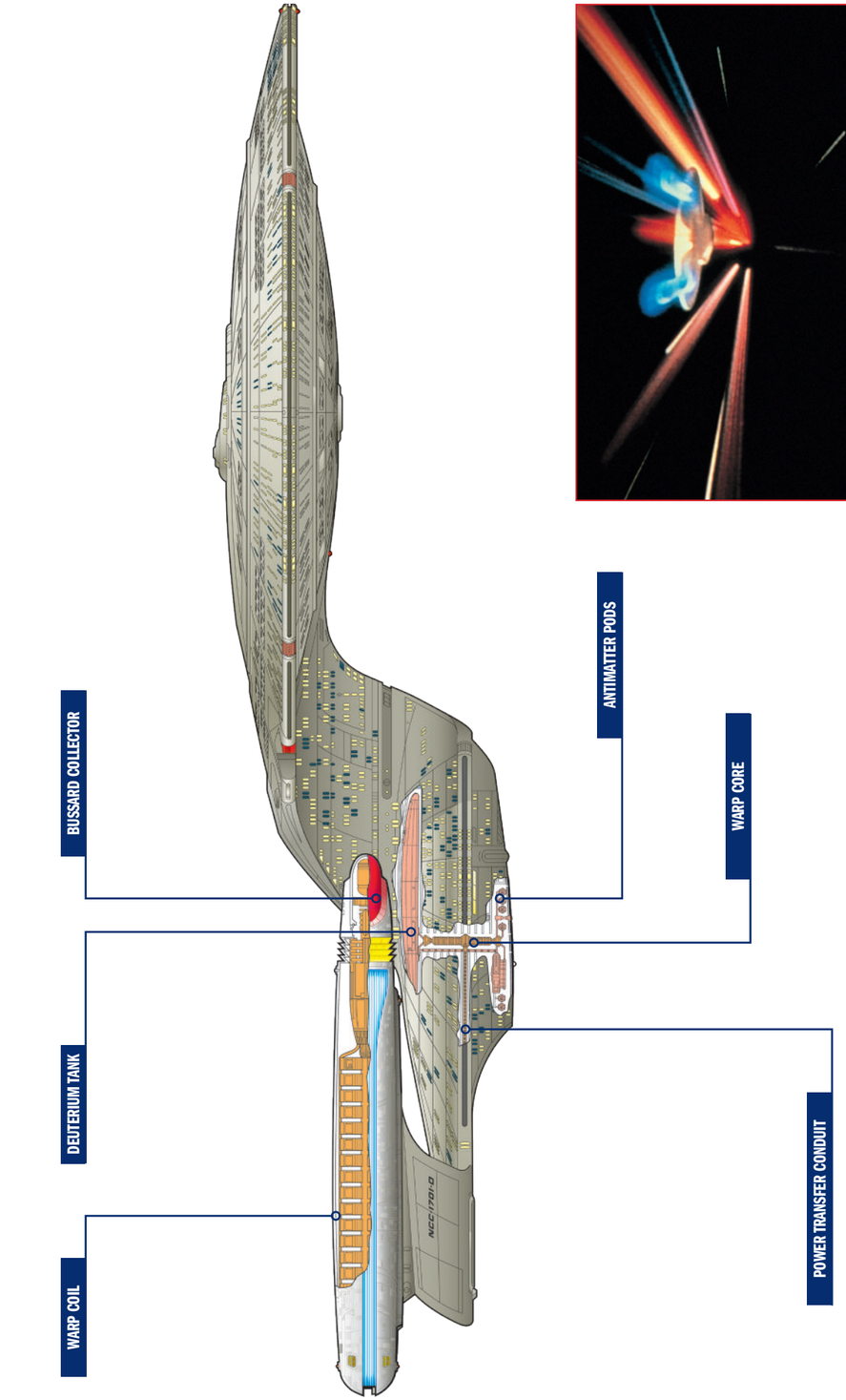
The upper MCS measured 18m in length, the lower 12m, while both had a diameter of 2.5m and comprised eight sets of tension frame members, 12 sets of magnetic constrictor coils constructed from high-density, forced-matrix cobalt-lanthanide-boronite, along with power-feed and control hardware. Released from their nozzles, the respective matter and antimatter streams were compressed in the Y axis for correct alignment within the matter/antimatter reaction chamber.

REACTION CHAMBER

The matter/antimatter reaction chamber was 2.3m high and 2.5m in diameter, comprising two bell-shaped cavities where the matter/antimatter reaction was contained. It was constructed from 12 layers of hafnium 6 excelion-infused carbonitrium. Its three outer layers were reinforced with acrossenite arkenide for extra protection. What was identified as the equatorial band of the reaction chamber housed the dilithium crystal articulation frame (DCAF). Crystal replacement was achieved via an armored hatch. The chamber contained around 1200cm^3 of dilithium crystals. Dilithium crystals were essential in matter/antimatter reactions, being the only known substance to remain non-reactive when exposed to a high-frequency electromagnetic field. The antihydrogen was able to pass straight through the 'porous' structure of the crystals, effectively without touching it.

The resulting energetic plasma created by the matter/antimatter reaction was then split into two streams and channelled directly into the power transfer conduits. These conduits were constructed from six alternating layers of machined tritanium and transparent aluminum borosilicate. Like the magnetic constrictor elements, the conduits contained the plasma at the very center of the channel as it was forced towards the terminal point of the entire propulsion system – the two warp nacelles.

WARP DRIVE SYSTEMS



The *U.S.S. Enterprise* NCC-1701-D once made an intergalactic journey in minutes by traveling at a speed of approximately warp 9.9999999996.

WARP NACELLE

The small, cylindrical plasma injector introduced warp plasma into the nacelle, where it was converted into the energy that formed the warp drive bubble by the warp field coils.

The *U.S.S. Enterprise* NCC-1701-D's warp nacelles were the most important part of the ship's propulsion system. The nacelles were even given their own series of internal ship coordinates to help the engineering staff pinpoint any potential problems, and their operation and maintenance was overseen from the warp nacelle control room.

POWERFUL AND DANGEROUS

Like the rest of the ship, the nacelles were constructed from duranium, and overlaid with gamma-welded tritanium that was 2.5 meters thick. The pressures exerted on the nacelles were extreme, and this was countered by three levels of cobalt cortenide that lined the structure's inner hulls. The power contained within the nacelles was so potent that they could be extremely dangerous if they malfunctioned, so safety features were incorporated that allowed them to be jettisoned in an emergency; explosive structural latches could be fired, driving the nacelles away from the ship at a rate of 30 meters per second.

The *Enterprise* had two warp nacelles and maneuvered in space by creating slight imbalances in the warp field produced by each nacelle; in simple terms, this was the same principle upon which a kayak is maneuvered, by paddling more quickly on one side than the other.

The symmetrical warp nacelles helped to create this imbalance; if one or the other was damaged, the operation of a single warp nacelle could literally tear the ship apart. Both nacelles were located at the rear of the ship, connected to the engineering hull by long, sweeping support pylons that kept the potentially dangerous warp fields away from the inhabited areas of the ship.

Inside the nacelles, the warp plasma generated by the warp core was turned into the energy that propelled the ship. In emergencies, when plasma was unable to reach the warp nacelles, the Bussard ramscoop assembly at the front of each nacelle was able to draw in low-grade galactic matter and use this as an energy source instead.

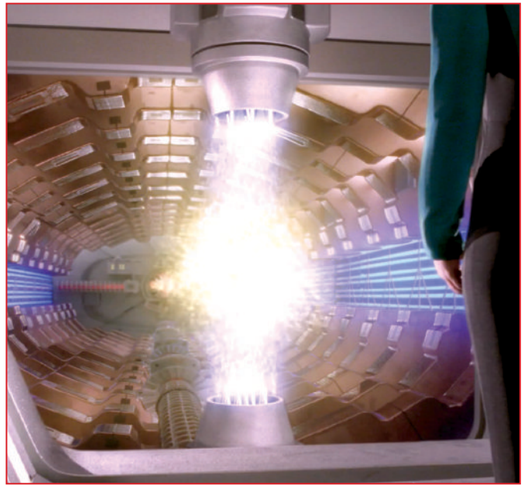
There were two major components to the warp nacelles: the plasma injection system, and the warp field coils. A plasma injection system was located at the terminus of each of the power transfer conduits that carried plasma from engineering, where it was generated, to the warp field coils, where it was turned into energy. There was one injector for each of the warp field coils.

PLASMA INJECTION SYSTEM

Each pair was fired in variable sequences, allowing for the permutations to be specified for different types of flight function. The open-close cycle could vary between 25 and 50 nanoseconds; low warp factors required the injectors to be fired at low frequencies, remaining open for short periods, higher warp speeds required higher frequencies and longer openings. The longest safe cycle for which an injector could be open was 53 nanoseconds.

The warp field coils generated the warp field that propelled the *Enterprise* by forming an intense, multi-layered effect that surrounded the vessel. The ship was propelled beyond the speed of light by the manipulation of the field's shape. Each nacelle had 18 warp field coils which, combined, accounted for almost a quarter of the entire ship's weight.

The warp coils' outer layer was constructed from verterium cortenide and, when energized, shifted the energy frequencies carried by the plasma into the subspace domain. The field was generated from inside the coils, and radiated outward. As the warp field layers built, they pressed against one another, reducing the apparent mass of the starship, and powered it to warp velocities.



The inside of the warp nacelles was made up of a series of verterium cortenide coils that warped space when they were superheated by plasma. The plasma was injected into the nacelle after it was generated by the warp core.

GENERATING WARP SPEEDS

A forcefield replaced the door to the plasma tube when it was open, ensuring that the crew were not placed in any danger during their duties.

CONTROL ROOM ACCESS
The maintenance staff for the warp nacelle entered the control room via a Jefferies tube.

MAIN COMPONENTS
Each of the *U.S.S. Enterprise* NCC-1701-D's warp nacelles consisted of a number of major systems, including the warp field coils, a plasma injector, and an emergency separation mechanism.

There were 18 warp field coils, arranged in pairs, along the interior of each of the warp nacelles.

Emergency maintenance work and essential diagnostics were coordinated directly from the warp nacelle control room.

NACELLE CONTROL ROOM

The crew of the *U.S.S. Enterprise* monitored the flow of the plasma that provided the energy for travel at warp speeds from the warp nacelle control room.

The warp nacelle control room, located on deck 25, was one of the smallest control sections of a *Galaxy*-class starship, yet it was here that one could actually see the source behind the ship's subspace field: the plasma streams.

On the *U.S.S. Enterprise*-D, the warp nacelle control rooms were accessed from Jefferies tube junctions on deck 25. As on all *Galaxy*-class starships, the nacelle control rooms were located at the rear of each warp engine nacelle.

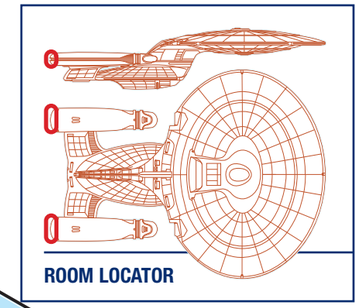
WARP SPEED MAINTENANCE

These compact, multifunction control rooms provided maintenance and monitoring facilities; they allowed ship's personnel to monitor the flow of the plasma streams through the warp power transfer conduits to the engine nacelles and the subspace field generation coils.

The usual complement for each nacelle control room was two crew members, both of whom were assigned to the engineering division.

SLOPED SIDES

The sloping sides of the control room reflected the shape of the warp nacelles in which they were located.



The warp coils were usually hidden away behind closed doors, but these could be opened to allow the crew to look into the very core of the warp nacelles.

The small panels at the front of these consoles, added to the room in 2368, flashed red during alerts.

The galleried catwalk provided a view over the entire control room and, when the doors were open, into the plasma stream itself.

The work consoles located along the wall of the upper level were seated. The room's support struts helped to isolate each console, providing the duty engineer with a degree of privacy.

Most functions were carried out at the primary control panel, including the command to open the isolation door to the injector room.

The upper level was accessed by a stepladder, and a thin handrail provided a measure of safety for the crew that worked here. Red safety markers were painted halfway up the metal pillars that supported the galleried walkway.

Lieutenant Daniel Kwan carried out a refit of the starboard warp nacelle over a double shift, but in 2370 he committed suicide by jumping into a plasma stream after experiencing hallucinations.

Crew accessed the warp nacelle control room from the lower level.

WARP CORE EJECTION

Serious damage to the *Enterprise*-D's warp propulsion system could lead to a catastrophic warp core breach. In those situations, a complete ejection of the warp core could be initiated as a last resort.

Central to the *U.S.S. Enterprise* NCC-1701-D's propulsion systems, the warp core was a safe and efficient means of powering the ship to warp speed. However, as with many starship systems, anti-matter propulsion possessed inherent hazards, and damage to the warp propulsion system, including a warp core breach, was a possibility in a variety of operational scenarios.

In extreme cases of warp core breach, the entire core, along with the anti-matter storage pod assemblies, could be ejected from the ship. This was always a last resort if the damage could not be contained and repaired by engineering personnel. If warp core ejection was deemed necessary, exterior plates on the ventral hull were jettisoned, allowing the ejection and rapid egress of both the warp core and anti-matter storage pod assemblies.

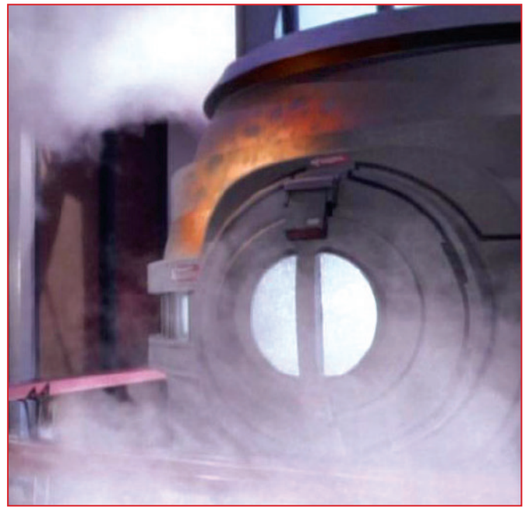
MANUAL EJECTION

If damage to the warp core indicated that a breach to the safety forcefield was likely, a manual ejection of the warp core could be initiated. This was usually undertaken by the chief engineer. Warp core ejection was the ultimate safety measure to safeguard the ship and its crew. If damage to the warp propulsion system could not be managed, certain mission parameters would trigger an automatic ejection of the warp core and anti-matter storage pod assemblies, initiated by the *Enterprise*'s main computer. In the event that impulse power was still available, the ship would move to a safe distance before detonation. In combat situations, a self-destruct command could also be initiated to detonate the core.

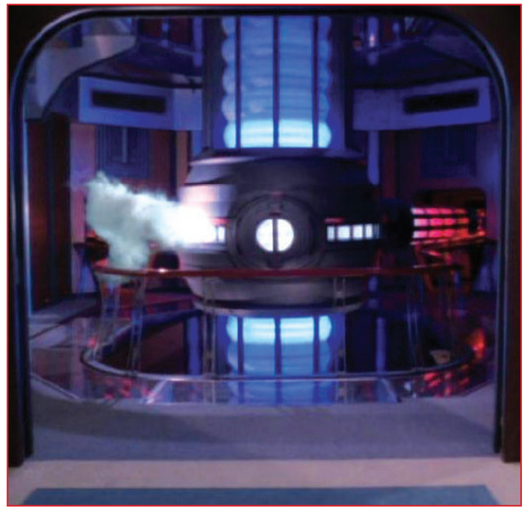
TEMPORAL LOOP

In 2368, while trapped in a temporal loop near the Typhon Expanse, a repeated collision with the *U.S.S. Bozeman* necessitated the ejection of the *Enterprise*'s warp core. On that occasion the ejection systems were offline and warp core ejection was not achieved. The temporal loop was ultimately broken and the need to eject the warp core avoided.

In certain situations, an ejection of the warp core could be initiated manually to achieve a specific outcome, such as the sealing of subspace tear. Again, this action was considered to be a last resort if all other options had been exhausted.

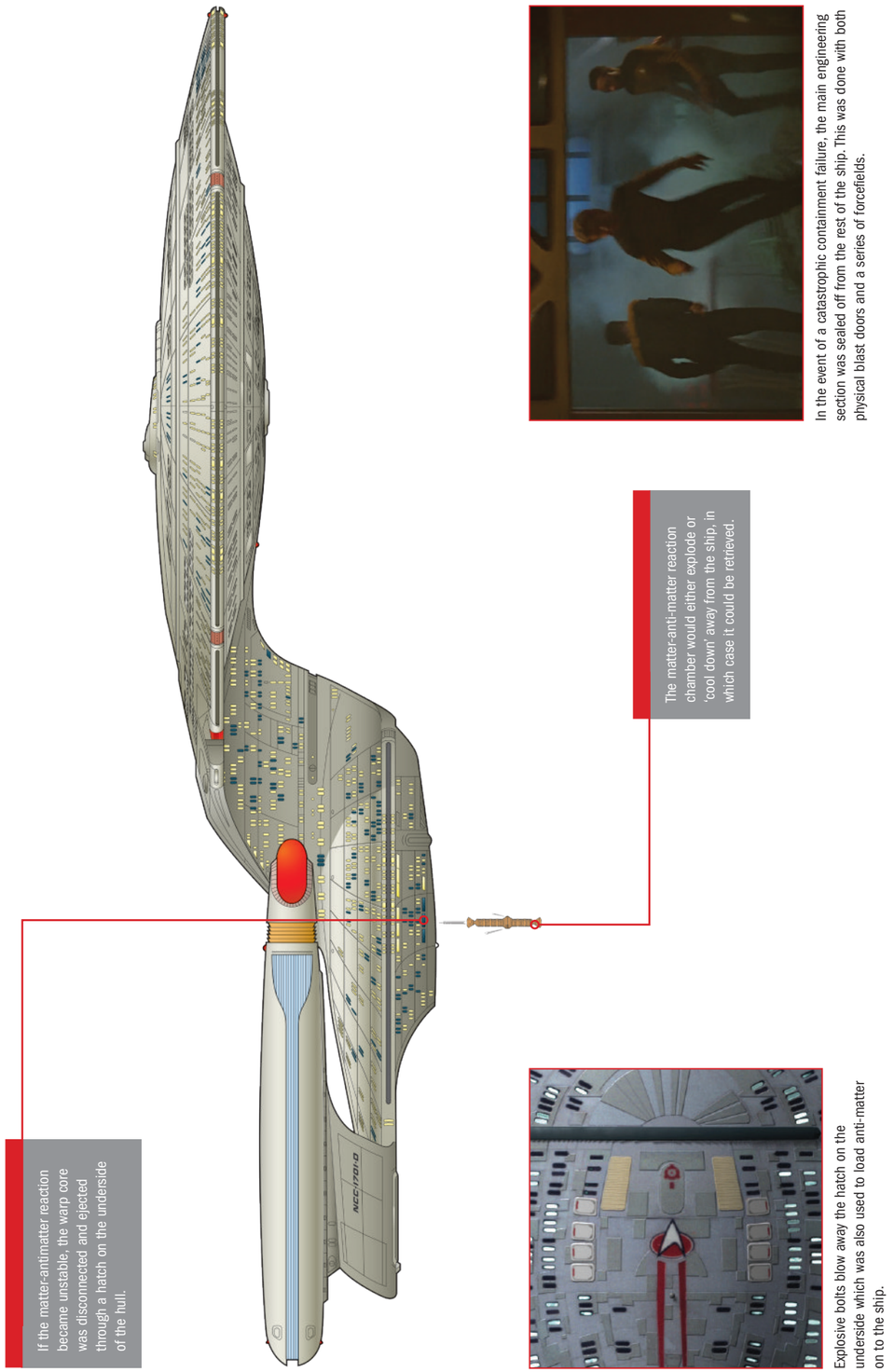


In the event of a warp core breach, power and fuel were valved off upstream of affected systems. The crew would undertake any repairs possible.



If the core reached flashpoint, the situation became critical, and could escalate to a warp core ejection.

EJECTION PROCESS



If the matter-antimatter reaction became unstable, the warp core was disconnected and ejected through a hatch on the underside of the hull.

The matter-anti-matter reaction chamber would either explode or 'cool down' away from the ship, in which case it could be retrieved.

In the event of a catastrophic containment failure, the main engineering section was sealed off from the rest of the ship. This was done with both physical blast doors and a series of forcefields.

Explosive bolts blow away the hatch on the underside which was also used to load anti-matter on to the ship.

IMPULSE ENGINES

The *U.S.S. Enterprise*'s impulse engines were a valuable source of power and were used for near-planet maneuvers. They were fueled by deuterium, fed from the primary deuterium tank.

Impulse engines were used in sublight-speed flight, and to provide a secondary power supply for a starship's onboard systems at all times.

Each of the *U.S.S. Enterprise*'s impulse engines consisted of four components: the impulse reaction chamber, the accelerator/generator, the driver coil assembly, and the vectored exhaust director.

A single impulse engine on the *Enterprise* used three spherical impulse reaction chambers strung together like beads, and an additional four backup chambers.

The impulse reaction chamber was built to withstand the proton-antiproton fusion reaction, fueled by deuterium, that generated high-energy plasma. Cryogenic deuterium was stored in primary and auxiliary fuel tanks in both the saucer and engineering sections of the ship.

Once the reaction (or explosion) had occurred in the reaction chambers, the destination for the high-energy plasma depended on whether the energy generated was needed to move the ship or power the systems.

PROPULSIVE FORCE

If the goal was to generate propulsion, then the plasma was sent to the accelerator/generator, which further excited the high-energy plasma. Next, the plasma was pushed through the space-time driver coils, which reduced the *Enterprise*'s internal mass, making it possible for space-time to slide past the ship a little more easily.

Finally, the reaction by-products vented through the vectored exhaust directors to produce propulsion – along the same principles used to propel the old chemically fueled rocket ships.

The *Enterprise*'s impulse engines were located on the back of the ship. They used Newtonian principles to generate thrust, which pushed the ship forward.

If ship systems required power rather than thrust, then the high-energy plasma coming through the impulse reaction chamber was sent through an inactive accelerator/generator and diverted to the electro-plasma system, which disbursed the energy.

It was also possible to use impulse energy simultaneously for propulsion and internal power by keeping the accelerator/generator active and bleeding off the excited, high-energy plasma for distribution via the magnetohydrodynamic (MHD) system.

HIGH MAINTENANCE

The impulse system was based on a design that had altered little since 2169, and only used one millionth of the energy required by warp drives. Impulse engines placed greater demands on the crew than the warp engines; they required 1.6 hours' maintenance to every one hour spent on the warp system. The reaction chamber had to be replaced every 10,000 hours and the accelerator/generator and drive coil assemblies were swapped out every 6,250 hours. Most of these components had to be changed in spacedock.

On a *Galaxy*-class ship the four main impulse engines located on deck 23 shared, along with warp power systems, the responsibility of powering the ship's computers and internal systems. If warp power could not be spared or went offline, main impulse power could shoulder the entire job.

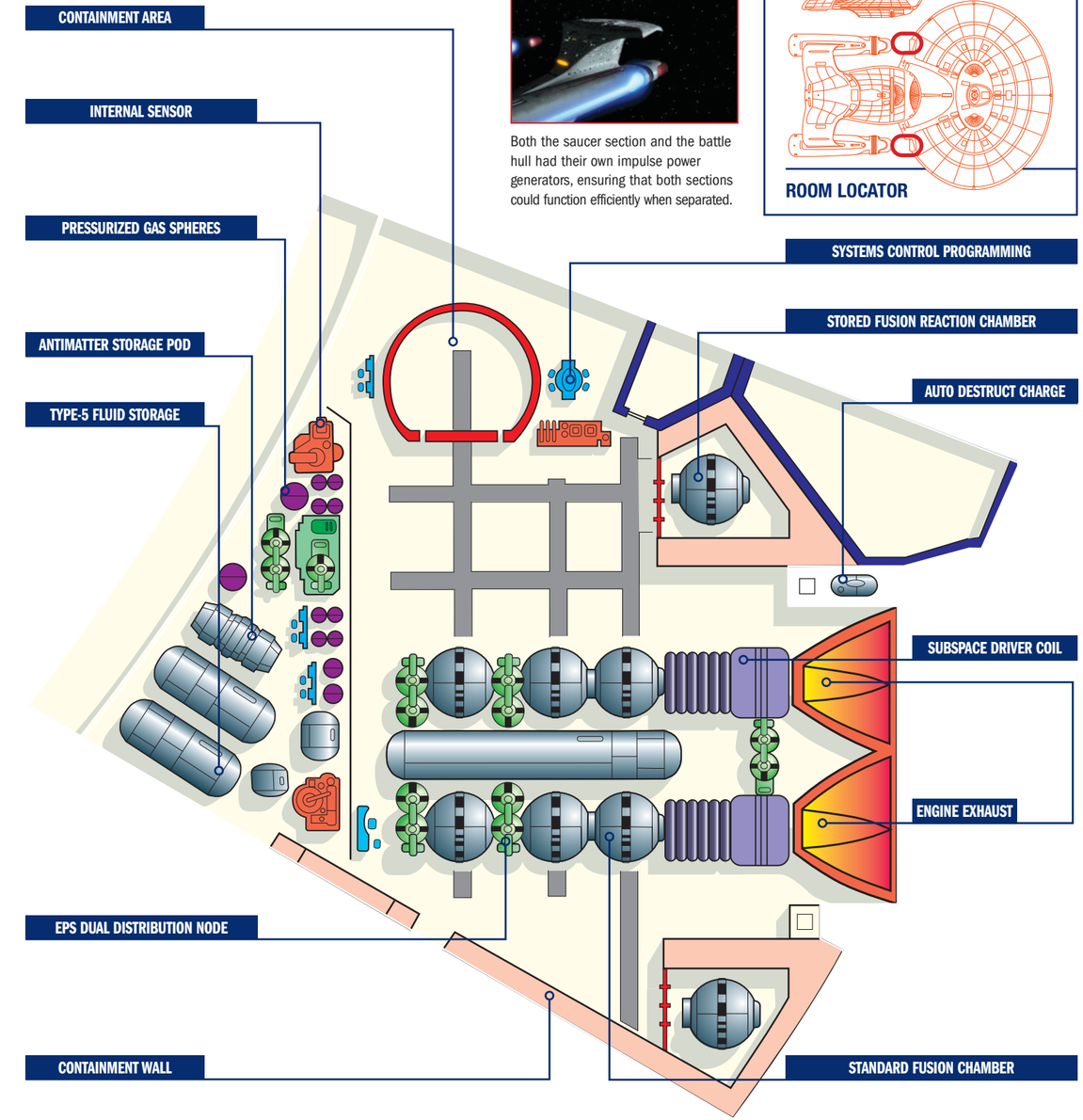
The load-sharing decisions and switch-offs were managed by the computerized impulse power system command coordinator. This coordinator was also linked with the warp power coordinator and the reaction control system. The latter ensured that the right kind of power was delivered where needed.

ENGINE LOCATION

Two sets of two impulse engines were positioned on deck 9, in the saucer section's rear port and starboard areas. They were installed to power both internal and propulsion systems on the saucer section if separation procedures took place.

Using both main and saucer impulse engines in tandem, speeds of 0.75c (three-quarters light-speed) could be reached using impulse power alone. However, due to relativity problems, impulse speeds were generally kept to 0.25c.

ENGINE ASSEMBLY



Both the saucer section and the battle hull had their own impulse power generators, ensuring that both sections could function efficiently when separated.

TIME DISTORTIONS

Traveling at high sublight speeds could cause convoluted relativity and synchronicity problems. The faster one travels, the slower time moves. This means that at speeds approaching light speed, an hour will take longer to pass on the ship than on Earth. Because the warp engines overcome many of the problems associated with Newtonian physics, this problem does not exist at warp speed.

In order to minimize this effect, the ship rarely traveled at more than a quarter impulse and the clocks on the *Enterprise* continually updated themselves to remain in sync with official Starfleet time. Traveling at accelerated speeds, or for extended periods of speed on impulse power, played havoc with such systems.

RCS THRUSTERS

Reaction control system (RCS) thrusters were placed at points across the *Enterprise*'s hull, providing low-velocity maneuvering, allowing for pin-point course corrections and attitude control.

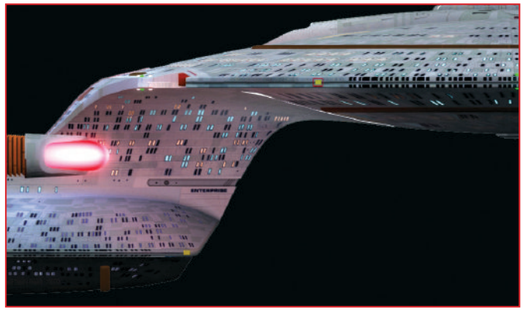
In sub-warp, low velocity situations, the *U.S.S. Enterprise* NCC-1701-D was able to make minute course corrections using the reaction control system (RCS) thrusters situated across both the saucer and main drive sections.

The RCS thrusters located at intervals on the outer edge of the saucer section comprised four main and four auxiliary thrusters, while thrusters situated on the main drive section were sited on either side of the main deflector dish.

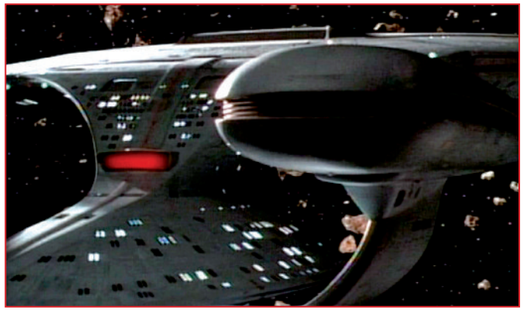
The main RCS quads comprised upper and lower vectored thrust nozzles and were powered by an injection of deuterium into each engine's gas-fusion reaction chamber. The local supply tanks of deuterium were replenished directly from the main deuterium tanks located in the drive section. Auxiliary thrusters comprised a single vectored thrust nozzle and micro-fusion chamber into which the deuterium fuel was injected.

A single main RCS thruster could generate a total of 5.5 million Newtons when both thrust nozzles were active, while each auxiliary thruster generated 450,000 Newtons.

The precision maneuverability of the starship's RCS thrusters was displayed in 2366 after the *Enterprise* had been disabled by a Menthar booby trap in the Orelious IV asteroid field. Captain Picard himself successfully navigated the *Enterprise* out of the asteroid field using only port and starboard thrusters to make minute course corrections to avoid obstacles.



The secondary hull's starboard-side forward RCS thrusters can be identified here as the small yellow-colored section next to the navigational deflector dish.



Four single-nozzle RCS thrusters and eight auxiliary engines are located in the aft part of each warp nacelle, ensuring a full range of motion at sub-impulse speeds.

RCS THRUSTERS SPECIFICATIONS (2369)

	PRIMARY HULL RCS	SECONDARY HULL RCS	NACELLE RCS
PRIMARY FUSION CHAMBERS:	3.1m diameter by 1.2m wide (cylindrical)	3.1m diameter by 1.2m wide (cylindrical)	1.85m diameter by 0.71m wide (cylindrical)
AUXILIARY CHAMBERS:	0.85m diameter (sphere)	0.85m diameter (sphere)	0.5m diameter (sphere)
DEUTERIUM TANKS:	2.1m diameter by 6.4m length (2)	2.1m diameter by 6.4m length (2)	1.2m diameter by 3.7m length (1)
MAXIMUM THRUST:	5.5 million Newtons (1,236,449 lbs.)	5.5 million Newtons (1,236,449 lbs.)	2.5 million Newtons (562,022 lbs.)
AUXILIARY THRUST:	760,000 Newtons (170,854 lbs.)	760,000 Newtons (170,854 lbs.)	340,000 Newtons (76,435 lbs.)
NUMBER OF NOZZLES:	4	2	1

SECONDARY HULL RCS THRUSTER

Fuel distribution nodes are the first stage of the fuel transfer process. They are positioned on the fuel lines leading from the deuterium supply tank to the pressure regulator.

Each RCS engine is supplied with fuel by one of two immediate-use supply tanks positioned directly behind the engine assembly. These tanks are tied to replenish lines that draw fuel from the primary deuterium tank (PDT) located in the ship's secondary hull.

The vectored nozzles direct the exhaust products at the proper angle for the desired force on the starship's spaceframe. For most operations these are set at 65 percent of their full power (3.57 million newtons).

Tractor beam emitters located between the upper and lower thrust nozzles are used for docking maneuvers at starbases where mooring beams are not available.

Krigerium plate valves located within the reaction control thruster quads are the final structures that regulate the relative proportion of exhaust products flowing through both the single and multiple nozzle groups.

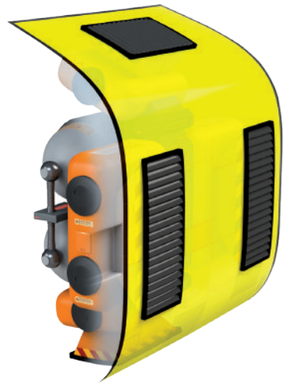
Pressure regulators, in concert with three redundant sets of magnetic-peristaltic pumps and distribution nodes, are responsible for managing the transfer of fuel to the RCS engines.

Magnetohydrodynamic (MHD) energy field traps serve the dual purpose of recovering and returning undifferentiated plasma to the power net, as well as performing partial throttle operations to control the exhaust products as they enter the thrust nozzle.

PRIMARY HULL RCS THRUSTER

UPGRADE MOVEMENT

RCS engines in the saucer section used four vectored-thrust exhaust nozzles. The upgrade program initiated in 2369 required each engine to be moved inboard from the hull exterior to provide room for a new armored outer shell.



EPS NETWORK

The *U.S.S. Enterprise* NCC-1701-D required vast amounts of energy. The distribution of this power was handled by the Electro Plasma System, also known as EPS power relays.

The Electro Plasma System, more commonly known as the EPS, was the primary power distribution network used aboard the *U.S.S. Enterprise* NCC-1701-D. This network of conduits and interfaces handled the vast levels of energy required for the smooth operation of the Federation flagship, ensuring that every department was at peak efficiency at all times.

PRIMARY SYSTEM

The EPS, trunking, and relay systems formed the primary power supply for all devices and systems on board the ship; they were so important that this was one of the first networks designed and integrated into the development of the *Enterprise*, a common approach to starship construction.

The dawn of the *Galaxy*-class development project in the early 2340s saw the first development of an EPS power relay system that largely superseded earlier Internal Power Grid energy distribution systems. The EPS system had the ability to act as a step-down transformer, reducing the amount of energy for devices requiring a lower input.

The main feed for the EPS power distribution network on the *U.S.S. Enterprise* came from three potential areas: the warp drive system, impulse drive system, and, in times of emergency, the auxiliary fusion generators. In the case of a vessel, these would divert a small amount of the drive plasma to generate electrical power for the use of relevantly configured equipment and systems. The conduits themselves contained a network of microwave power transmission waveguides. The energy capacity was directly related to the source of the EPS taps and the devices they were feeding – hence major power supplies were sourced from the warp propulsion and main impulse engines, while equipment requiring a more specialized kind of energy was supplied through a secondary power distribution system.

LETHAL ENVIRONMENT

EPS taps were usually located on the power transfer conduits, and a measure of the amount of power available to the EPS system could be given by the fact that it was used to initiate the matter/antimatter reaction from a warp core 'cold' start. Regardless of the source, all EPS power taps directed their microwave energy to a main EPS power distribution node. The dimensions of the EPS trunking and conduits varied in size depending on the current being handled, but conditions within them were dangerous.

EPS conduits were arranged in convenient locations within corridor hatches around the *Enterprise* and within the internal network of Jefferies tubes, but extreme caution had to be maintained by engineering crews working on them. Former *U.S.S. Enterprise* NCC-1701 Chief Engineer Montgomery Scott almost received a serious injury from an EPS power tap when he came aboard the *Enterprise*-D in 2369. His unfamiliarity with the system led him to open a conduit that he mistakenly expected to house duotronic enhancers.

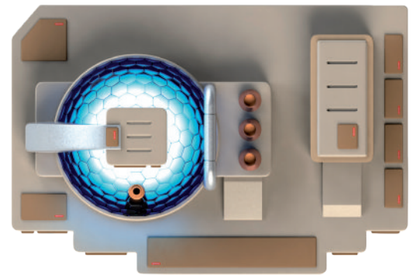
The EPS distribution network was hard-wired into every section of the ship that required power, and it fed a number of vital systems. This flow of power was regulated by the main computer, and main engineering had ultimate control over the entire EPS network. Consequently, in cases of emergency, entire areas of usage could be temporarily disconnected to increase the energy supply to other systems. The primary systems on the *Enterprise*-D included the ship's computer cores and optical data networks (ODN), atmospheric and environmental control systems, and water reclamation and distribution. A disruption to the supply of any of these could prove to be catastrophic for the personnel on board, although the ease of maintenance built into the system usually led to very quick repairs.

SECONDARY POWER

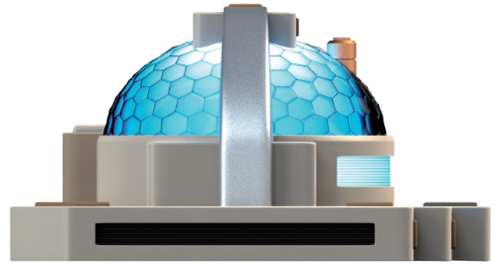
Secondary, but still highly important, power requirements aboard the *Enterprise* came from the gravity generation network, personnel and freight transporters, holodecks, replicators, and solid waste recycling systems, all of which helped make the ship – and all Starfleet vessels – comfortable and desirable working environments. Main Engineering and the warp drive assembly acted as the 'heart' of the *U.S.S. Enterprise*, and the computer system as its 'brain,' but the EPS power relay system was the network of electronic arteries that distributed vital energy to the entire ship. In simple terms, if the EPS system suffered a critical failure, the ship would not be long behind it.

The EPS system was integral to the *Enterprise*'s attempts to avert a disaster on Penthara IV in 2368 due to an atmospheric disturbance caused by an asteroid striking the planet's surface. After firing a blast from the main deflector dish directly into the planet's atmosphere, the phaser's were fired, boosted by a power discharge from every EPS tap aboard the ship. Without the facility to do so, the attempt to save Penthara IV would have failed.

TOP VIEW



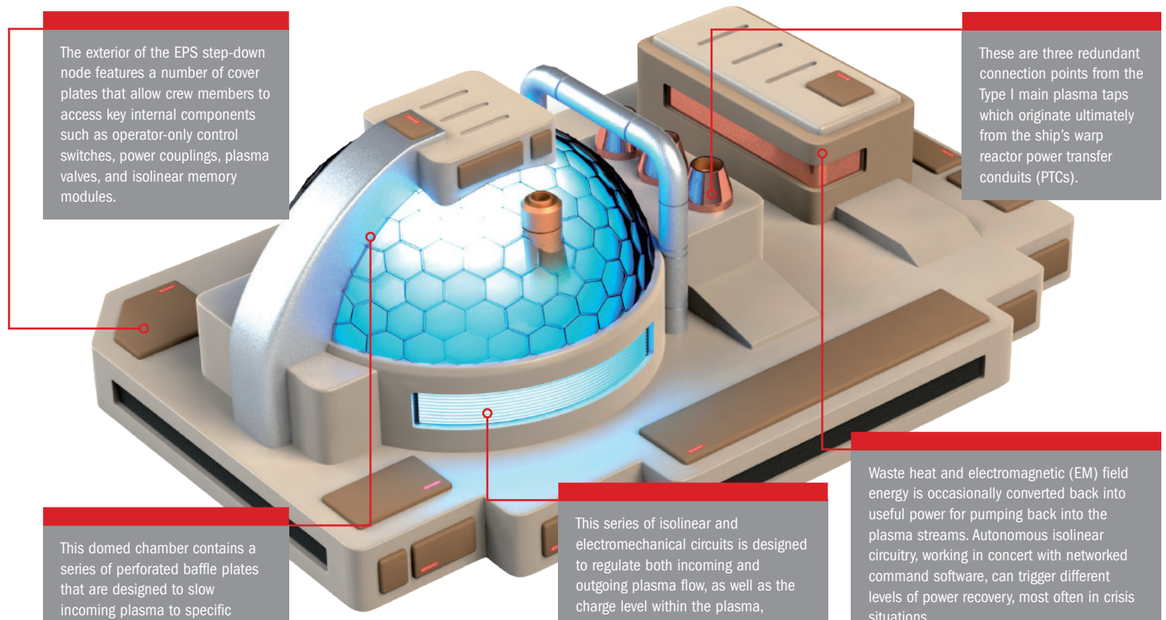
SIDE VIEW



FRONT VIEW

SIZE COMPARISON

The size of the EPS step-down nodes in use aboard the *U.S.S. Enterprise* NCC-1701-D is indicative of the immense power they regulate so that the starship can maintain its day-to-day operations. The node towers over the average-sized humanoid crew member serving aboard the *Enterprise*.



STRUCTURAL INTEGRITY

The structural integrity system reinforced the structure of a starship to prevent it from flying apart when traveling at warp and impulse speeds.

Operating at warp and impulse speeds placed the structure of a starship under enormous strain. Although the ship's spaceframe was built to the highest standards, this in itself was not sufficient to resist the stresses generated by the propulsion systems, so the structure of the ship was reinforced by a network of forcefields known as the structural integrity field (SIF).

The forcefields were distributed around the hull by a network of molybdenum-jacketed triphase waveguides. Conductive elements were built into all the major structural elements of the ship, and when the field is active it could increase their loadbearing capacity by as much as 125,000 percent. Other feeds increase the structural integrity of the rest of the hull.

POWERFUL GENERATORS

On a *Galaxy*-class starship the structural integrity field was produced by five generators. Two of these were located on deck 32 in the engineering hull; the remaining three were on deck 11 in the saucer section. There were also two backup generators, one in each hull, which provided 55 percent of the maximum rated power for as long as 12 hours.

Each of the generators was made up of twenty 12 megawatt graviton polarity generators which feed two 250 millicochrane subspace field-distortion amplifiers.

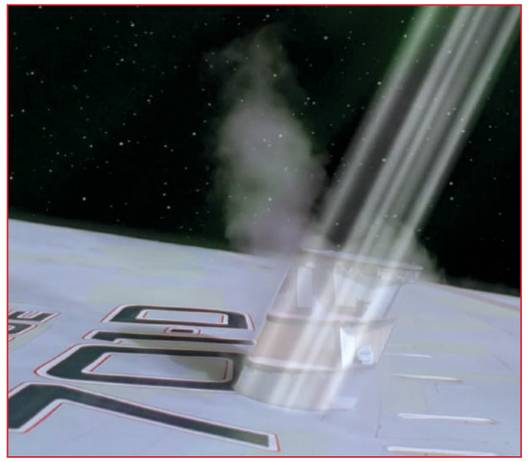
The generators produced an enormous amount of heat, but this was dissipated by a pair of continuous-duty liquid-helium loops, which can disperse 300,000 megajoules per hour.

The generators were designed to go 1,500 hours between routine services. They normally operate on a cycle of 36 hours on and 24 hours off. When the generators were down they were degaussed and undergo routine maintenance. At least one generator in each hull was active at all times. If the ship was required to perform unusually stressful activities, more generators can be brought online.

VITAL SYSTEM

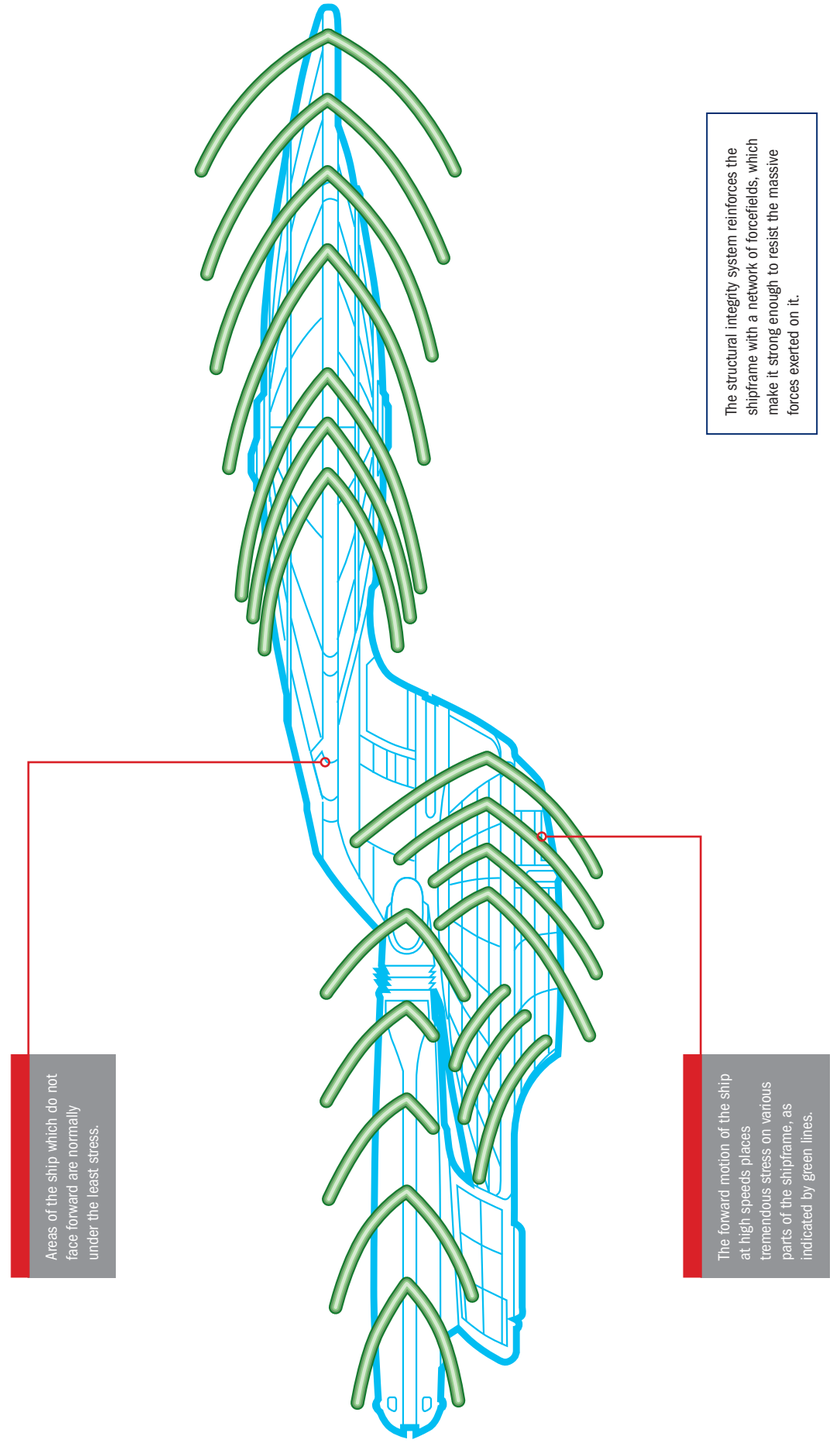
During red and yellow alerts, all the ship's generators were on standby, ready for immediate activation. This was important because the structural integrity field was an essential part of the ship's defenses and could compensate for most hull breaches. The damaged area was instantly sealed with a forcefield, equalizing the pressure of the entire vessel. In emergencies, additional power could be be diverted to the structural integrity field from other sources, such as the warp engines. If necessary, other systems could draw on the power of the structural integrity field generators, but this was rarely done, because if the structural integrity field failed it almost invariably lead to the disintegration of the ship.

Additional power may be diverted to the structural integrity field if the ship travels at very high velocity or enters a particularly dangerous area.



Once a ship's hull has been breached, a forcefield immediately seals the damaged area to compensate for weaknesses in the ship's structure.

GALAXY-CLASS STRUCTURAL INTEGRITY STRESS POINTS



The structural integrity system reinforces the shipframe with a network of forcefields, which make it strong enough to resist the massive forces exerted on it.

INERTIAL DAMPENING

On starships, even normal maneuvers involved massive acceleration. The forces involved would crush the crew if they were not protected by a series of forcefields.

The fact that starships moved at great speeds had serious implications for the safety of the crew. Without some form of protection, the human body would be incapable of resisting the kind of forces generated by the impulse drive and would be pulverized. Starships prevented this from happening by means of a series of variable-symmetry forcefields which absorbed inertial forces. This network of forcefields was known as the inertial damping system, and without it even the most basic interstellar journey would have been impossible.

SAFE ENVIRONMENT

The inertial dampers operated in all the habitable areas of the vessel. They generated a low-level forcefield which averaged 75 millicochranes. In order to maintain an inertia-free environment as the forces acting on the ship changed, the inertial damping system attempted to predict the amount of force that would be generated by starship maneuvers. The computers then adjusted the strength of the forcefields to absorb the appropriate amount of inertial force. The ship's computers could cope with most maneuvers programmed in by the flight controller because they knew exactly what was going to happen, and the crew were rarely aware of any acceleration. There was a timelag, but at impulse speeds this was only in the region of 300 milliseconds. The inertial dampers were less effective when the ship was hit by weapons fire, or the flight controller initiated extremely sudden or sharp maneuvers.

On a *Galaxy*-class starship, power for the inertial dampers was provided by six generators, two in the engineering hull on deck 33, and four in the primary hull on deck 11. A further six generators provided an emergency backup: three in each hull. Each of the generators had a cluster of twelve 500 kilowatt graviton polarity sources which fed a pair of 150 millicochrane subspace field-distortion amplifiers. Under normal circumstances, the primary generators operated in 48-hour shifts with a 12-hour rest period for maintenance and degaussing.

The graviton polarity sources were rated for 2,500 hours of operation before the superconductive elements required routine servicing.

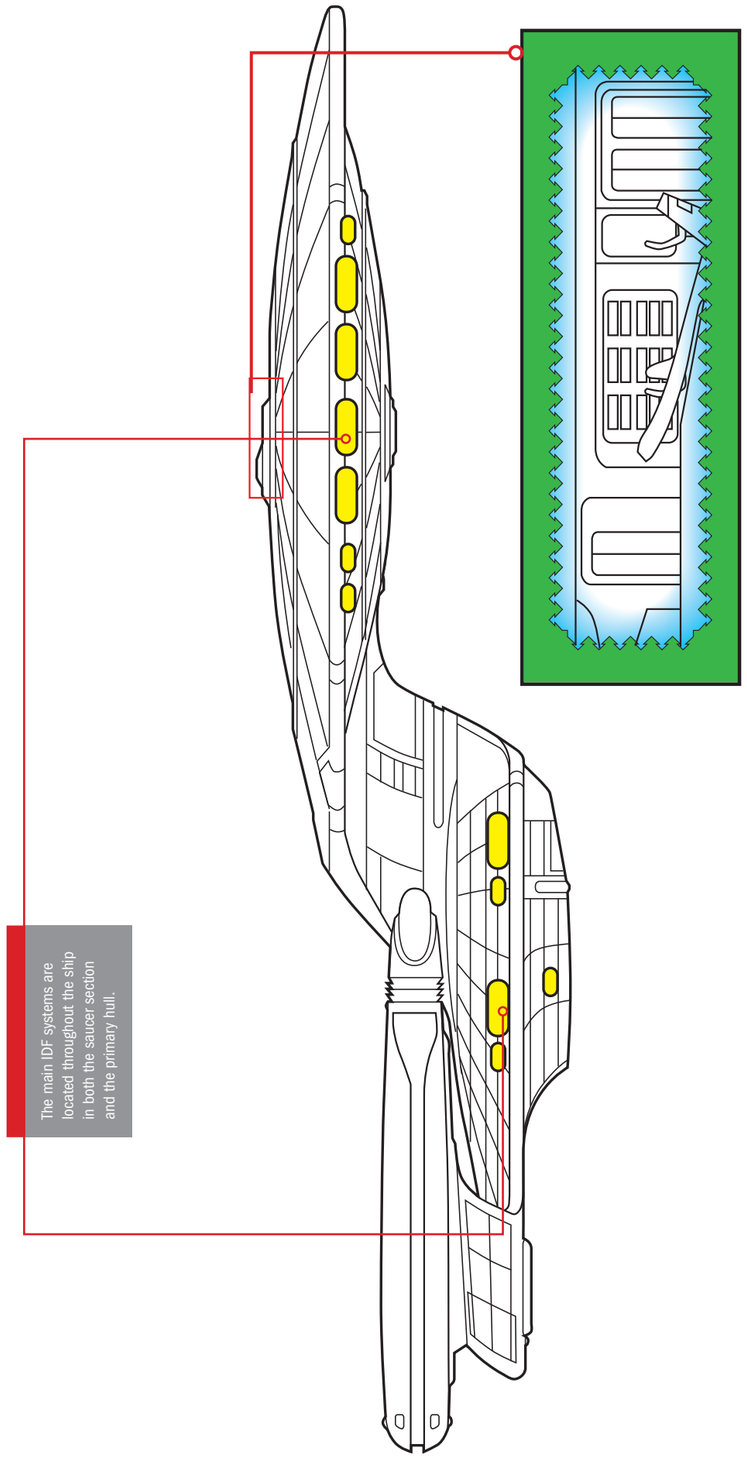
The inertial damping system used its own network of molybdenum-jacketed waveguides, which were parallel with those used by the structural integrity field. The inertial dampers were conducted by synthetic gravity plates.

POWER REQUIREMENTS

If necessary, the inertial dampers could function on one generator. However, in normal flight mode, at least two of the generators were active in each hull. If extreme maneuvers were required, the remaining generators could be brought on line. At red and yellow alert, all the inactive generators were brought to hot standby so that they were available for immediate use.

The inertial dampers could cope with most maneuvers, but the crew needed to brace themselves if the ship was attacked or in danger of crashing.

GALAXY-CLASS INERTIAL DAMPENING SYSTEM



A close-up of the bridge of a *Galaxy*-class starship shows the invisible gravitational field set up by the inertial damping field (IDF) system.

The main IDF systems are located throughout the ship in both the saucer section and the primary hull.

Inertial dampers are one of the most important systems on a starship. Without them, the crew would be pulverized.

MAIN BRIDGE

As on all *Galaxy*-class starships, the main bridge was at the very top of the *U.S.S. Enterprise* NCC-1701-D, and was easily accessible from most other areas of the ship.

The main bridge of the *U.S.S. Enterprise* NCC-1701-D stood proudly on the main body of the ship in the center of the upper surface of the saucer section. It was a roughly egg-shaped room, with a main viewscreen at its front and duty stations in the center and around the walls.

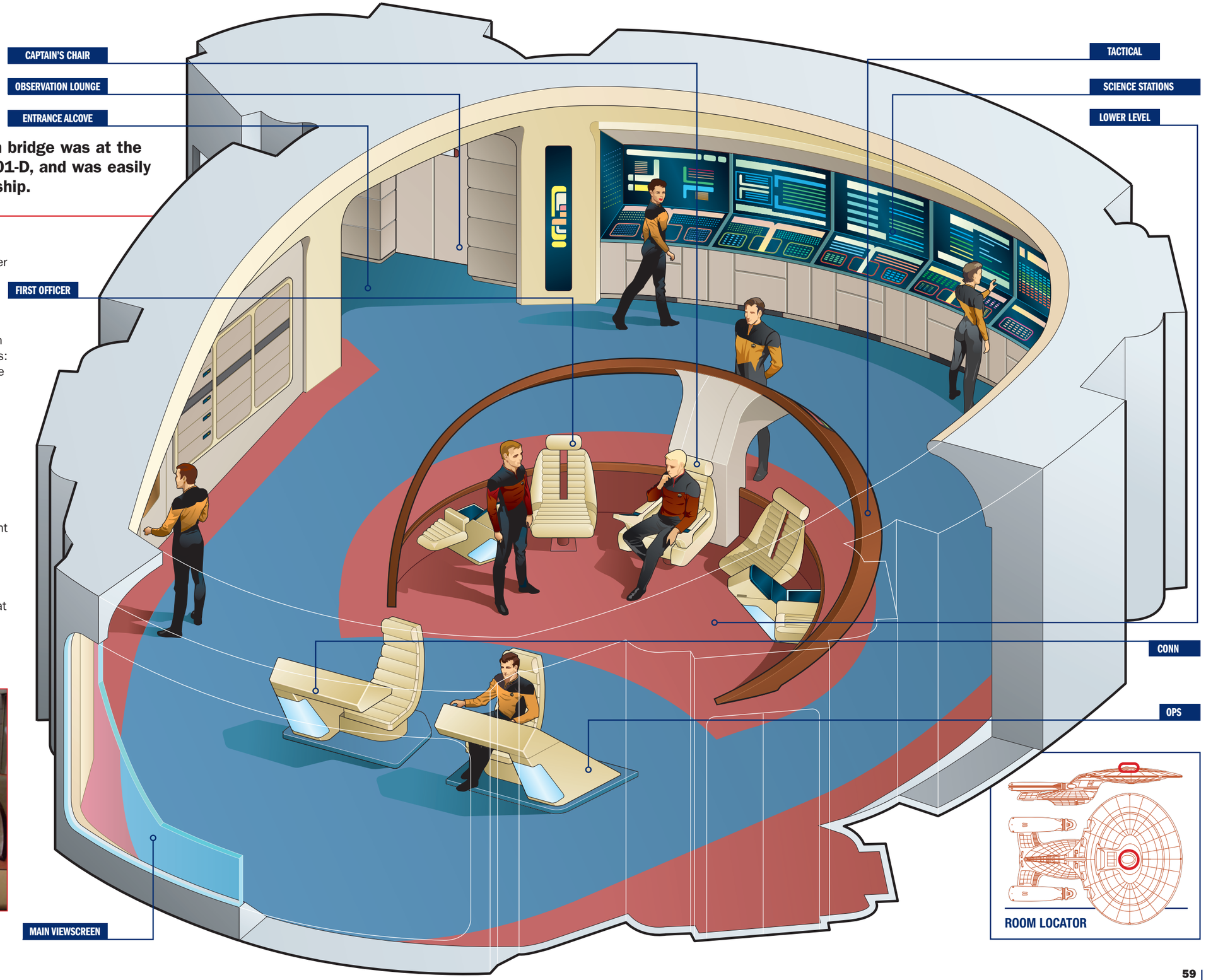
At the very center of the room was the captain's chair. On many previous starships this had been isolated, but on ships of the *Galaxy* class it was flanked by two other seats: the first officer to the right, and the ship's counselor to the left. The tactical console was located in the wooden handrail which encircled the rear half of this central command area; it was located directly behind the captain.

In keeping with traditional bridge layouts, the conn and ops consoles were located between the captain and the main viewscreen; conn was on the left, ops to the right. Other duty stations lined the perimeter wall of the bridge.

EASY ACCESS

The bridge had easy access to and from all other important areas of the ship, with six doors leading off it. Moving clockwise from the main viewscreen, the first door, level with the ops console, led directly into the battle bridge turbolift. At the rear left, a shallow alcove contained two doors, one leading to a bathroom, the other to a corridor at the end of which was the observation lounge. The door at the rear right of the room led to a turbolift. Continuing round, the fifth door led into the captain's ready room, the sixth to another turbolift.

The central area of the main bridge, with the flight controller and operations manager seated to the fore of the captain, and two senior officers.



BRIDGE SEATING

The *U.S.S. Enterprise* NCC-1701-D was controlled from the command chair positioned at the center of the bridge. From here the captain could easily interact with all bridge officers.

The bridge layout as seen from above.

Federation starships were fitted with systems of awesome power such as warp engines, phaser banks, and photon torpedoes – but these were subject to the rule of one officer: the ship's captain. His command chair was located at the heart of the main bridge; from here, the captain or duty officer took responsibility for the supervision of all primary mission functions, and executed orders in compliance with Starfleet directives.

SEATING LAYOUT

In the 2260s, the captain's position was set apart from the rest of the bridge stations and placed alone on a small, raised platform, underlining the isolation and responsibility that accompanied the role. A century later, the captain's station on some classes of vessel, such as the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D, was no longer isolated. Instead, it sat between two other command positions dedicated to the first officer and the ship's counselor. The executive officer's station was now an area in its own right; previously the second-in-command also held separate responsibilities. For example, Captain Kirk's first officer, Mr. Spock, also held the position of science officer and, as such, usually manned the science station.

The command seats of the *Enterprise* were still separated in some measure from the rest of the bridge by a polished wood console in a semicircle configuration behind them, and the large amount of space that separated them from the conn and ops stations in front.

The seats themselves were high backed with a head rest. The armrests of the first officer and counselor sloped down into the fluid shape of the seat, but the captain's armrests curved up to provide two status displays with basic conn and ops controls. The first officer and counselor were provided with larger data display screens on the outer side of their chairs; these were used to access information as they performed their duties. Each of these display panels was designed within the same parameters as most of the other consoles throughout the ship: they accepted vocal commands, but manual keyboard operation was preferred as it reduced the risk of a command being misinterpreted.

The bridge seating on the *U.S.S. Enterprise* NCC-1701-D was comfortable and provided officers with excellent support. The conn, or flight control seat lay before the captain to the right, the ops, or operations seat to the left. Both featured integrated consoles.

The main bridge on *Galaxy*-class starships of the 2360s provided seating and information displays for three people. The central seat was for the captain, while the other two seats were normally used by the first officer and the ship's counselor. Together, these three officers determined the running of the ship and how to carry out mission directives; the counselor was also able to offer useful cultural insights.

CAPTAIN'S & FIRST OFFICER'S COMMAND SEATING

On *Galaxy*-class starships such as the *U.S.S. Enterprise* NCC-1701-D, the commanding officers sat in a group in the center of the bridge, the captain's chair flanked by seating for a first officer and counselor.

As with any starship, the bridge of the *U.S.S. Enterprise* NCC-1701-D was the crucial command hub from which the captain and his first officer oversaw all ship's mission activities. The captain and first officer sat side by side in the seating area at the very center of the bridge. A third seat to the captain's left could be assigned to another senior officer – most often the ship's counselor – or an honored guest such as a Federation ambassador or visiting Starfleet dignitary.

From this central position, the *Enterprise*'s commanding officers had a clear view of the main viewscreen for easy ship-to ship communication. They could interact easily with the rest of the bridge personnel, including the ops and conn positions to the front, and tactical station manned by the security officer directly behind them.

CAPTAIN'S CHAIR

The captain's chair was occupied at all times; if he was not present on the bridge for any reason, the duty command officer routinely took his place in the seat. Yellow and red alert status required that two command level officers were present on the bridge at all times. Often the captain would be in his ready room adjacent to the bridge, and could be summoned within seconds to relieve the duty command officer.

Two small consoles were built into the armrests of the captain's chair. These combined simplified conn and ops control with a basic status display; if necessary the captain could use these to override the normal operation of the ship. The consoles could also be used to make log entries and to access the Library Computer Access and Retrieval System (LCARS) and ship's intercom system to address the crew or individual officers.

SIDE CONSOLES

The seats on either side of the captain's chair, including the first officer's position, were equipped with larger consoles that were mounted on free-standing units on the outside of the positions. These consoles could be swivelled to consult the readouts from a variety of positions to suit the user's preference.

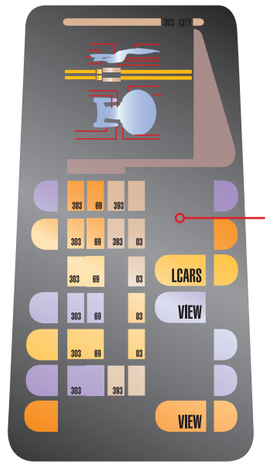
These additional computer consoles could be used to access a wide variety of information from the ship's sensors and databanks and update on the overall status of the *Enterprise*.

Both side consoles were essential in apprising the first officer and counselor of mission-critical information to provide the correct support to the captain in making snap decisions in pressured situations. All of the consoles would accept manual keypad input or verbal commands.

The captain's chair, seen here unoccupied at the very center of the bridge of the *U.S.S. Enterprise*, was where often difficult decisions were made in high-pressure situations that affected the safety of the ship and its entire crew.

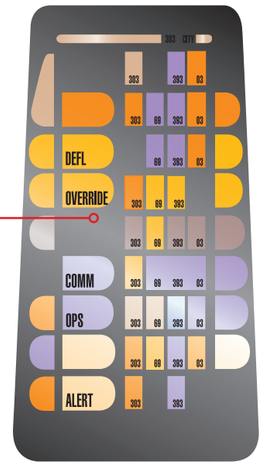
Captain Jean-Luc Picard occupied the command chair at the center of the *U.S.S. Enterprise* NCC-1701-D's bridge. Commander William Riker, his first officer, was seated at his right hand, with Counselor Deanna Troi seated to the left.

CAPTAIN'S CONSOLES



CAPTAIN'S LEFT SIDE

These controls included facilities for library computer access and retrieval, log entry, main viewer control, and communications, plus intercom control for intra-ship communication.

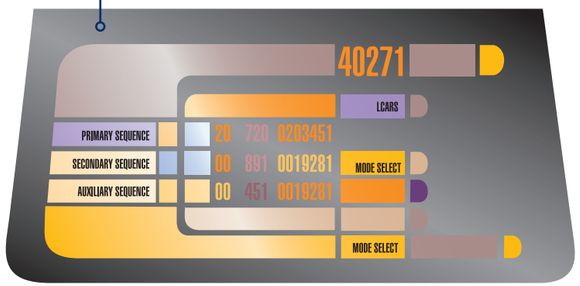


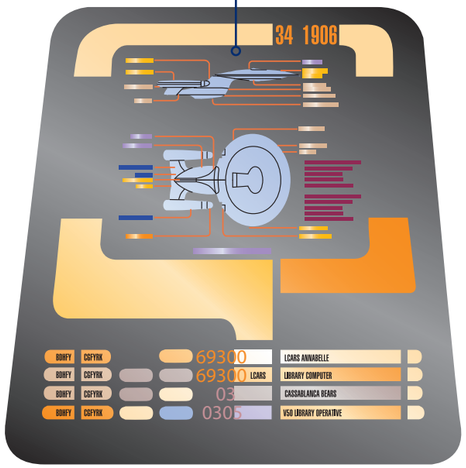
CAPTAIN'S RIGHT SIDE

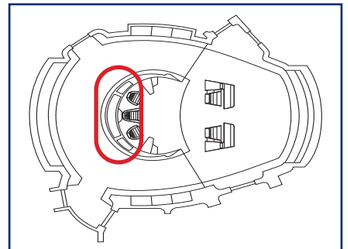
These controls included backup facilities for ops control, armaments, the deflector and conn functions. They could also be used for emergency override.

FIRST OFFICER'S CONSOLE

The seats alongside the captain's were provided with larger interface screens for quickly accessing vital information.







COMMAND AREA

These small consoles were mounted on the end of the armrests, where they could be easily accessed at a second's notice.

The captain's display panels were designed so that input controls with related functions were grouped together. Operation of these control panels was continually monitored, so the displays reconfigured to suit the specific task in hand. This could lead to the same button performing different functions, depending on how the panel had been configured.

NAVIGATION CONSOLE

The conn officer or flight control officer was responsible for piloting the *U.S.S. Enterprise* NCC-1701-D and inputting all course changes as required during a mission.

On the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D, the flight control console, often referred to as the conn, was at the front of the bridge, on the captain's right, alongside the ops station.

The conn officer was responsible for piloting the ship. Many of the tasks involved in controlling the vessel's course were automated, but on Starfleet ships a conn officer was always on duty to monitor flight operations. His or her duties included the supervision of automatic flight operations, plotting and monitoring the ship's course, verifying the ship's position, liaising with the engineering department, and all manual flight operations.

The vessel's course could be entered through the keyboard or verbally. Once this had been done, the navigational computers suggested an optimal course, which the conn officer could accept, modify, or reject.

On the *Enterprise*, the conn displayed a wealth of information relating to the vessel's course; readings from the ship's tactical and navigational sensors could be combined with information showing the ship's current position and its projected course.

If the conn officer deemed it necessary, information from the secondary navigation and science sensors could be used to confirm this data. This procedure was performed automatically when the ship went to alert status or the duty shift changed.

MANUAL OPERATIONS

Most flight operations were fully automated, and the conn officer had only to input general commands such as a new heading. However, the conn officer could take direct manual control of all the ship's flight operations. In full manual mode, the movement of the entire ship, right down to the individual reaction control (RCS) thrusters, could be controlled from this console.

Because the conn was an absolutely critical station, it was directly connected to a dedicated backup flight operations subprocessor that allowed the conn officer to initiate manual control at all times. The station could also access emergency navigation sensors. Control could be re-routed through Main Engineering at any time, overriding the bridge console.

The conn officer's operational duties varied depending on which flight mode the ship was operating in. At impulse speed, the conn monitored the inertial damping systems and the relativistic effects of sublight travel. Under normal circumstances, the computer would warn the conn officer if a specified maneuver would place the inertial damping systems under undue strain, and maybe suggest an alternative. However, when the ship was at alert the computer allowed the conn officer to specify more dangerous maneuvers.

WARP SPEED

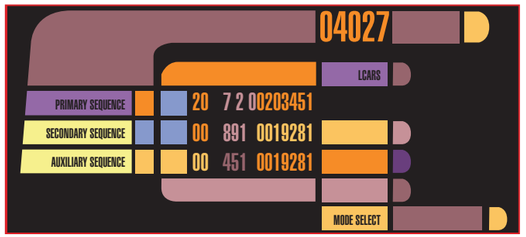
During warp flight, the conn officer was responsible for monitoring the subspace field geometry. This task involved working closely with engineering personnel. In fact, the conn officer acted as the permanent bridge liaison with engineering. He or she was also responsible for providing the captain with data on the status of the propulsion systems. This meant that the chief engineer was rarely seen on the bridge of the *Enterprise*.

Automatic systems built into the conn continually updated long-range sensor data and made any automatic course corrections that were required.

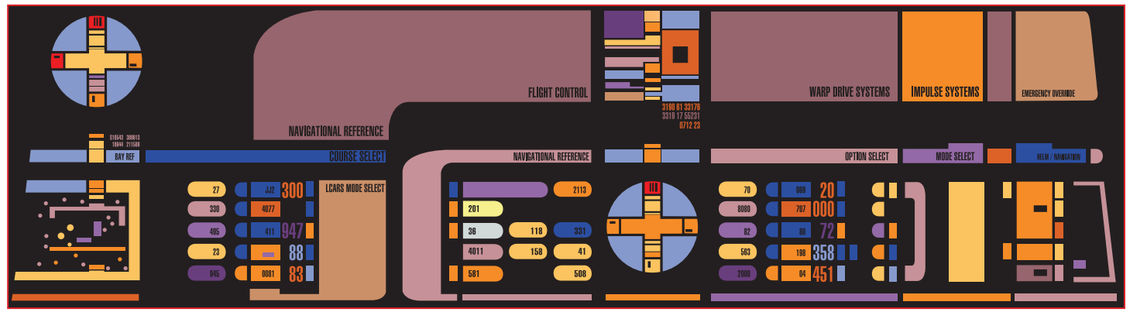
COMBAT AND SURVIVAL

The conn officer was trained to operate the ship in combined and separated modes, and to control the saucer section during an emergency landing.

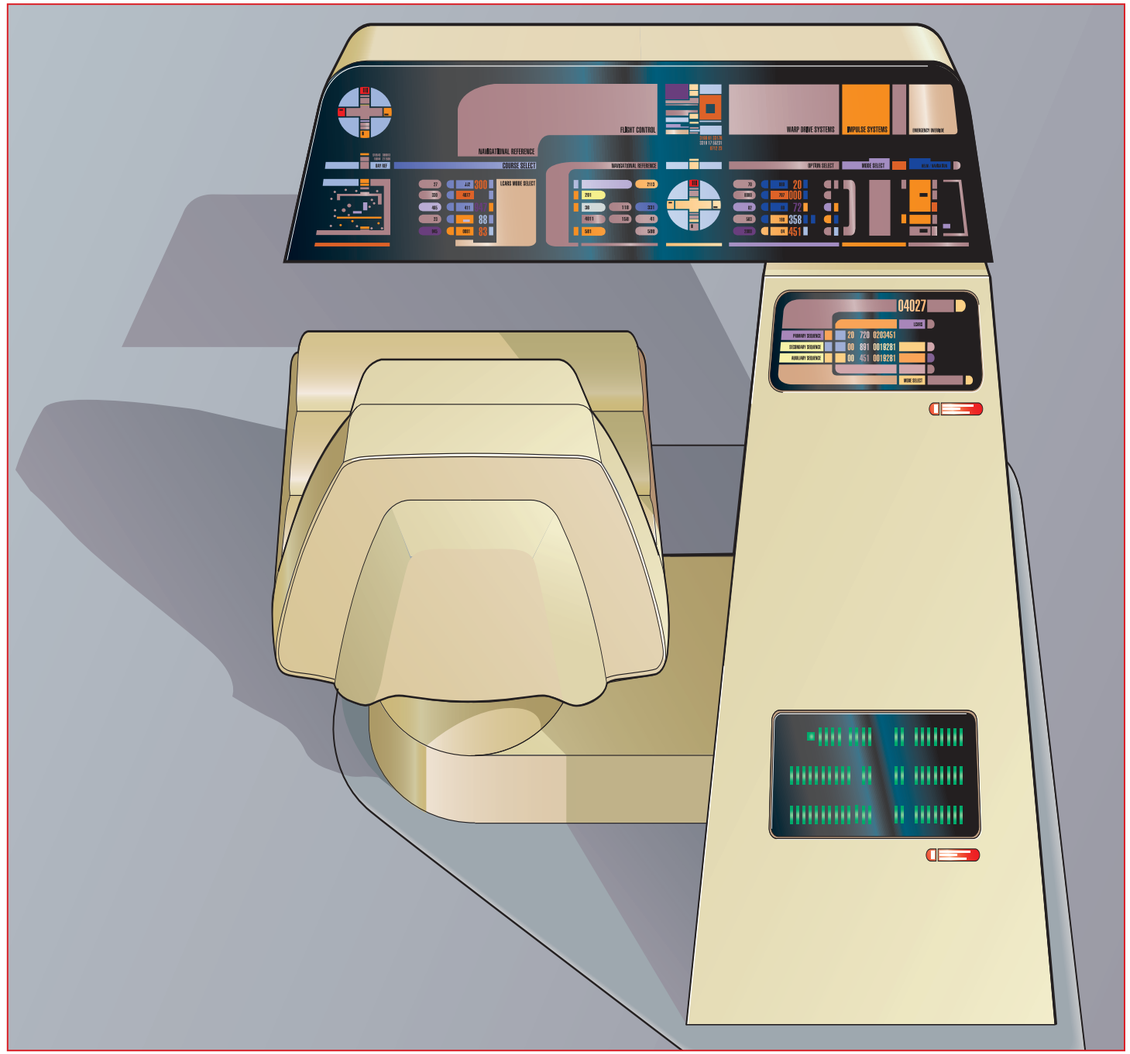
During combat situations, the conn officer worked closely with both the ops and tactical officers. Additionally, targeting and external communications functions were automatically duplicated on the conn station in case the tactical station was disabled. The ship's computers were preprogrammed with a wide variety of tactical maneuvers, all of which could be accessed by the conn officer. As ever, the conn officer could also take direct manual control.



This small panel on the side of the conn console could be used to access several different modes.



The conn panel was used to control and monitor the warp and impulse systems, and provided data on the ship's exact position. Most of its functions were automated, but it could also be used to control the ship manually; the *U.S.S. Enterprise* NCC-1701-D could be flown by tapping on the keypad.



The conn station was at the front of the main bridge alongside the ops station and directly in front of the viewscreen. The main part of the console could be swung out and the chair could rotate through 180 degrees. The conn officer inputted the commands given by the captain or first officer and constantly monitored the ship's course.

OPS CONSOLE

The ops officer of the *U.S.S. Enterprise* NCC-1701-D was responsible for keeping the captain informed of the ship's status and for allocating its resources.

The operations officer worked with the other officers on the bridge to coordinate resources and hardware.

On the *U.S.S. Enterprise* NCC-1701-D, the station at the front of the bridge on the captain's left was normally assigned to the operations manager, also known as the ops officer.

This officer had wide-ranging responsibilities, the main one being coordinating the allocation of ship's resources to various departments. The role required a thorough knowledge of all the ship's systems and involved working closely with other bridge officers, such as the tactical and conn officers. These positions shared many of the ops responsibilities.

DECISIVE ROLE

Despite the fact that the *U.S.S. Enterprise* NCC-1701-D was an extremely powerful vessel, the crew often made demands on the ship's systems that could not be met. The ops officer's job was to prioritize the allocation of resources in the most efficient manner possible.

Any requests for diversion of the *Enterprise*'s resources were routed via the ops console; the station provided information about the ship's resources, which allowed the ops officer to see what impact granting the request would have on other shipboard activities. For instance, stellar cartography might have requested the use of the forward sensor array to gather data on a passing comet at the same time as it was being used by the conn officer to monitor a nearby space station. The ops officer would have either denied the request or arranged to alter the ship's attitude so that stellar cartography could use one of the other sensor arrays.

AUTOMATED SYSTEMS

Many of these requests were routine and simply dealt with by the main computer; however, some were more complex and required a trained mind. The ops officer used several filter programs that dictated at which point he or she became involved in the resource allocation process. Experience had shown that even the most advanced starship systems were not capable of predicting every situation and, as a result, the ops manager had to monitor the computer's decisions even when it was performing automated operations.

The ops officer also provided information to other ship's departments and inputted status information into the main computer. Ops had to inform the appropriate personnel if an anticipated change would have an effect on their work.

ROLE IN BATTLE

In a battle situation, the best allocation of resources was vital, and the ops officer had to work closely with the tactical officer to route power to the most needy areas and assign damage control teams. This involved working closely with main engineering.

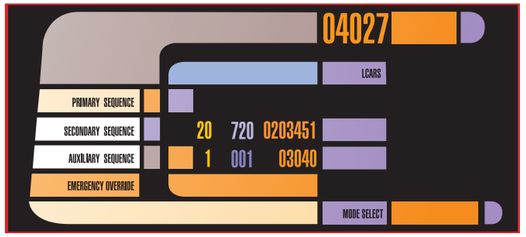
Ops often provided the captain with data from the sensors, informing him or her about the situation on a planet's surface or the approach of a ship, and if possible identifying the vessel. Ops was also responsible for launching probes and then collecting data from them. In these instances, the ops officer would work closely with other bridge stations such as science or engineering.

Another of the ops officer's duties was coordinating away teams and arranging appropriate personnel and equipment, such as phasers and tricorders. If an away team member was already on duty, ops allocated another officer to take his or her station while they were off the ship.

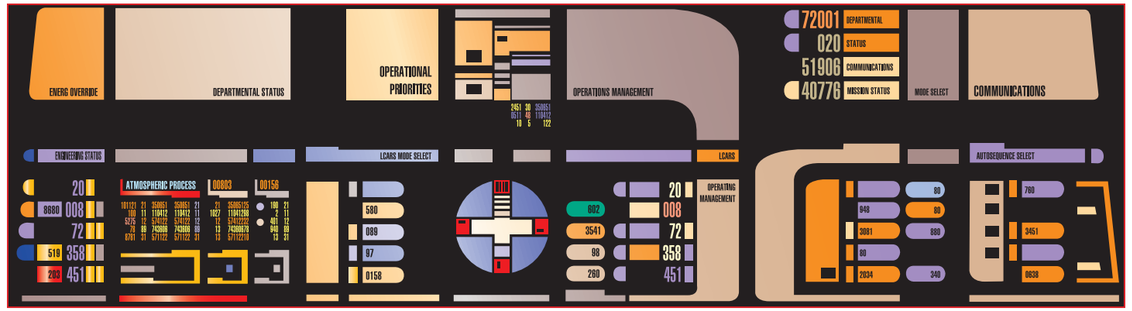
DISTRIBUTING DATA

The ops console also coordinated the allocation of comm frequencies with mission ops and ensured that the away team landing party could be monitored at all times. A transporter room was notified that a party was leaving the ship; a transporter chief was assigned and ops provided transporter coordinates if necessary.

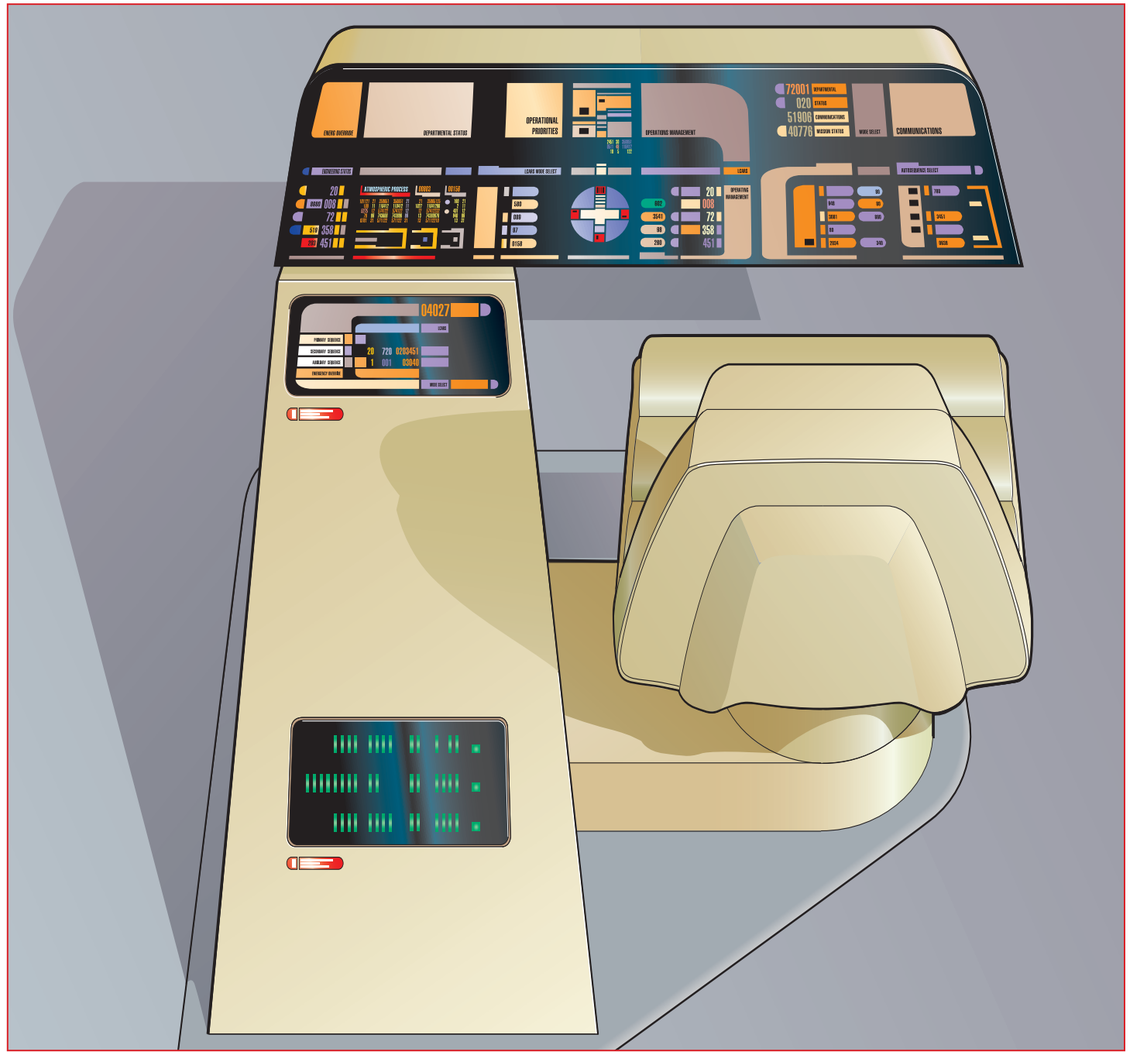
Ops coordinated other ship activities, including initiating and controlling the saucer separation sequence, and authorizing shuttle launch and approach procedures. Before a shuttle was launched, the main shuttlebay officer obtained clearance from the ops officer. Once the shuttle had cleared the ship, the pilot informed the ops officer, who then monitored the shuttle as long as it was in range.



A panel was located on the leg of the ops console. Its controls were duplicated on the conn.



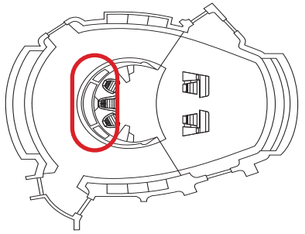
The ops panel automatically reconfigured itself in different situations. In this typical configuration, the ops officer had access to information from several departments, and could monitor shuttlebay operations and environmental conditions on board the ship.



Ops was a stand-alone station at the front of the bridge. It was placed next to the conn, and these two stations could easily be reconfigured to perform the other's duties. The ops officer's chair rotated through 180 degrees, and the top of the console also swivelled to make it easier for the ops officer to get into position to man the console.

SECURITY CONSOLE

***Galaxy*-class starships depended on their security and tactical console – controlled by the tactical officer – to maintain security and assess threats to ship and crew.**



LOCATION: MAIN BRIDGE

On the main bridge of the *U.S.S. Enterprise* NCC-1701-D, the combined security and tactical station was mounted on a large rail that formed a horseshoe shape around the rear of the commanding officers' chairs. The console was larger than most other bridge stations and could be crewed by two people, but was almost always controlled by a single officer, who stood. Its raised position near the center of the bridge allowed him or her a clear line of sight to the main viewer, and ensured easy communication with the other bridge staff. The station was usually manned by the *Enterprise*'s tactical officer, a post held by Natasha Yar until her death in 2364, and afterward by Worf.

INTERNAL SECURITY

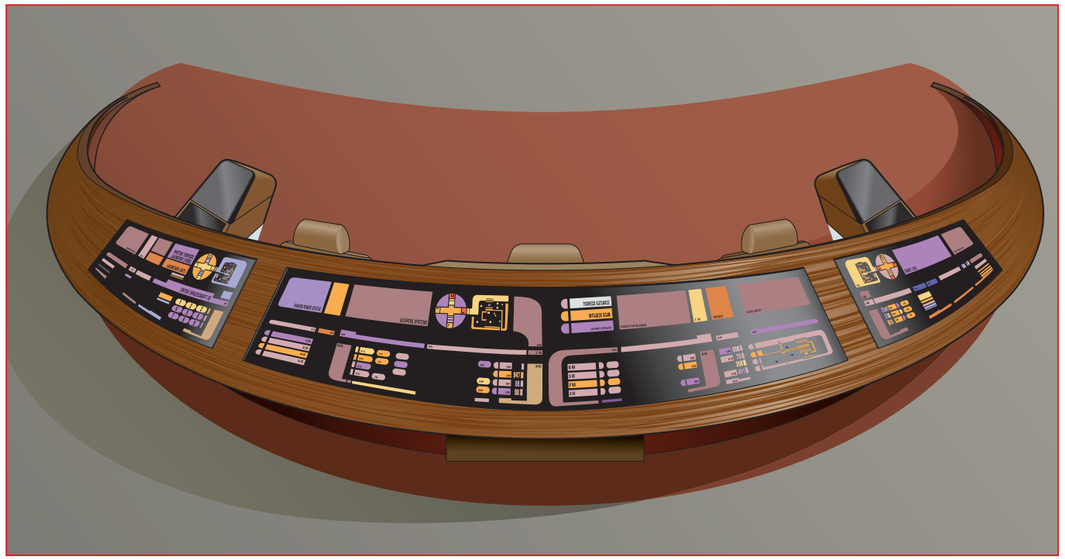
During combat situations, the chief security officer doubled as the tactical officer, but under normal circumstances he or she had duties that related to the safety of the ship and its crew. Internal sensors allowed the officer to pinpoint the location of every crew member who was wearing a communicator badge, and the console automatically informed him or her if there was an intruder alert. With proper calibration, the internal sensors could be used to track an individual who was not wearing a communicator.

The station could be used to erect security forcefields, or seal bulkheads at predetermined locations around the ship. Readouts informed the security officer of the location of security personnel, and instructions to security details could be made either verbally or from the keypad.

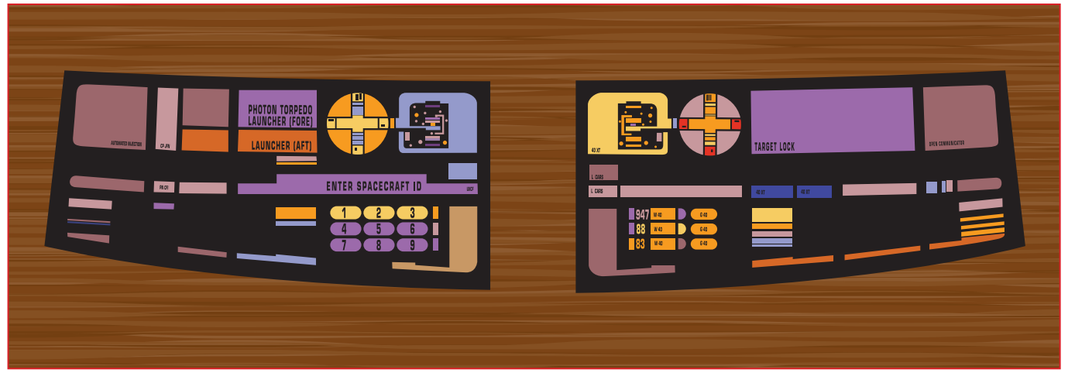
The tactical station provided low level information about any potential threats to the crew. On diplomatic missions, it could provide more detailed information about the disposition of personnel and the status of specialized security devices.

TACTICAL ROLE

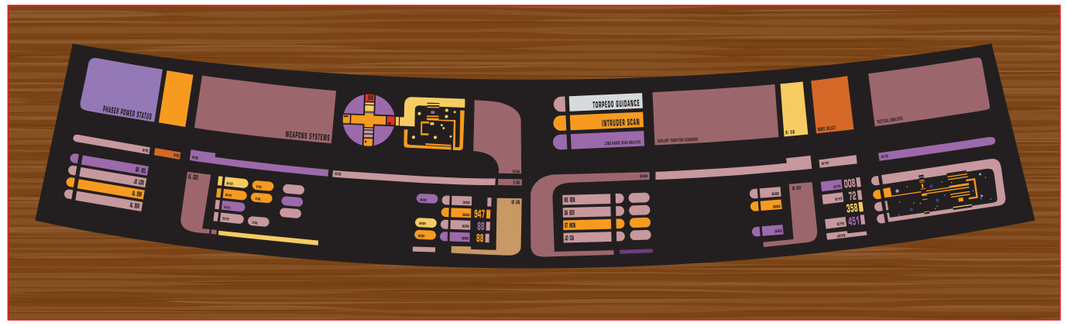
The station also provided information on any ships that approached the *Enterprise*. Where possible, the computers would identify the approaching vessel and provided the security officer with relevant computer records. Even when a vessel could not be positively identified, the station could provide data about its weapons and engine capabilities. The tactical database could also provide a list of preferred tactics and information on an enemy vessel's weaknesses.



The security and tactical station was one of the largest consoles on the *U.S.S. Enterprise*'s bridge. It held a central position behind the captain on a raised level so that the security/tactical officer could communicate swiftly with the commanding officer. One of the duty officer's key tasks was to provide tactical advice.



The panel on the far left of the security/tactical station could be used to control the photon torpedo launchers and access information on other spacecraft. The panel on the far right was used to establish a target lock for photon torpedoes and phasers.



In the standard configuration, the central panel could be used to monitor phaser power, select and monitor weapons systems, and control the torpedo guidance systems once a torpedo has been fired. It also controlled the intruder scanning system.

The tactical database could also provide a list of preferred tactics and information on an enemy vessel's weaknesses.

The security systems automatically monitored all external comms traffic. On modern Starfleet vessels, the security officer was responsible for controlling communications, and opened and closed hailing frequencies. The officer maintained particularly close contact with the transporter rooms, ensuring that any potential dangers could be beamed off the ship and personnel beamed to safety.

TORPEDO CONTROL

In combat situations, the security/tactical console was used to control the *Enterprise*'s phasers and photon torpedoes. In the 2360s, *Galaxy*-class ships were equipped with 12 Type-X phaser arrays that could be adjusted to fire anything from a low level energy transfer beam to destructive combat phaser beams. The precise firing sequence and energy levels were determined by the tactical computers once the tactical officer has identified a specific objective.

Photon torpedoes could be fired from any of three torpedo launchers, although the saucer module launcher was rarely used. As with the ship's phasers, all the tactical officer had to do was program in the target and the number of torpedoes. The console offered the tactical officer a series of prompts that allowed him or her to specify a time or distance until the torpedo detonated. Photon torpedoes were normally autonomous once launched, but the computers could allow the tactical officer to take manual guidance control.

WEAPONS SYSTEMS AND INVENTORIES

Readouts on the station provided the tactical officer with information on the state of all weapons systems and on the weapons inventory, including how many photon torpedoes were available, how long there was until they could be launched, and which phaser banks were recharging.

The tactical station shared a number of its duties with ops, including the launch of probes and message buoys, and control of the tractor beams and some transporter systems. In combat, both tactical and ops monitor the condition of the ship's shields and, if necessary, could reroute power to them from other systems. If the ship was damaged, the security/tactical officer was responsible for collating reports, forwarding them to the commanding officer, and organizing repair crews.

All the tactical station's guidance, navigation, and targeting readouts were also routed to the conn and ops stations. This ensured that the ship could still defend itself if the tactical station was disabled.

MISSION SPECIFIC CONSOLES

Located to the aft of the main bridge of the *U.S.S. Enterprise* NCC-1701-D, the five console stations serve a variety of essential operational functions during missions, including scientific tasks and environmental control.

While mission critical consoles on the main bridge of the *U.S.S. Enterprise* NCC-1701-D, such as the forward conn and ops consoles, command consoles and tactical, were key operational stations, the five consoles located at the rear of the bridge provided crucial support to the command crew.

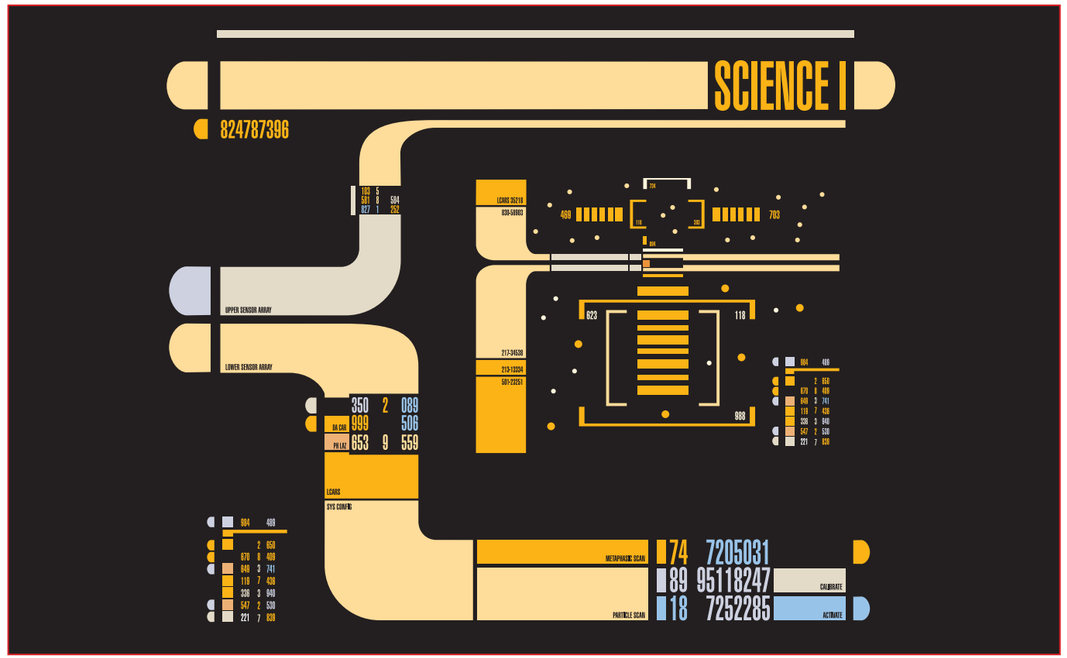
Covering two separate science stations, environment, mission ops and an engineering station, these consoles were manned, as needed, by mission specialists as a matter of routine. They could be called upon at a second's notice by senior bridge personnel to provide essential data and systems status updates. The discrete pull-out chairs from beneath each console allowed for greater crew comfort during long duty rotations, but their ergonomic design allowed these seats to be pushed beneath the consoles when not in use.

The Mission Ops station on the *U.S.S. Enterprise*'s bridge. The console was situated between Environment and Science II.

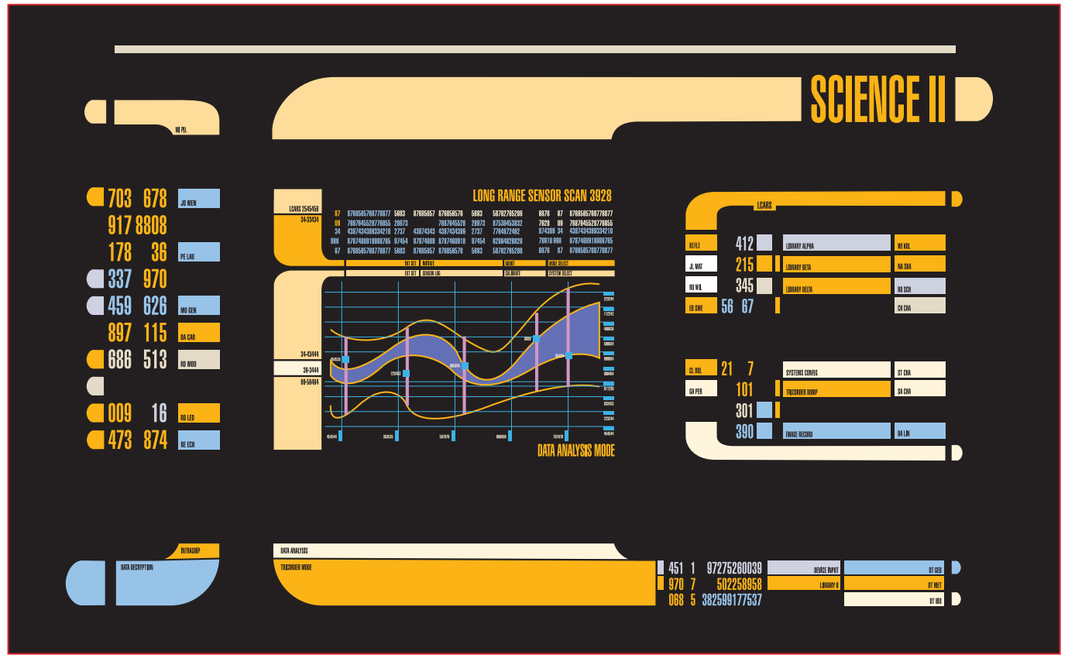
SCIENCE I AND II CONSOLES

Providing real-time scientific data as required by the command crew, the first two stations on the upper, rear level of the bridge were headed Science I and Science II. They were independent of each other, but could be interlinked for co-operative work between science personnel or visiting researchers.

Both science stations were generally utilised when scientific activity on the *Enterprise* required closer co-ordination with command crew, such as major research projects where the positioning of the ship could be essential to the outcome. These stations could link directly to the ship's sensor array, allowing the rapid dissemination of data in alert conditions, while also being able to directly override and recalibrate the sensor systems. Both consoles were a key command resource for co-ordinating scientific collaboration between internal ship departments and external scientific facilities and establishments.



Science I and Science II provided central support for co-ordinating the activity of various departments working on the *Enterprise*, such as stellar cartography. Largely working independently, the stations could be linked cooperatively when needed to better serve the needs of diverse scientific research programmes.

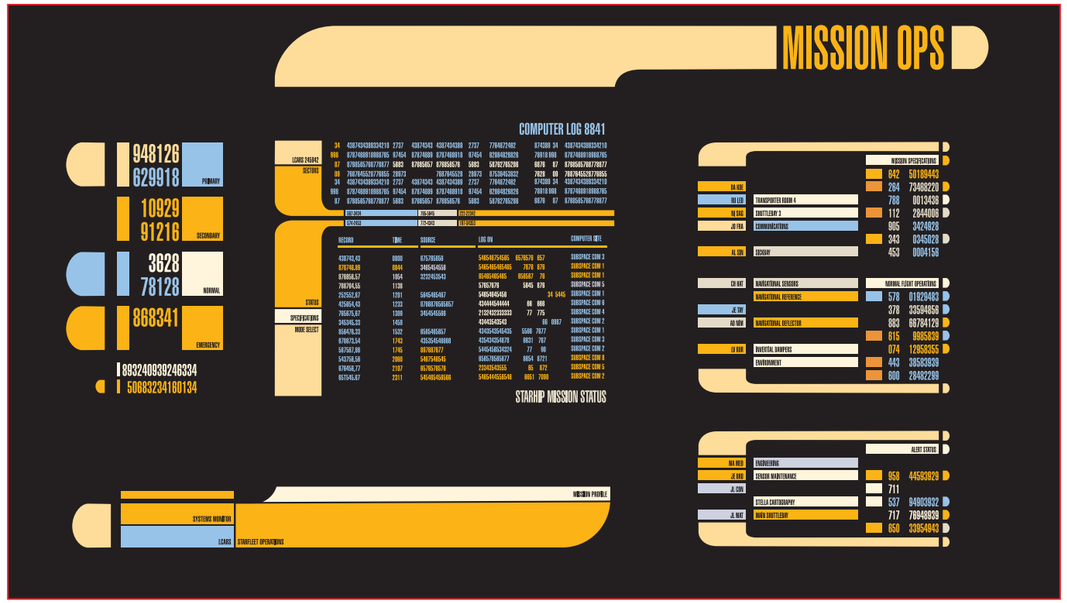


The Science consoles provided mission intelligence and realtime data to command personnel when required. They were not assigned a permanent science officer, but staffed according to mission requirements.

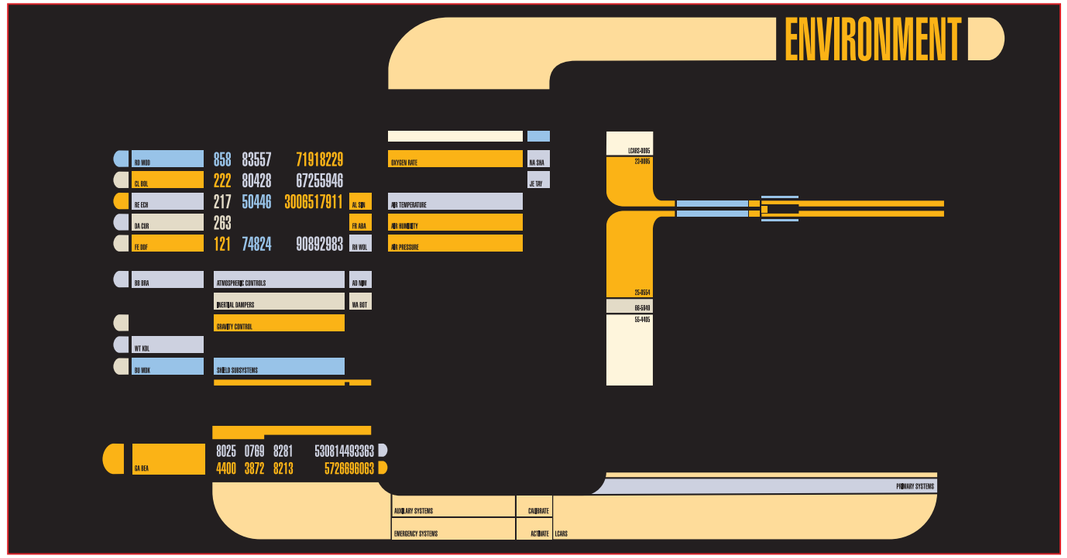
MISSION OPS CONSOLE

To the right of the two science stations, the mission ops console provided support and monitoring of telemetry data from away team parties that were off the *Enterprise*. This included management of tricorder and other instrumentation data being recorded by the away team during their mission.

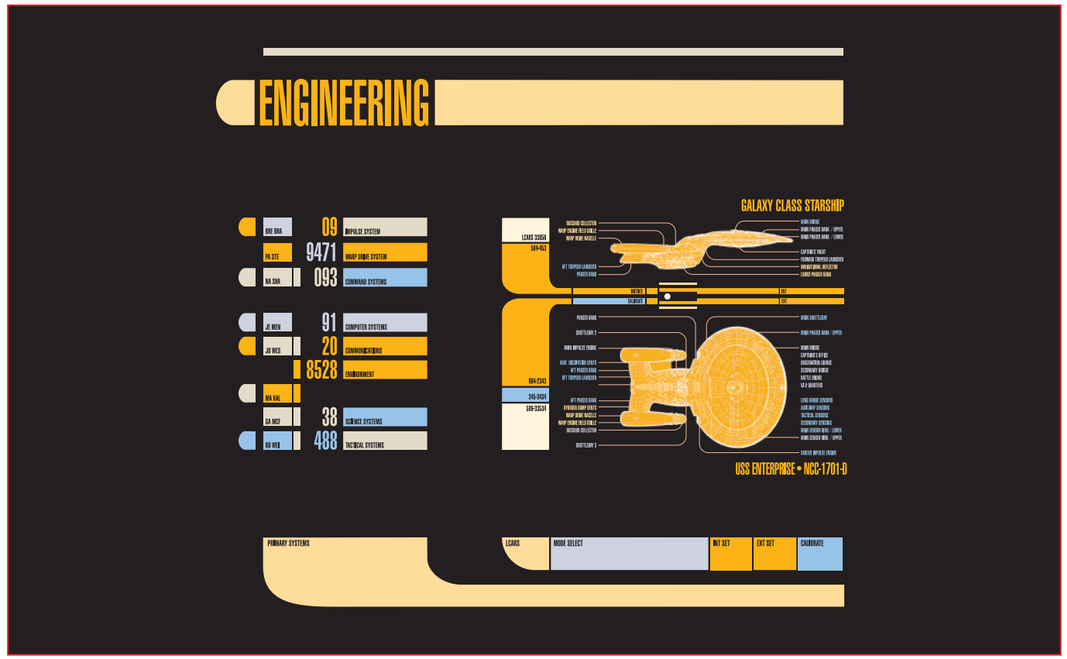
Mission ops also managed the activities and requirements of secondary missions undertaken by the *Enterprise* to ensure no conflicts with the primary mission status of the ship took place. During alert conditions, mission ops worked closely with the tactical station and security officer to advise on the impact of away team and secondary mission activity in relation to security concerns.



During standard operating parameters, the *Enterprise* routinely managed a diverse array of primary and secondary missions. The mission ops console was a key resource for monitoring mission status, avoiding resource conflicts and maintaining a link to instrumentation being operated by away team parties.



Largely operating automatically, the environment console monitored and managed resources relating to the *Enterprise*'s life-support systems and environmental conditions. In cases of life-support failure, the environment console directed resources to better the manage the crisis and ensure the survival of the crew.



Directly linked to main engineering via the ODN network, the engineering console was a prime resource for the chief engineer to remotely monitor the status of the *Enterprise*'s core systems when required to be on the bridge. It could also provide full engineering control from the bridge when main engineering was unavailable.

ENVIRONMENT CONSOLE

The environment console was often left unattended during normal operating parameters, its systems were largely automatic during nominal control and monitoring of the *Enterprise*'s life support systems. However, its key position in the essential operation of the ship and safety of its crew was not to be underestimated, especially during alert situations that arose during missions.

At normal operations status, the bridge's environment console provided real-time monitoring of atmospheric conditions within the *Enterprise* itself, the ambient temperature, status of artificial gravity systems, inertial damping and all shielding subsystems. The station's other function was in maintaining systems relating to recycling and reprocessing of raw waste materials to ensure crewmembers received constant supplies of breathable air, water and food.

Alert conditions would often see this station manned by an environmental systems officer, and the station provided key support to the operations manager in directing life support resources to ensure the survival of the crew in crisis situations.

ENGINEERING CONSOLE

The aft engineering console, located on the far right of the bridge's upper level, was a highly adaptable work station that allowed the chief engineer to monitor core engineering systems when required to be present on the bridge.

With the *Enterprise*'s main engineering section at full operating capacity, this bridge station was routinely left unattended in a passive display mode. However, in alert conditions the station could be quickly moved to full enable mode, a status that gave the chief engineer or other engineering personnel almost full-spectrum control of the ship's engineering systems directly from the bridge. This could be necessitated when the engineering section was inaccessible due to hazardous systems failure causing the area to be evacuated.

Linked to engineering systems via the bridge's optical data network (ODN), the chief engineer could utilise this station to access all propulsion systems and reconfigure engineering operations in response to quickly changing mission parameters.

The engineering console on the bridge provided a link with the more extensive controls that were housed in main engineering.

MAIN BRIDGE REFIT

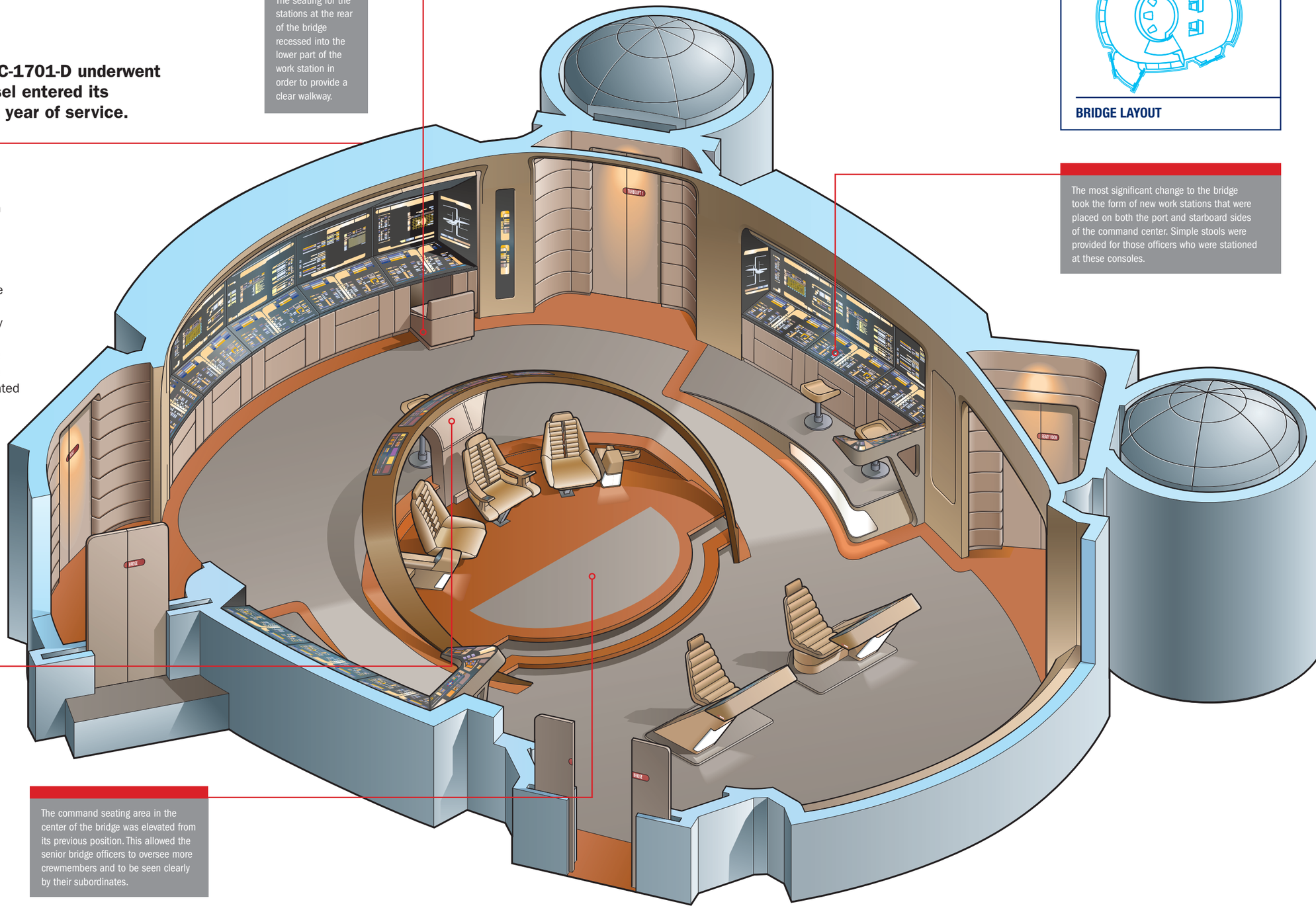
The bridge of the *U.S.S. Enterprise* NCC-1701-D underwent a series of subtle revisions as the vessel entered its eighth, and what proved to be its final, year of service.

The main bridge area of the *U.S.S. Enterprise* NCC-1701-D experienced its first major upgrade at some point prior to its encounter with El-Aurian scientist Dr. Tolian Soran in 2371.

On a small level some minor adjustments had been made to the secondary lighting systems of the bridge, and more emergency indicators which became visible only during a red-alert situation were also added to the original configuration. The most radical development, however, involved the seating arrangements for the key senior officers present on the bridge. Previously, the captain, first officer, and counselor were placed on the same level as the forward conn and ops work stations near the viewscreen, but the 2371 modifications elevated the entire command seating onto a raised dais, and added a series of steps running along the front of the seating area.

DESIGN AND CONFIGURATION

The second significant change to the bridge at this time was the inclusion of additional work stations that were located on opposing sides of the command area. These positions were originally occupied by flat computer access panels, but were now updated to allow bridge personnel to carry out work at them, resulting in an increased crew presence on the bridge at all times.



The seating for the stations at the rear of the bridge recessed into the lower part of the work station in order to provide a clear walkway.

BRIDGE LAYOUT

The most significant change to the bridge took the form of new work stations that were placed on both the port and starboard sides of the command center. Simple stools were provided for those officers who were stationed at these consoles.

The tactical station maintained its position behind the captain's chair, but a stool was provided during the refit for the comfort of the officer on duty.

The command seating area in the center of the bridge was elevated from its previous position. This allowed the senior bridge officers to oversee more crewmembers and to be seen clearly by their subordinates.

CAPTAIN'S READY ROOM

The captain's ready room was effectively an office situated next to the main bridge. It allowed the captain to work in seclusion and to hold meetings in private.

On the *U.S.S. Enterprise* NCC-1701-D, the captain's ready room was located to the port of the main bridge. Around seven meters in length, it provided the captain with a place where he could both work and relax, and was furnished with a desk, several chairs and a couch. A small terminal on the desk could be used to access the Library Computer Access and Retrieval System (LCARS) or to receive communications from other vessels. One door led directly onto the main bridge, while another led to the captain's private bathroom. The room was fitted with a replicator terminal.

PRIME LOCATION

The ready room was located on deck 1 so that the captain could be near the bridge even when he wasn't taking bridge duty. If an emergency arose, he could replace the duty officer in a matter of seconds. This private area also provided an enclosed space where the commanding officer could receive secure transmissions from Starfleet Command, or talk to his senior officers in confidence.

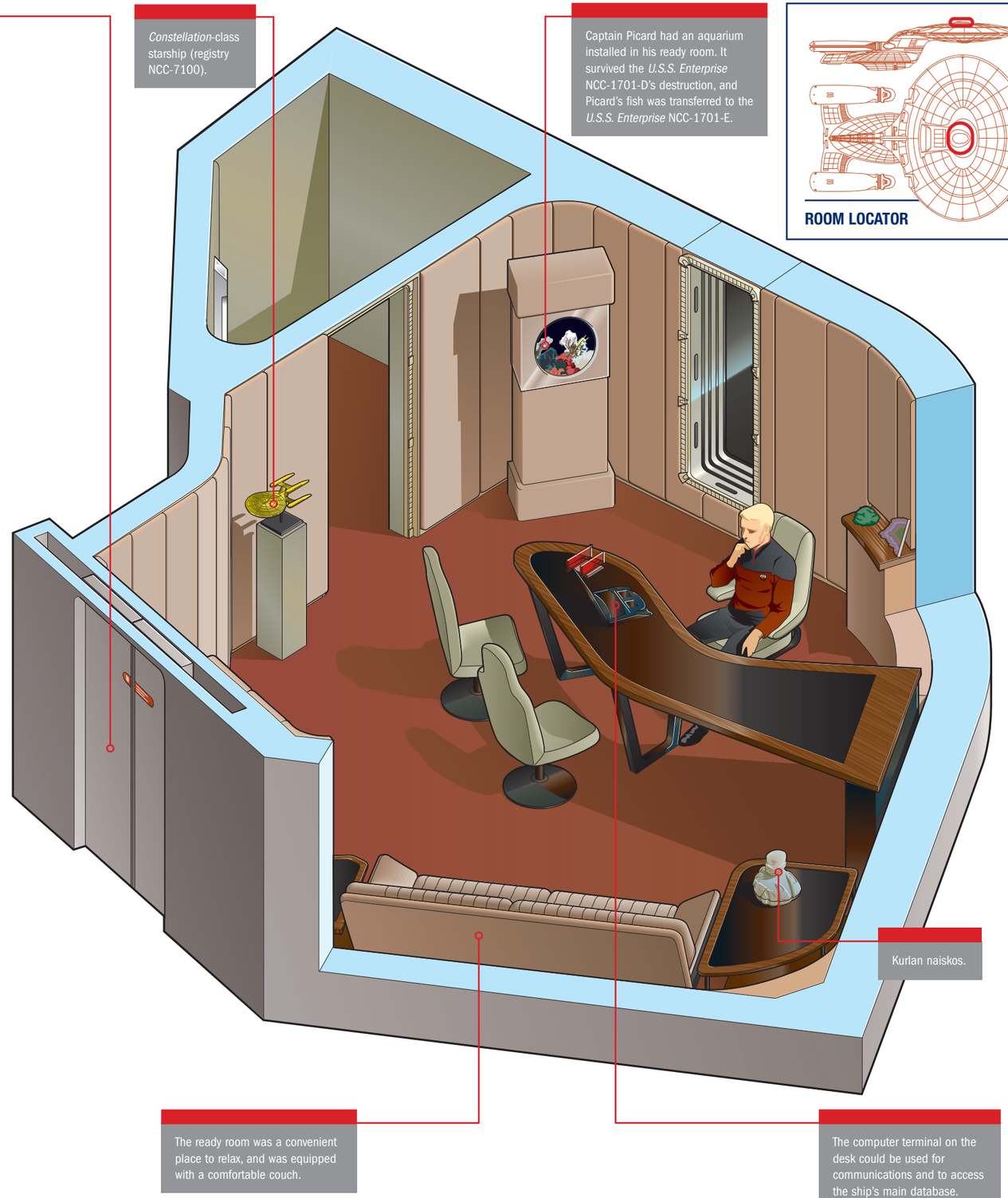
Captain Picard spent a reasonable proportion of his spare time in his ready room, carrying out administrative duties, or – when off duty – reading or listening to music.

The room was decorated with a few of his personal effects, including a nautical sextant, a sailing ship modelled in crystal, a Third Dynasty Kurlan naiskos nested statuette (a rare and valuable artefact, gifted from Picard's former archaeology professor, Richard Galen), and the collected works of Shakespeare. Perhaps the most attractive feature was the spherical salt-water aquarium, home to Captain Picard's pet lionfish, Livingston, situated in the corner close to the room's viewport.

Captain Picard often used his ready room to receive sensitive orders from Starfleet Command and to talk to members of his senior staff in private. It was easy to route secure transmissions directly to the terminal on the captain's desk.

Captain Picard received many visitors in his ready room, including other starship captains such as Admiral Nechayev.

The captain's ready room was used for small meetings, with attendees generally limited by the room's size and number of chairs.

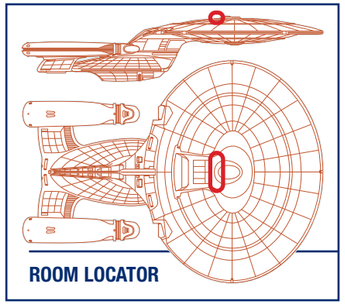


OBSERVATION LOUNGE

This room, located behind the bridge of the *U.S.S Enterprise* NCC-1701-D on deck 1, was equipped for conferences and presentations.

Control panels built into the desk allowed the crew to access the ship's computer during briefings and presentations.

Monitors positioned at either end of the table allowed the crew to review mission specifics or receive briefings from Starfleet command.

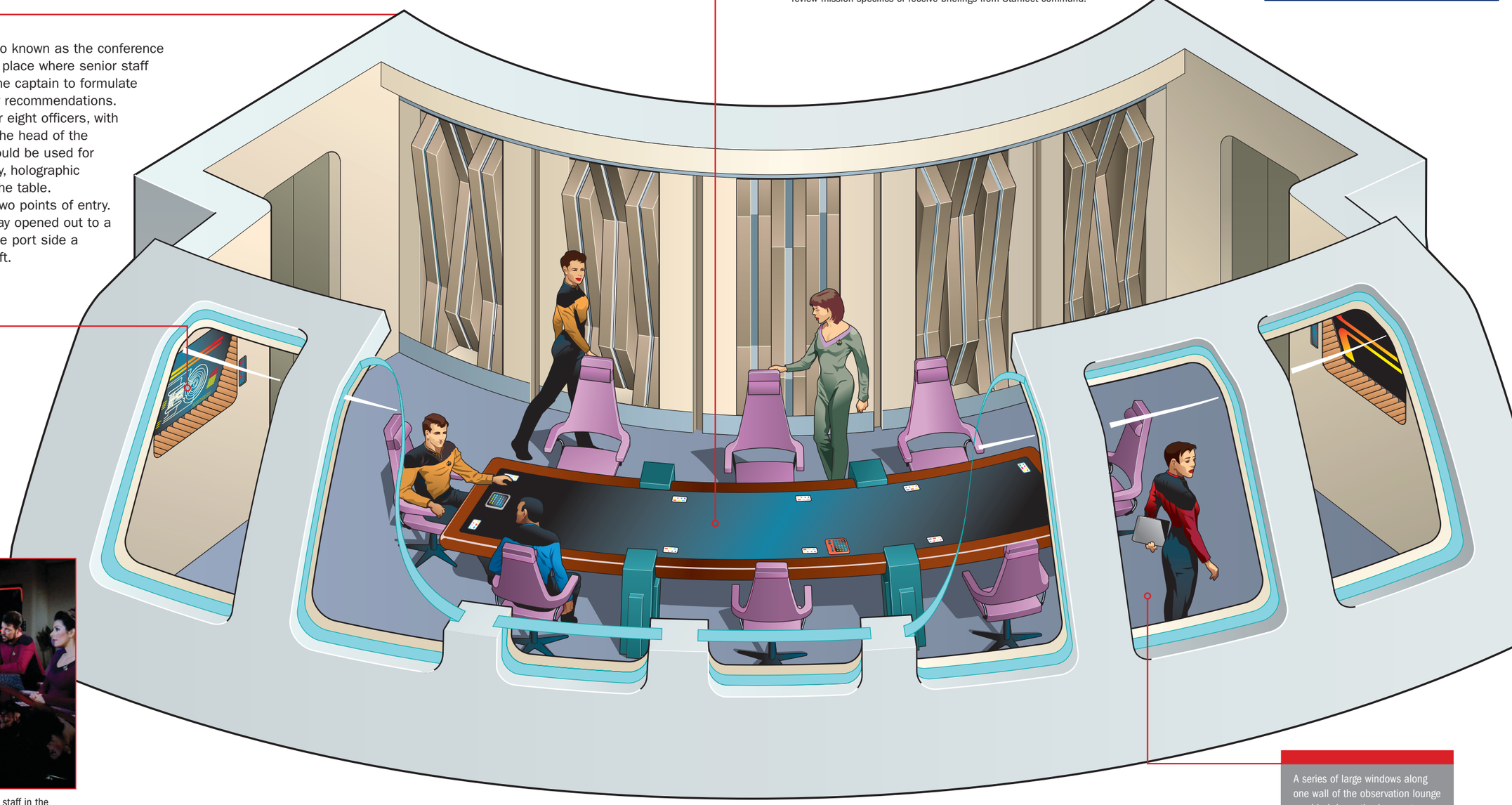


The observation lounge (also known as the conference lounge) was a small, quiet place where senior staff and specialists met with the captain to formulate plans, report findings, and offer recommendations.

The room provided seating for eight officers, with the captain normally sitting at the head of the table. Monitors at either end could be used for presentations, and, if necessary, holographic projectors could be placed on the table.

The observation lounge had two points of entry. On the starboard side, a doorway opened out to a ramp on the main bridge. On the port side a second doorway led to a turbolift.

A small computer screen just inside the door was used to present important data and reports to the crew.



Captain Picard held meetings with his senior staff in the observation lounge.

A series of large windows along one wall of the observation lounge provided dramatic views out over space, giving an impressive backdrop to every meeting.

TURBOLIFT NETWORK

The personnel transport system on a *Galaxy*-class starship enabled passengers and crew to access all decks using a ship-wide network of shafts.

The large turbolift network on the *U.S.S. Enterprise* NCC-1701-D spanned 42 decks and a primary hull more than 400 meters wide, and served a standard crew and passenger complement of more than a thousand. Each car had built-in inertial dampers that allowed vertical as well as horizontal movement with little momentum change.

Exploiting that ability, the network was based on two main vertical shafts that ran parallel to each other throughout the ship. These vertical shafts in turn connected to a loop on each deck, with extra loops to pick up the stubs on decks 8 and 10 in the primary hull and decks 25 and 31 in the battle section.

NUMBERING SYSTEM

The *Enterprise* has 15 turboshafts and around 10 cars in service at normal operational status. Each turboshaft was numbered, with individual stations on each deck designated by a two-digit numeral following the deck and shaft number: “Turboshaft 4, Station 6-02,” for instance, is on deck 6, and is the closest shaft to Transporter Room 1. Thus, within the primary hull, shafts 1 and 2 ran from the main bridge on deck 1 to deck 12, shafts 3 and 4 connected decks 2 through 16, and shafts 5 through 8 linked decks 4 to 14. In the secondary hull, shaft 9 linked decks 8 through 24, while shafts 10 to 11 connected deck 8 all the way through to deck 31. Main engineering was accessed from shafts 12 and 13, which connected shafts 25 through 42, and shafts 14 and 15, running from deck 25 to 36.

At most locations, and especially terminuses, extra shaft space was built so that cars could bypass each other or be stored side-by-side, as in the case of the route ends on the main bridge. Such was the shaft routing efficiency that the number of cars could be doubled during alert situations or shift changes with only a 22 percent loss in response time.

The exception to the primary design rule was the dedicated emergency turboshaft route from the main bridge’s starboard station on deck 1 down and laterally back to the battle bridge on deck 8, atop the secondary hull’s upper hood. The system also included an auxiliary shaft from below, with at least one backup route that can be accessed from deck 17 en route from main engineering.

In an emergency, crew members could leave the turbolift through a hatch in the roof and use a ladder on the inside of the shaft to reach the next doorway.

SECURITY ALERTS

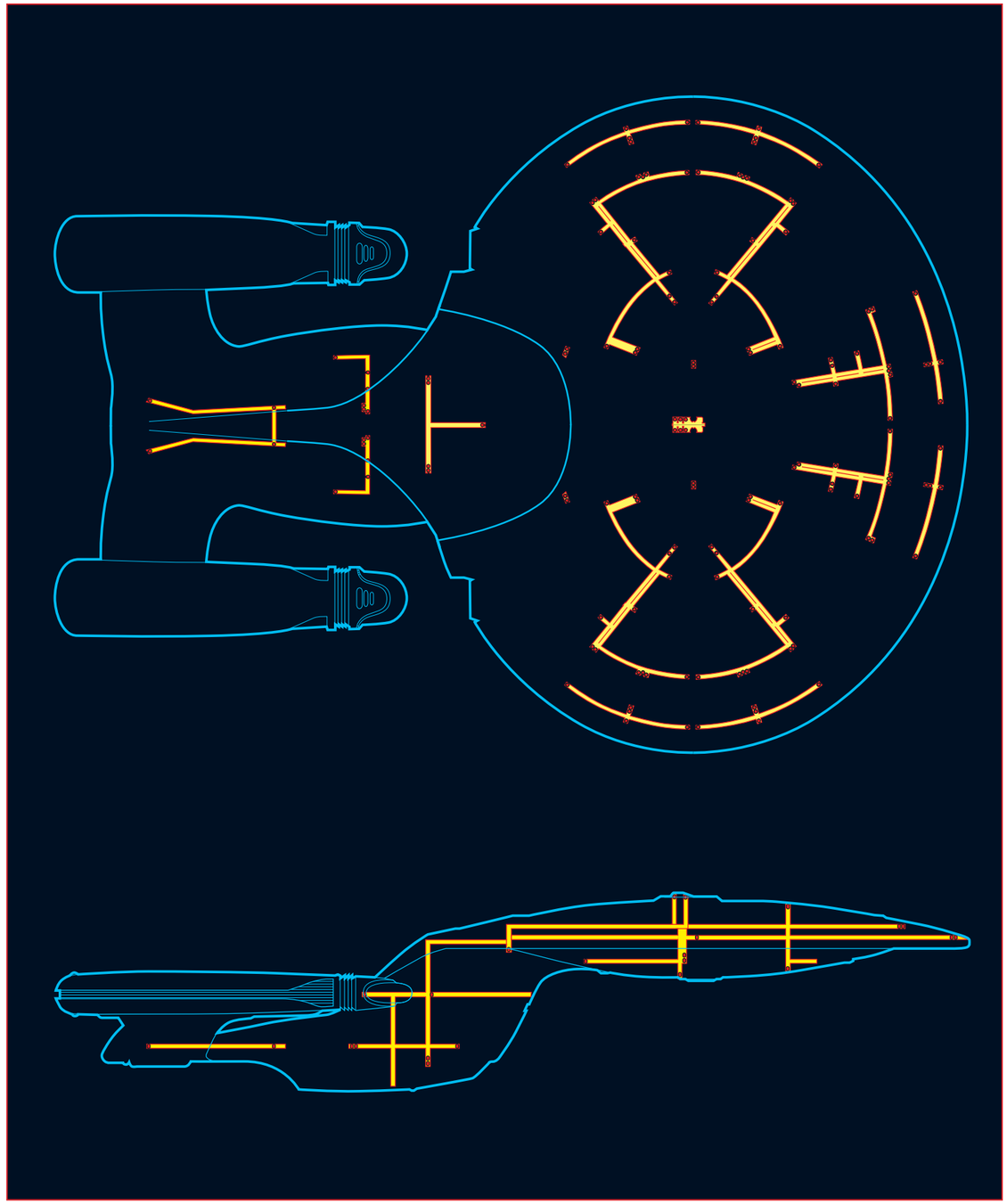
Turbolifts featured prominently during internal alerts due to the very nature of the access they provide. Thus, a command for a full security alert could shut down the lift system (as well as transporters and shuttlebays) and limit the movement of hostile escapees or intruders, although the individual system must be specified. In catastrophic cases such as a hull breach, isolation protocols provided for ‘confinement mode,’ in which turbolift cars are held in place so emergency bulkheads could close off the shafts: two large clamps on opposite sides of the car locked into the recessed beam in the shaft. With lift shutdown, the Jefferies tube crawlways provided the only access between decks. Additionally, in the case of an emergency or lift malfunction, all turbolift shafts were provided with access ladders and emergency lighting, enabling trapped passengers to climb to safety.

TWO-WAY TRAFFIC

The upper end of Turboshaft 2 – the aft bridge shaft portside – featured a hard-connect port for starbases and other Starfleet facilities. Thanks to standardized designs fleetwide, once docked in this way, a ship’s turbolift cars could traverse directly to the base and vice versa, easing traffic flow from departing personnel and incoming visitors.

As with all ship specifications, of course, variations from vessel to vessel were seen over time. Aboard the *Enterprise*, at various times the aft hard-connect shaft on the bridge was numbered as 4, not 2, and Turboshaft 9 extended all the way to deck 36 and main engineering. Moreover, at one time Turboshaft 3 was the designation for another tube that connected deck 22 to the bridge in about 6 seconds.

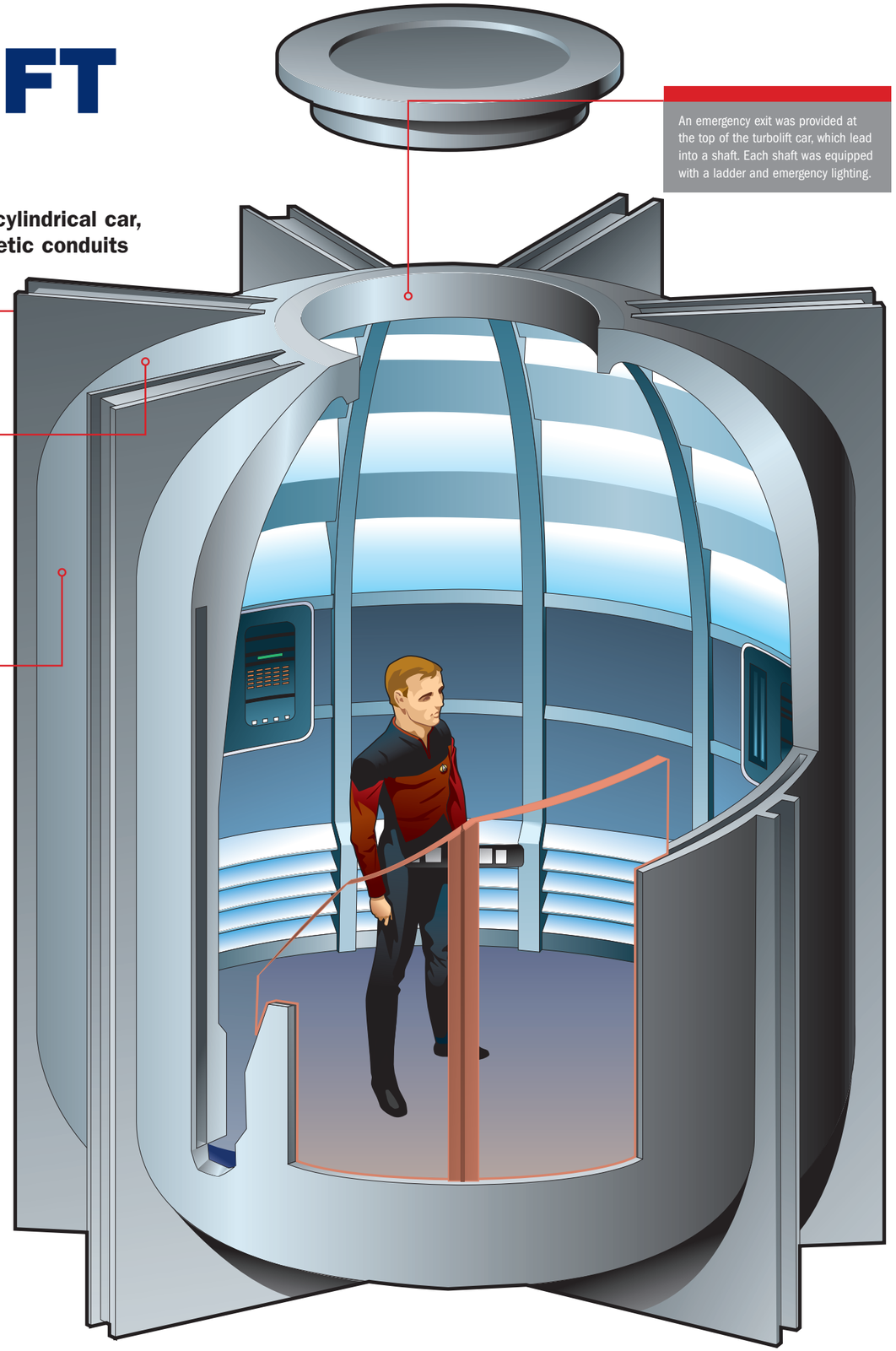
TURBOLIFT TRANSPORT SYSTEM



Turbolift cars represented advanced Starfleet engineering at its simplest, facilitated by an efficient network route design to get them around the *Enterprise*-D.

TURBOLIFT CAR

Three linear induction motors power the cylindrical car, which obtained energy from electromagnetic conduits fitted along each turboshaft.



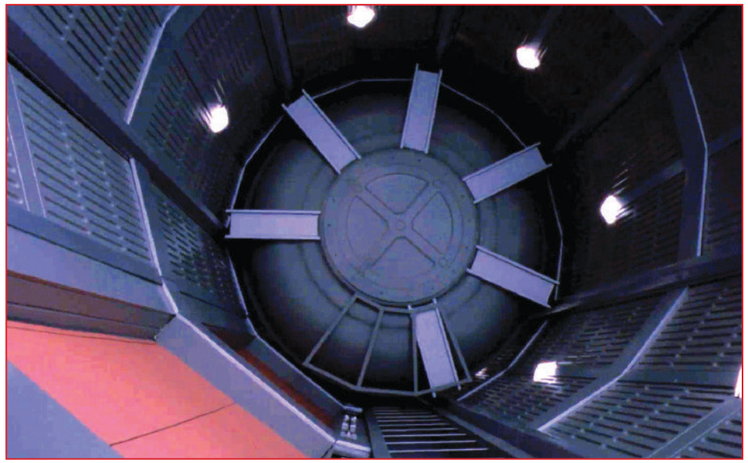
An emergency exit was provided at the top of the turbolift car, which lead into a shaft. Each shaft was equipped with a ladder and emergency lighting.

The turbolift car had a basic, streamlined bullet-shaped design.

Cars had a lightweight duranium-composite framework with the cab formed of microfoamed duranium sheeting. .

The turbolift network allowed the *U.S.S. Enterprise's* crew to reach their required destination in seconds. The bridge was only accesible by turbolift and through the network of Jefferies tubes.

Crew members often discussed their concerns with one another during their brief turbolift journeys.



The turbolift shafts were designed with wall lighting and ladders for rare cases of breakdown.

The car's emergency exit was via a hatch in the roof that led to the shaft.

BATTLE BRIDGE

The battle bridge in the stardrive section was a duplicate of the main bridge in the saucer section: an autonomous command and control center with its own captain and crew.

The *U.S.S. Enterprise* NCC-1701-D was fitted with a duplicate bridge that provided the stardrive section with its own center of operations during periods when saucer separation procedures had been initiated. This was known as the battle bridge, and was located on deck 8 at the top of the stardrive section.

DEPLOYMENT

The battle bridge was normally only used to control the stardrive module in heavy combat situations, but it could be used to control the entire *Enterprise* if the main bridge in the saucer section had sustained damaged and was unavailable. As with the main bridge, the battle bridge was supported by a nearby captain's ready room and conference lounge.

REPLACEABLE MODULE

The battle bridge was a replaceable module and could be separated from the stardrive section, but only after the saucer module had been separated. On the *U.S.S. Enterprise*, the battle bridge was replaced twice during the lifetime of the ship. This swapout was achieved through a series of steps separating the battle section head, stardrive section, and battle bridge module. The end result allowed for a complete module upgrade that could be tested to ensure the highest level of defensive readiness.

BATTLE READY

Main command functions of the *U.S.S. Enterprise* NCC-1701-D were transfered to the battle bridge at several points during its lifetime. Command was taken by Captain Picard, Commander Riker and Lieutenant La Forge on various occasions following saucer separation.

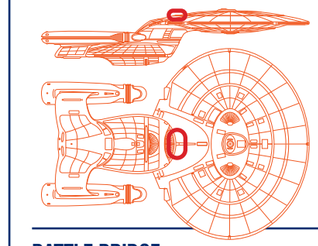
The battle bridge was normally commanded by the ship's captain. A senior officer, usually the first officer, took control of the saucer section following separation.

The design of the battle bridge was highly reminiscent of older Starfleet ships such as *Constitution*-class vessels, as it had fewer stations.

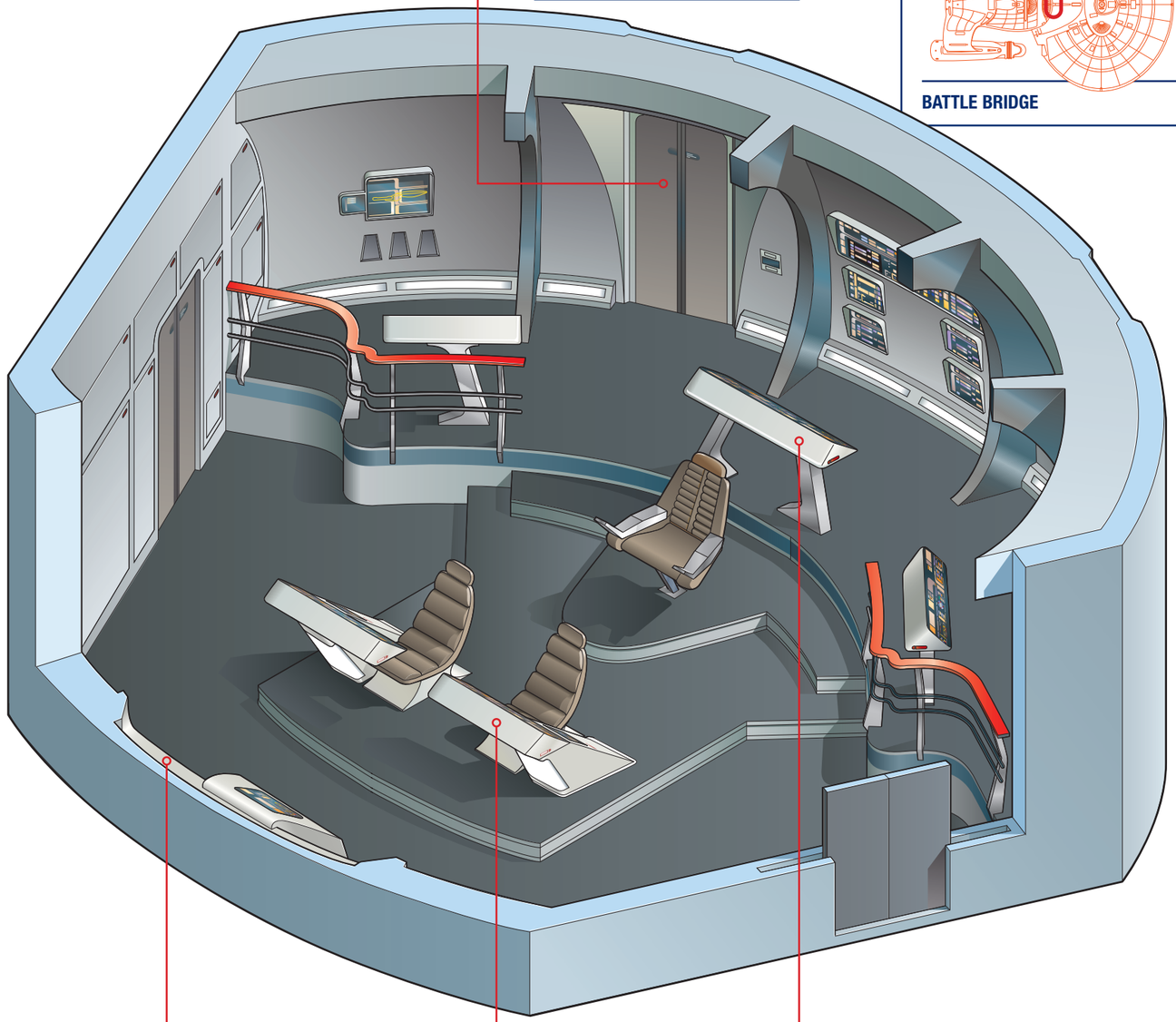
A dedicated emergency turbolift shaft linked the main bridge with the battle bridge.

UPGRADED

The battle bridge was remodeled before the *U.S.S. Enterprise*'s encounter with the Borg in 2366. The command consoles were moved closer together, and the number of monitors was increased.



BATTLE BRIDGE



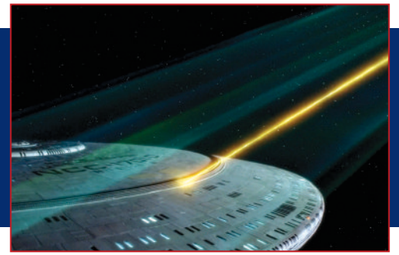
The main viewer on the battle bridge was smaller than its counterpart on the main bridge.

The battle bridge consoles duplicated all the controls on the main bridge. The conn and ops officers sat closer together, and a special tactical console was immediately behind the captain's chair.

The security officer manned the tactical station, which was directly behind the captain's chair. From here, the security chief could access all the weapons in the drive section, which included phasers and photon torpedoes. The saucer had similar weaponry.

WEAPONS AND DEFENSE SYTEMS

The *U.S.S. Enterprise* NCC-1701-D was equipped with several impressive defense systems that provided protection against natural and artificial hazards.



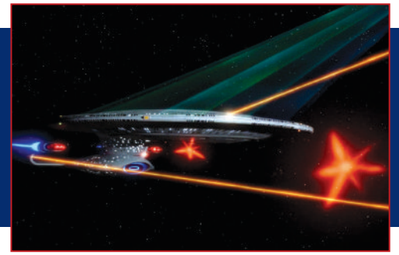
The *U.S.S. Enterprise*'s phaser banks were primarily used to defend the ship against aggressors.

PHASERS

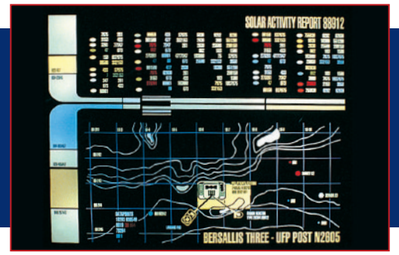
The main phasers on the *U.S.S. Enterprise* were rated as Type-X, and were capable of a 5.1 megawatt burst (personal phasers produce a 0.01 megawatt burst). There were 12 phaser arrays on the *Enterprise*, covering all sides of the ship, and the largest arrays, such as those on the top of the saucer section, consisted of 200 emitter segments. Phaser operations were controlled from the tactical station on the bridge.

PHOTON TORPEDOES

The *Enterprise* had three launcher tubes for photon torpedoes: one facing forward within the neck of the ship on deck 25, one facing aft above the support pylon wing on deck 35 and one in the saucer section. The launchers could be loaded with up to 10 torpedoes that could be fired simultaneously. The photon torpedoes used aboard the *Enterprise* had an effective range from 15 to nearly 3,500,000 km.



The *U.S.S. Enterprise* could fire photon torpedoes and phasers simultaneously.



The ship's computer used the data gathered by the sensors to form the best defense strategy.

COMPUTER SYSTEMS

The ship's computer tied all defensive systems together and assessed the variables that could change within seconds during combat. Codes were required by all crew to operate the main systems. Able to assimilate trillions of bits of information from a verbal request, the computer could make the difference between victory and annihilation. However, the computer was only as good as its orders; the human element was still all-important.

DEFLECTOR SHIELDS

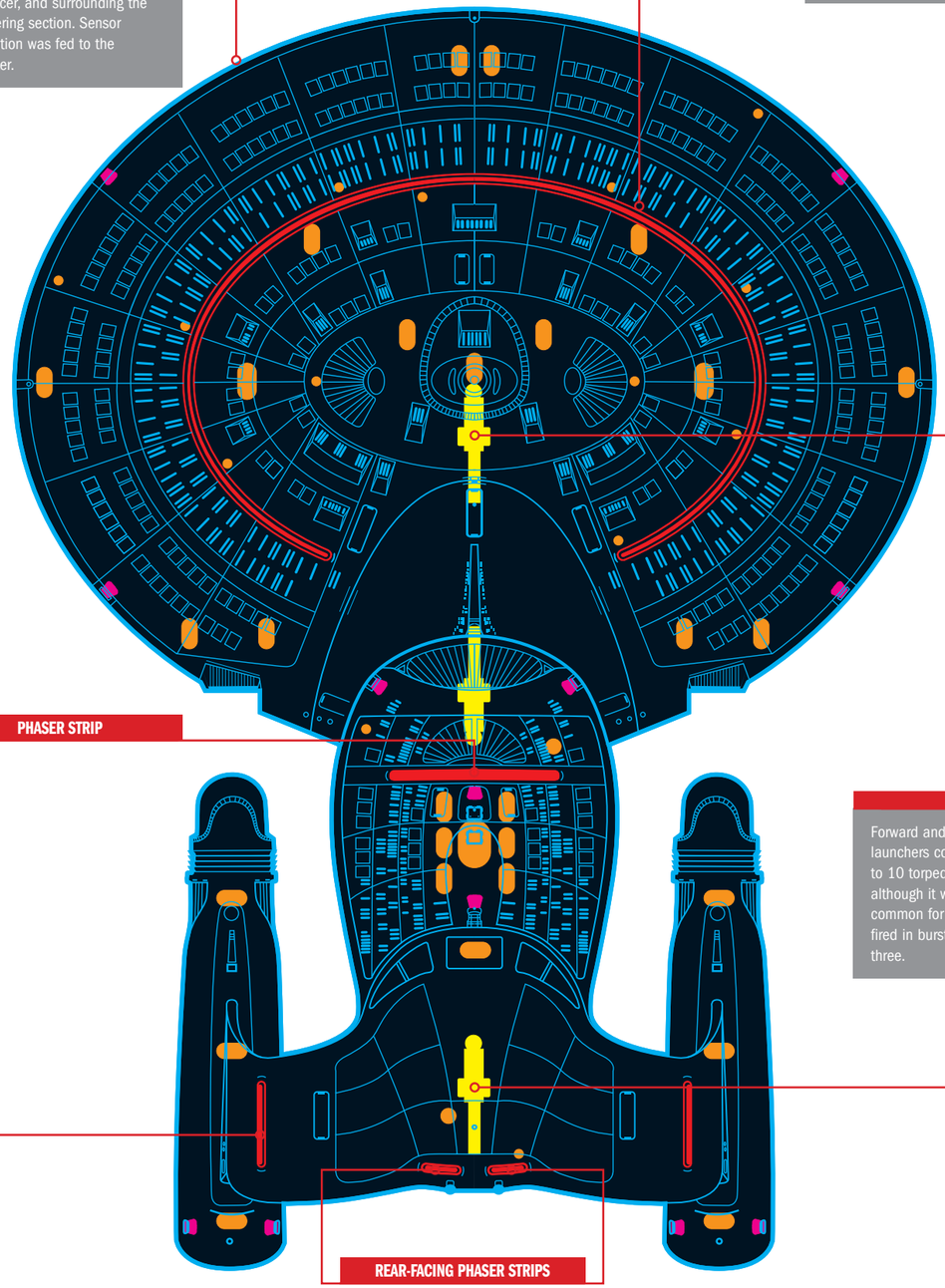
The deflector shields provided the *U.S.S. Enterprise* NCC-1701-D with a high level of protection from galactic objects and enemy fire in combat by using a highly localized spatial distortion. The deflector field was created by a series of conformal transmission grids on the ship's hull. Once the shields were up, the transporter could not be used to beam personnel off the ship.

The shield's main function was to protect the ship from enemy fire.

WEAPONS PLACEMENTS

Primary hull lateral sensors surrounded the saucer. Other sensors were located aft, under the saucer, and surrounding the engineering section. Sensor information was fed to the computer.

The ventral phaser array on the saucer module was one of 12 Type-X arrays surrounding the ship.



PHASER STRIP

REAR-FACING PHASER STRIPS

Forward and aft torpedo launchers could launch up to 10 torpedoes at a time, although it was more common for them to be fired in bursts of two or three.

PHASER ARRAYS

Galaxy-class starships were equipped with multiple phaser arrays situated at strategic locations to provide full 360-degree coverage in combat situations, capable of unleashing devastating firepower.

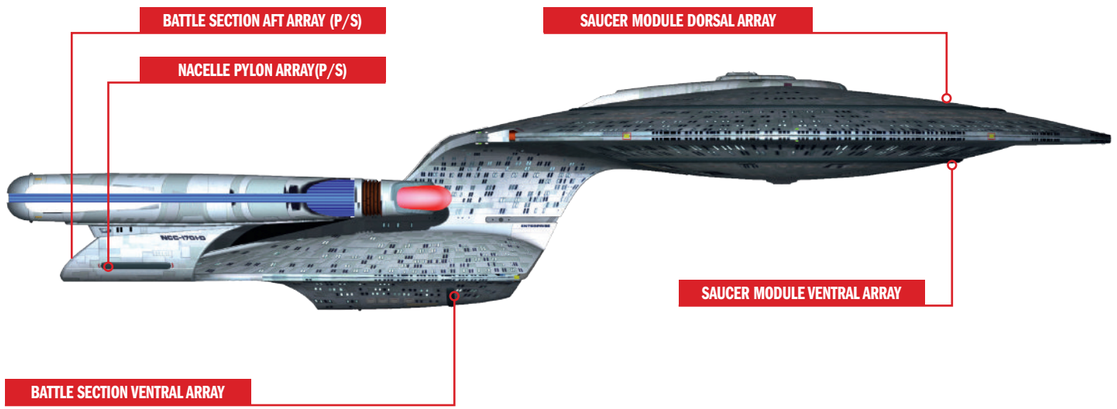
While Starfleet's overriding mission was one of peace and diplomacy, there were occasions when any starship captain has no choice but to enter into combat against hostile vessels. In addition to its complement of photon torpedo launchers, the *U.S.S. Enterprise* NCC-1701-D was equipped with 12 Type-X phasers located at various tactical points across both the saucer and main drive sections.

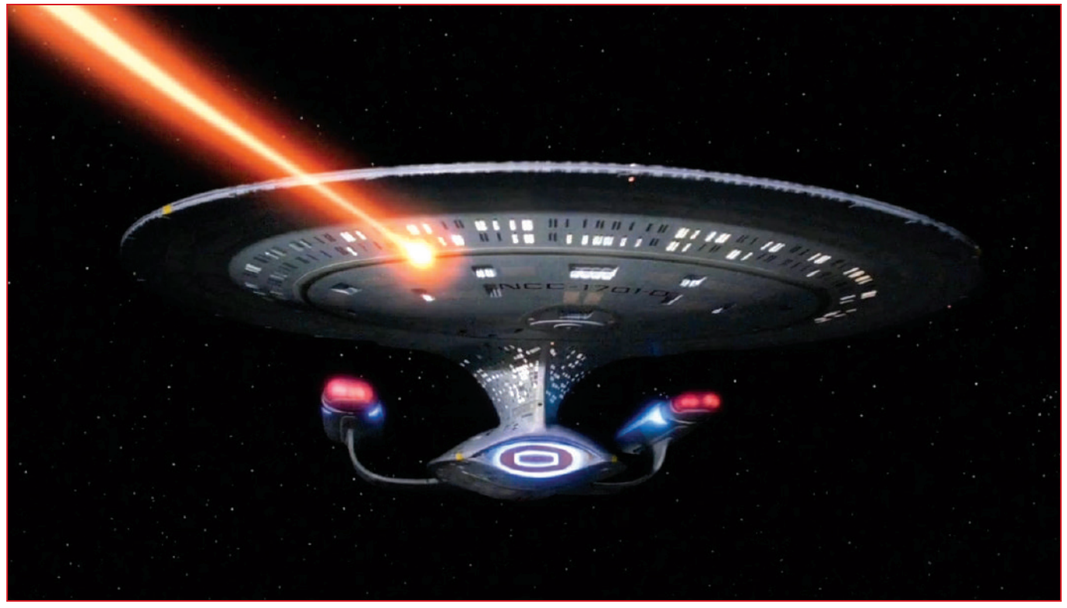
COMPLICATED ENERGY RELEASE

Phasers were utilised while a starship such as the *Enterprise* was operating at sublight speeds. Phaser was a common, catch-all term for an energy release process that was developed to supplant pure EM devices such as the laser and particle beam accelerators. The contemporary phaser used aboard the *Enterprise* had become much more sophisticated, with the term phaser very much a holdover acronym originating with the first use of the process – PHASed Energy Rectification. This referred to the original process by which stored or supplied energy entering the phaser system was converted to another form for release toward a target, without the need for an intermediate energy transformation. Although many developments of the weapon have been made since its introduction, this complicated energy release process remained essentially consistent in the current phaser effect.

The breakthrough in phaser technology occurred with the development of the rapid nadion effect (RNE), a process through which phaser energy was released. Short-lived subatomic particles, rapid nadions possessed properties conducive to high-speed interaction with atomic nuclei. This led to the ability to liberate and transfer strong nuclear forces within superconducting fushigi-no-umi crystals. The crystals were named by the Starfleet R&D team based in Tokyo when they perceived the materials being developed as representing a "sea of wonder".

PHASER BANK EMPLACEMENTS (STARBOARD ELEVATION)





The *U.S.S. Enterprise* NCC-1701-D firing the saucer module ventral phaser array. Phasers installed on *Galaxy*-class ships were rated Type-X, and were the largest available.

ARRAY LOCATION

The 12 phaser arrays located across the hull of the *Enterprise* provided a vast range of targeting and firing options to provide 360-degree coverage around the starship. The tactical station was given full, comprehensive assistance from computer targeting systems in selecting priority targets. With an effective range of 300,000km, the *Enterprise*'s phasers were capable of inflicting damage from a distance or close quarters, or even carrying out precision drilling operations directly into a planet's surface from orbit.

The main phaser arrays were located in a near-360-degree perimeter on both the dorsal and ventral hulls of the saucer section. The main dorsal array comprised 200 separate emitters capable of outputting a 5.1 megawatt burst.

Multiple phaser arrays were located at points on the main drive section: two aft arrays situated near the saucer section's impulse engines, individual arrays mounted on both port and starboard warp nacelles, a single array on the ventral hull of the main drive section and aft arrays in the vicinity of the photon torpedo launchers.

In separated mode, the main drive section was able to utilise the phaser array mounted at the fore 'snake-head' section of the hull, an option only available when full saucer separation had been achieved.

ARRAY COMPONENTS

In cross section, a typical phaser array resembled a thickened Y shape, capped with a trapezoidal mass of the actual emitter crystal and phaser-transparent hull antierosion coatings. The base of each segment was situated within a structural honeycomb channel of duranium 235 and supplied with supersonic regenerative LN2 cooling.

The EPS submaster flow regulator was the principal mechanism controlling firing power levels, which led into the plasma distribution manifold (PDM). This branched into 200 supply conduits which fed an equal number of prefire chambers. The final component of the system was the emitter crystal.

All phaser arrays were supplied with primary power from the warp reaction chamber while the *Enterprise* operated in cruise mode. Supplementary power could be drawn directly from the impulse engines.

PHASER OPERATION

Primarily used defensively, the *Enterprise*'s phaser arrays landed single or multiple beams to inflict damage upon a target vessel or structure in an attempt to disable or, in extreme situations, completely destroy. The Type-X phaser was highly adaptable, able to perform multiple functions from active low-energy scans to high-velocity ship-to-ship combat operations.

The ship's main computers played a vital role in determining performance levels of any phaser firing, utilising an extensive range of practical and theoretical scenarios. Once commands had been issued by the relevant officer, computer-controlled artificial intelligence routines established the necessary power levels and discharge configuration.

Entering combat was only ever used as the last option available to a responsible starship captain. However, when needed, a *Galaxy*-class vessel such the *Enterprise* was more than equipped to defend itself when the situation arose.

PHOTON TORPEDOES

The photon torpedo was developed as a tactical weapon to be used primarily while a starship is traveling at warp speeds; a mission situation when phasers are ineffective.

Photon and quantum torpedoes were explosive weapons that, unlike phasers, could be fired when a ship was traveling at warp speed. They were carried as standard on most Federation starships and are often fitted to space stations such as *Deep Space 9*.

The standard photon torpedo took some time to develop. Although casing and delivery systems for such a weapon were in place early in the 23rd century, Starfleet had difficulty designing a torpedo in which the matter/antimatter charge would be rapidly and totally destroyed. Early models of photon torpedo had a range of 750,000 km, and had a relatively low explosive yield.

STANDARD DESIGN

A much more powerful photon torpedo was introduced in 2271. This model had an effective range of 3,500,000 km. This range could be extended, but because the torpedo's engine drew fuel from the matter/antimatter tanks it could be done only at the expense of the torpedo's destructive power.

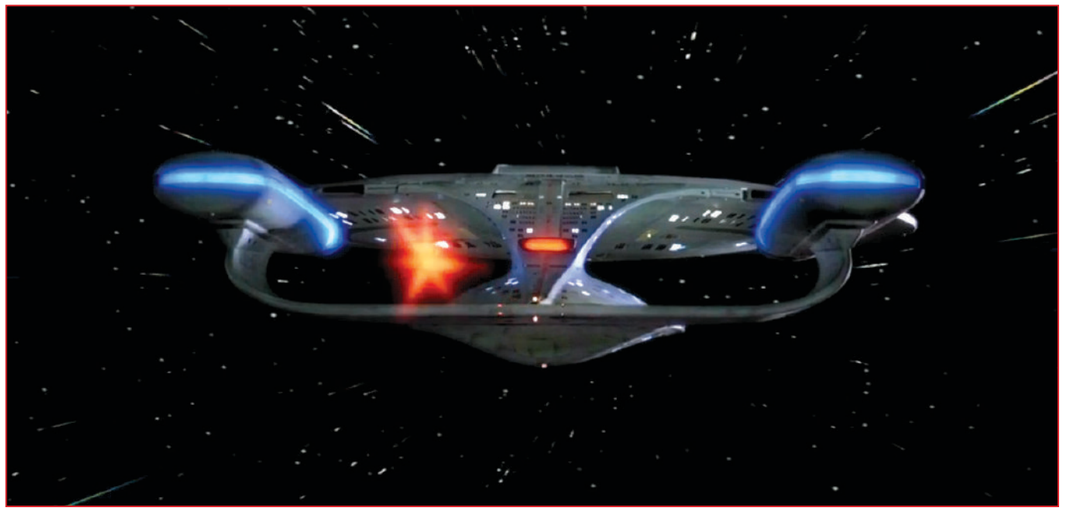
Refinements were made over the years, but the photon torpedoes in use by *Galaxy*-class starships such as the *U.S.S. Enterprise* NCC 1701-D remained basically of this standard type. The torpedo contained matter and antimatter packets, which were usually delivered at warp speed by a small matter/antimatter fuel cell, then thrust together to cause an explosion.

If the occasion called for it, photon torpedoes could be used in concert with the ship's phasers. Phasers could 'soften up' a target's defensive shields, allowing a torpedo to penetrate outer shield layers. In cases such as this the target would be vaporized rather than merely fragmented.

The standard photon torpedo carried by *Galaxy*-class starships was a lozenge-shaped casing made of molded gamma-expanded duranium and a plasma-bonded terminium outer skin. The basic casing was then modified by precision phaser cutters.

COMPONENT PARTS

When used as a weapon, the torpedo casing contained the matter/antimatter explosive material, target acquisition, guidance, and detonation assemblies, and a warp sustainer engine. However, the torpedo could be adapted for many uses, depending on what the case was packed with.



Photon torpedoes were often used as a defensive weapon to attack pursuing ships while traveling at warp speed. The aft launcher could launch multiple torpedoes as required by the mission situation.

PHOTON TORPEDO MARK IV

CONSTRUCTION

The photon torpedo carried aboard the U.S.S. Enterprise-D was made of molded gamma-expanded duranium with a plasma-bonded terminum exterior shell.

The standard photon torpedo came into use in 2271. These photon torpedoes were superior to their predecessors, with a much greater range, and could be used as an effective offensive weapon.

Starships carry a large stock of torpedo casings. A *Galaxy*-class ship carried more than 250 casings, all of which could be fitted with an explosive charge.

Because of its small size, the warp sustainer engine was not a true warp engine, and was more accurately described as a matter/antimatter fuel cell. If the photon torpedo was launched when the starship was traveling at warp speed, the sustainer coils in the fuel cell acquired warp velocity from the torpedo launcher tube.

The matter and antimatter were carried aboard the torpedo in tiny packets; this method increased the effective contact area by three orders of magnitude over the same amount of matter and antimatter carried in large chunks. As a safety measure, the matter packets and antimatter packets were carried in widely separated parts of the torpedo until just after launch.

While the photon torpedo carried a maximum of only 1.5 kg of antimatter, the use of packets yielded destructive power greater than that caused by a *Galaxy*-class antimatter pod rupture.

DEPLOYMENT

Galaxy-class starships regularly carried 275 basic torpedo casings, each of which could be modified for specific use.

Galaxy-class starships had three torpedo launchers: a saucer module launcher, a forward launcher, and an aft launcher. Torpedoes were loaded with fuel four at a time, and each launcher could fire as many as 10 torpedoes simultaneously.

Torpedoes were directed by the tactical officer and ship's computers, working together with computers and sensing devices aboard the torpedo itself. Under emergency conditions, when saucer separation became necessary, control of the launch tubes was immediately given to the duplicate situation controller aboard the battle section. Because photon torpedoes were semi-autonomous, initial accurate aiming was not important. Working together, onboard computers and sensors would help a torpedo find its designated target.

Photon torpedoes of a *Galaxy*-class starship had an effective tactical range between 15 and approximately 3,500,000km. When firing at a target within 25wkm, a starship would automatically break away immediately after launch to prevent damage to itself.

ADVANCES

Quantum torpedoes were a more powerful form of the same basic device, which have been introduced on the latest Starfleet vessels. They are carried by the *U.S.S. Defiant*, based at *Deep Space 9*, and by the latest *U.S.S. Enterprise*, the *Sovereign*-class NCC-1701-E.

DEFENSIVE SHIELDS

The *U.S.S. Enterprise*-D's shield grid provided extensive protection from hazards encountered in routine missions and powerful defense against the weaponry of hostile enemy vessels.

The *U.S.S. Enterprise* NCC-1701-D was protected by an extensive coverage of tactical defensive shields that operated in a variety of modes depending on mission parameters and level of alert condition. Shields provided protection to the ship and crew during routine cruise operations, and became an essential element of combat situations in repelling the weaponry of hostile vessels.

The shield grid effectively created a protective skin around the *Enterprise*, closely corresponding to the shape of the starship, creating an area of focused spatial distortion. Within this spatial distortion an energetic graviton field was generated and maintained. When taking impact from an object or weapon, energy from the field concentrated around the impact zone, leading to an increase in localized spatial distortion in that area.

FIELD GENERATORS

The shield grid was established and maintained by a network of field generators located across both the saucer and main drive sections of the *Enterprise*. Five field generators were located on deck 10 of the saucer section, with a further three located on deck 31 of the main drive section. The warp nacelles added two more generators to the grid, the generators' output phase-synchronized through a network of subspace field distortion amplifiers.

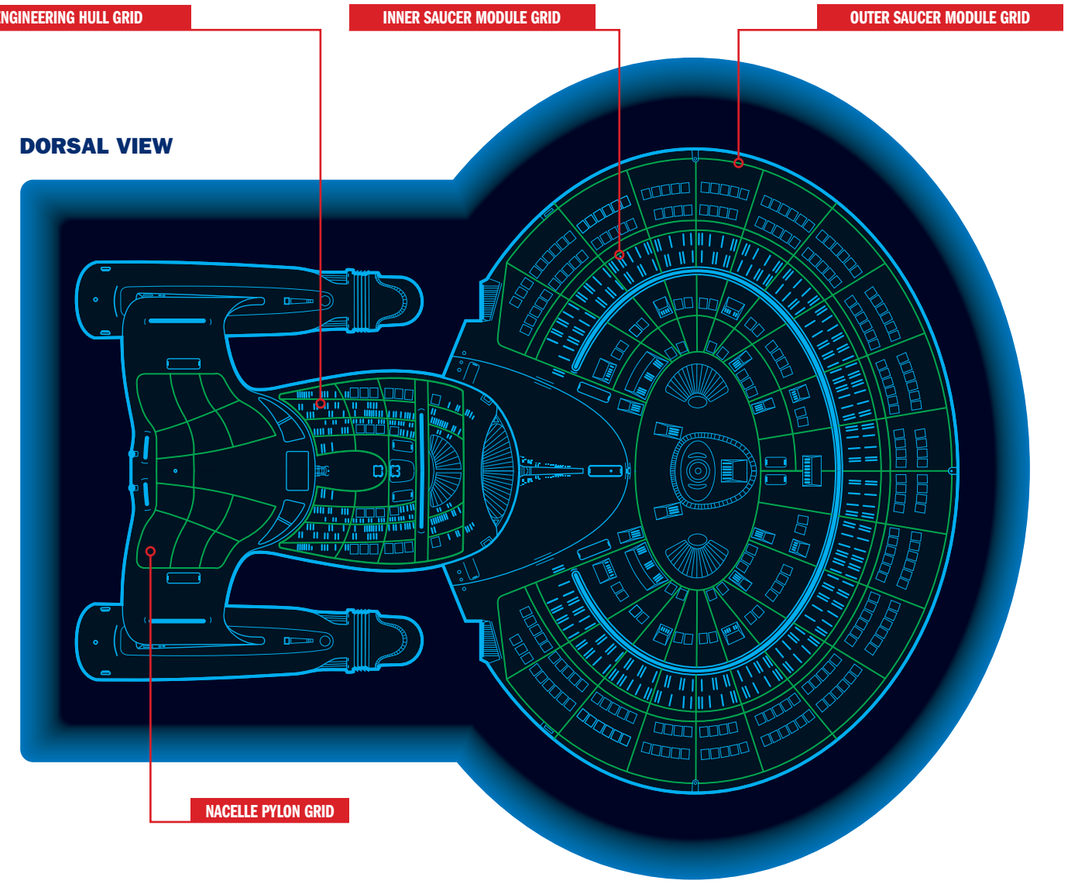
During normal flight status, standard procedure required one shield generator to be active in each main section of the ship, while alert situations required all generators available to be powered to standby if required.

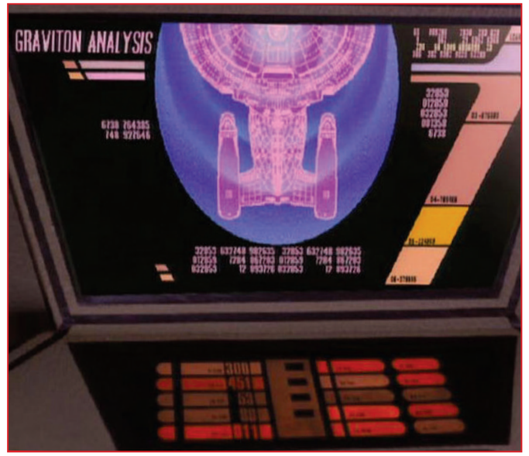
Alert condition brought the shield grid to full defensive operation with an increase of at least 85 percent of generator output. The rotation of a generator's shield modulation frequency (measured in megahertz) kept the possibility of an enemy ship matching its weapons' to that frequency and directly penetrating the shields. This tactic was successfully employed by Lursa and B'Etor of the House of Duras in 2371 when obtaining the exact frequency harmonics of the Enterprise's shields via a link to Lieutenant Commander La Forge's VISOR. This allowed their bird-of-prey to fire torpedoes directly through the ship's shield grid to inflict heavy damage that ultimately led to the *Enterprise*-D's destruction.

Transporters were usually unavailable when shields were raised, with personnel unable to beam to or from the ship. However, in 2367, experienced transporter chief Miles O'Brien used his skills to beam from the Enterprise onto the shielded *U.S.S. Phoenix* using the brief 'EM window' between rotating frequency harmonics that allowed for sensor scans through raised shields. This operation was not recommended as part of transporter operating procedure.

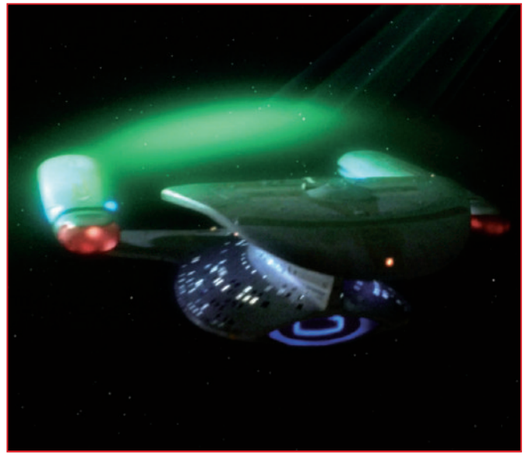
The *Enterprise*-D's shields reacting to an attack by a Borg cube.

U.S.S. ENTERPRISE NCC-1701-D DEFLECTOR GRIDS





Graviton Analysis of the *Enterprise*-D's shields.



The shields employed to repel a Borg tractor pulse.

AUTODESTRUCT SYSTEMS

The autodestruct system could be initiated from a number of locations around the ship. In 2364, Captain Picard and Commander Riker activated the sequence from main engineering.

Starfleet learned through experience that it was sometimes necessary to destroy its ships to prevent them falling into enemy hands, or as a last resort in other dire situations. Accordingly, *Galaxy*-class starships such as the *U.S.S. Enterprise* NCC-1701-D were fitted with systems that allowed the ship to be vaporized.

REDUNDANT SYSTEMS

Galaxy-class ships had two independent autodestruct systems that ensured the vessel could be completely destroyed even if the saucer had been separated; autonomous subprocessor nodes located around the vessel ensured that the autodestruct sequence could still be activated and carried out in a situation where the main computer had been disabled.

The primary autodestruct system was designed to vaporize the ship with an enormous matter-antimatter explosion, which was created by initiating a controlled release of the warp engine reactant materials. This produced a massive mechanical and thermal shock that destroyed the ship rapidly and completely.

FINAL MOMENTS

When the autodestruct sequence entered the final phase, the computer generated a deliberate cascade failure in which all the warp engine safety interlocks were compromised. All the antimatter in the storage pods on deck 42, and the matter in the primary deuterium tanks was released simultaneously. This generated an explosion that was roughly equivalent to the explosive force of 1,000 photon torpedoes. The amount of energy released was in the region of 1,015 megajoules. This was significantly greater than the amount of energy normally released as the result of the antimatter containment loss, and it ensured that the ship and any valuable technology aboard the vessel were completely eliminated.

If the computer could not send the necessary instructions to the engineering system (for example, if the command links were severed), the ship was equipped with a backup autodestruct system. This secondary system was somewhat more primitive. Ordnance packages were fitted to various locations, including the antimatter storage pods. If necessary, they could be detonated, releasing the antimatter. At the same time, the secondary system could deliberately overload the fusion reaction chambers. This would generate an explosion equivalent to that of 500 photon torpedoes, approximately 109 megajoules. Although this was only half as powerful as the primary autodestruct system, it was more than enough to vaporize the ship.

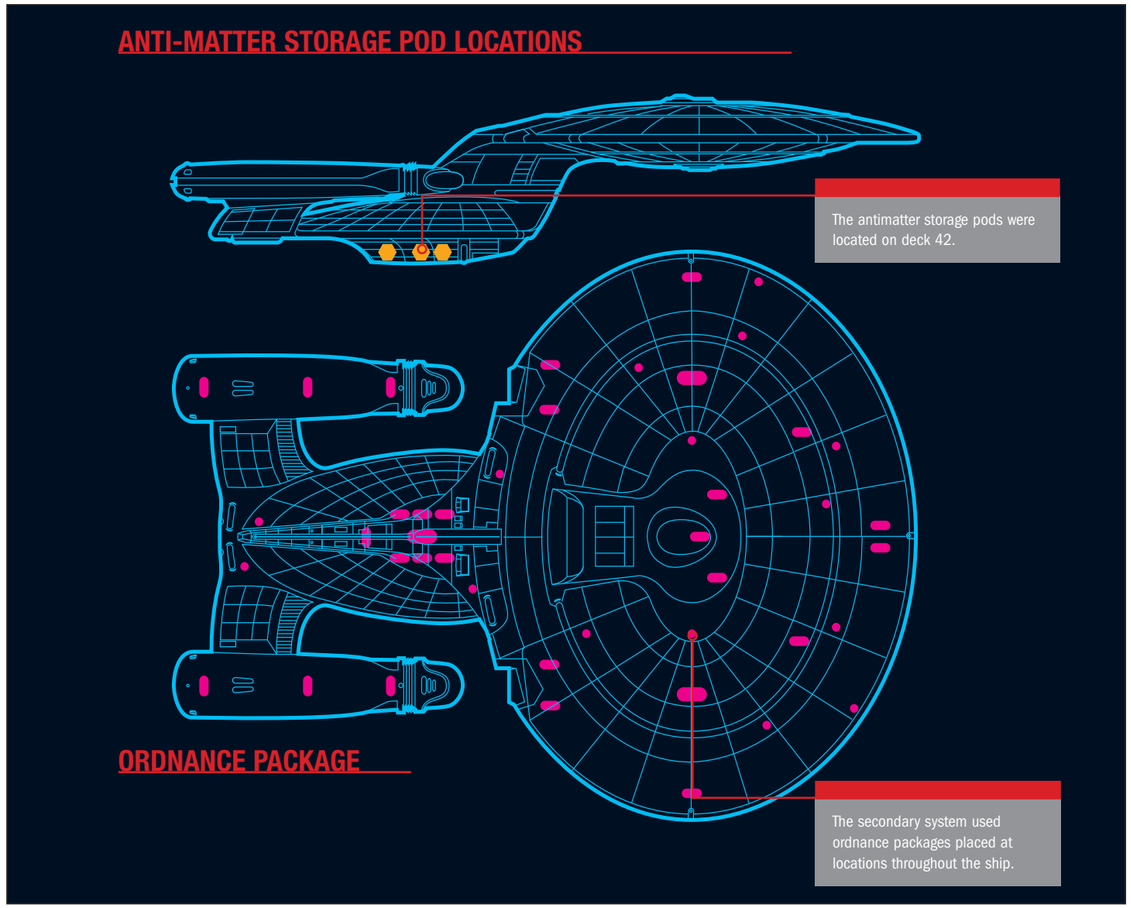
SEPARATE HULLS

Because the primary autodestruct sequence used the antimatter storage tanks in the engineering hull, it could not be used to destroy the saucer section when the ship was in separated flight mode. However, the secondary system was sufficient to destroy the saucer on its own, and this became the saucer's primary auto-destruct system when the two parts of the ship were not joined.

The autodestruct requires authorization from two command-level officers, normally the captain and first officer.

Starship security measures require the command-level officers to verify their identities with a dermal print.

SYSTEM LOCATIONS



MAKING THE DECISION

In combat it was normally only deemed necessary to destroy the ship when all propulsion and weapons systems had been disabled and there is little or no prospect of assistance from other Federation vessels. Computer models had also shown that it might be necessary to destroy the ship if navigational control had been lost and it was on a collision with a populated area. The decision to activate the autodestruct systems rests with the ship's commanding officers.

The autodestruct sequence required authorization by at least two command-level officers. If the captain and first officer were dead or disabled, the computer would automatically look for the next highest ranked officer; however, it would not accept an autodestruct order from an officer below the position of operations manager.

To activate the sequence, the two most senior command officers instructed the computer to begin the autodestruct procedure, and then confirm their identities with a dermal imprint or by giving their personal access codes. Once the the computer had verified their authority, the senior officer gave the command to set the autodestruct sequence. The computer asked the other officer if he or she agrees, and, if they do, the senior officer set the duration of the countdown until the system is activated.

The computer informed the crew of the time remaining until the ship is destroyed by making repeated audio announcements and producing graphics on displays throughout the vessel. The two initiators of the procedure could order a silent countdown if desired.

ABORT PROCEDURE

The autodestruct sequence could be aborted at any time before the countdown reached zero and the ship was destroyed. But the abort order required both officers who initiated the autodestruct to be in agreement.

PHASER RANGE

Proficiency in hand-held weaponry was an essential part of a Starfleet officer's skillset. Logging hours on a starship's phaser range helped crewmembers maintain their marksmanship.

The *U.S.S. Enterprise* NCC-1701-D was equipped with two phaser ranges, where personnel could maintain and enhance their weapons proficiency with regular target practice.

It was important for the Starfleet crew to keep their eye keen, as they were tested at regular intervals as part of their continuing training, so that they would be fully prepared should a combat situation arise.

The phaser ranges were located on deck 4 of the ship, and each consisted of a large dark room with an illuminated circular platform in the center. The user would stand within the circle, which was about three meters in diameter, and fire at holographic targets that appeared at random in the darkness around them.

SHOOTING COMPETITION

The central platform was divided into two semi-circular areas; one blue; one yellow. If there were two users, they could compete to see who scored the most hits.

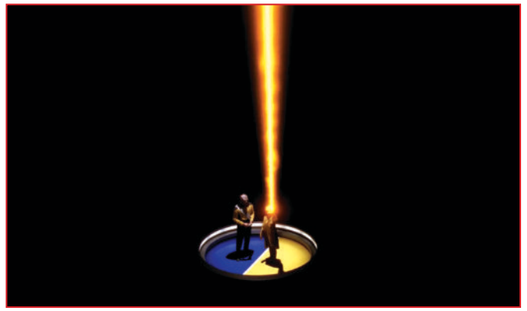
The targets were small, colored lights; some appeared only briefly, while others moved around the room at speed. The targets generated a sound that indicated their nature and distance from the firer. When hit, they emitted another noise that signaled that they had been destroyed; misses were signaled by another sound.

RULES AND REGULATIONS

The user was not restricted to firing at targets on his or her side of the platform, although they were not allowed to step into the other user's territory. The user was not intended to fire at all of the targets, as some colors indicated a 'friendly' target; this helped to hone their ability to reason as well as sharpening their reactions.

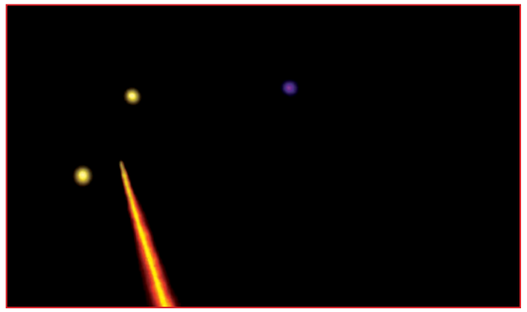
The phaser range's targets were controlled by the computer, but users could choose from a number of programs, and the difficulty level could be adjusted. Extremely adept officers, such as Lieutenant Worf, practiced at level 14, where some of the programs only lasted for one minute.

Many Starfleet personnel found practicing on the phaser range a relaxing activity, and they enjoyed the routine, which resembled a game. But the phaser range was not restricted to Starfleet personnel; some civilians, including Guinan, also enjoyed using it.



Targets appeared in various locations around the range, and emitted a sound that alerted the user to their location and status.

Guinan's long life allowed her to become something of an expert with a phaser, and she proved to be an even better shot than Worf.



The targets were controlled by computer; some were static and appeared only briefly; others moved rapidly across the room.

SHOOTING GALLERY

The phaser range was designed to be used by one or two officers at a time. It was an oval room with a circular platform in the center; the users stood in the middle and fired at targets, which appeared around them. Officers typically practiced with hand phasers, although the room could also be used to practice firing phaser rifles.

MAIN DEFLECTOR

The primary function of the main navigational deflector dish on the *U.S.S. Enterprise* NCC-1701-D was to clear a path ahead of the ship as it made its way at high speeds through the Galaxy.

Tiny hazards at warp, or even impulse speeds, anything, from tiny micrometeoroid particles to larger objects such as asteroids, posed a major navigational hazard to Starfleet ships. Even repeated collision with stray hydrogen atoms could cause damage, so the *U.S.S. Enterprise* NCC-1701-D relied on its main navigational deflector dish to clear the path ahead. The significance of the deflector system cannot be overstated; it was an absolutely vital part of the ship's operation.

TRACTOR/DEFLECTOR EMISSION

The main navigational deflector operated by generating a deflector beam in front of the ship that swept hazardous material out of the way.

The deflector beam itself was a graviton beam that was focused and manipulated by a series of subspace field coils. This powerful tractor/deflector emission swept thousands of kilometers ahead of the ship, pushing aside not only small particles, but also larger objects that could present a hazard. The navigational sensors detected any objects that were too large to displace and made automatic course corrections.

In addition to the actual deflector beam, the dish generated a series of parabolic shields that extended approximately 2km in front of the ship; these low-powered fields were relatively static, and were designed to deflect stray hydrogen atoms and any submicron particles that the main deflector beam may have missed.

The deflector system was powered by three redundant high-power graviton polarity source generators situated on deck 34. These fed two 550-millicochrane subspace field distortion amplifiers, with the resulting energy being focused by the subspace coils through the deflector array.

SYSTEM ARCHITECTURE

The array, which was made up of a series of molybdenum-duranium mesh panels, was mounted on a duranium framework. Collectively, the array and the framework were referred to as 'the dish.'

The dish, and therefore the direction of the beam it emitted, could be steered by the navigational computer system. Its movement was controlled by four high-torque electrofluidic servos, which could move it as much as 7.2 degrees from the ship's X axis (a notional line drawn through the center of the vessel from the front to the back).

Because of the large amounts of power required by the deflector beam, the system generated significant subspace and electromagnetic radiation. Such fields sometimes affected the ship's sensor systems.

SENSOR ALIGNMENT

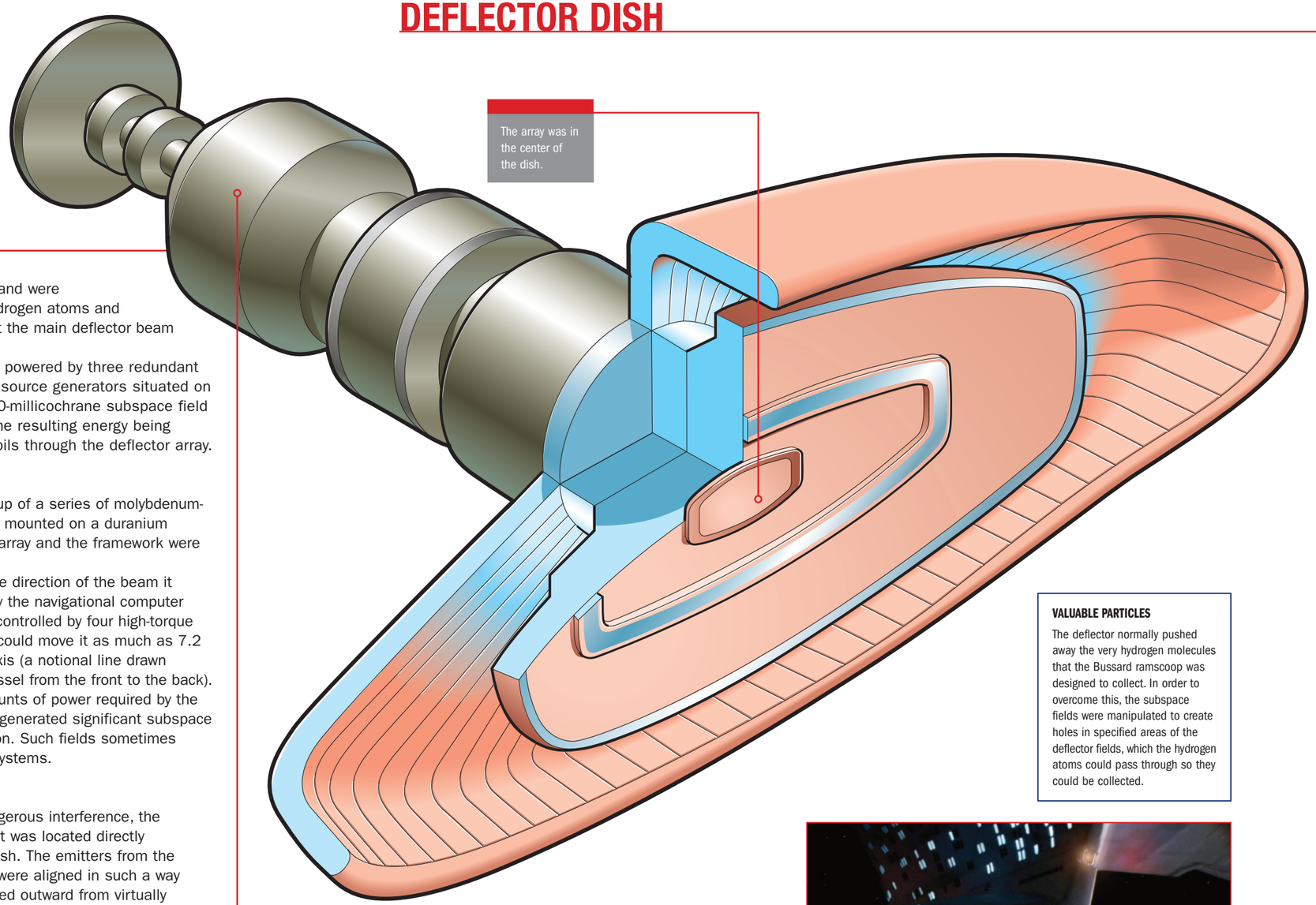
To avoid this potentially dangerous interference, the long-range sensor equipment was located directly behind the main deflector dish. The emitters from the sensors and the deflectors were aligned in such a way that both of their fields issued outward from virtually the same point, effectively allowing the sensors to look straight through the interference generated by the deflector systems.

A significant increase in power to the deflectors could still affect some of the systems, notably the subspace field stress and gravimetric distortion sensors, so the balance of power was carefully maintained unless there was an emergency.

If an unusual or dangerous situation occurred, the sensor dish could perform functions for which it was not specifically designed. Various fields could be channeled with great effect through its broad aperture, and these could be used as weapons or to remove anomalies.

The main deflector was used to fire a high-powered beam at the Borg in an unsuccessful attempt to disrupt the systems on the Borg cube.

DEFLECTOR DISH



The array was in the center of the dish.

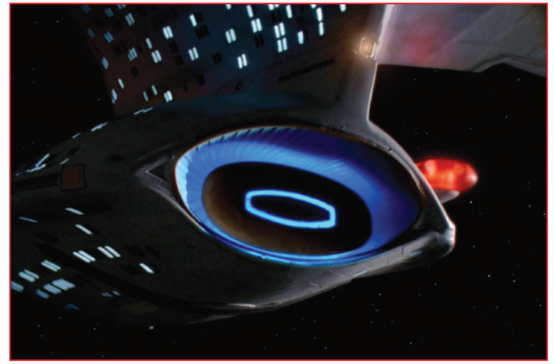
The deflector beam was created by generators on deck 34.

VALUABLE PARTICLES

The deflector normally pushed away the very hydrogen molecules that the Bussard ramscoop was designed to collect. In order to overcome this, the subspace fields were manipulated to create holes in specified areas of the deflector fields, which the hydrogen atoms could pass through so they could be collected.

POWER REQUIREMENTS

The deflector normally only tapped one of its three generators at a time. At faster-than-light speeds up to warp 8, the deflector used 80 percent of its output. At speeds greater than this, two deflector generators operated in phase sync. At impulse speeds, the deflector normally only outputted 27 megawatts.



In separated flight mode, the saucer section relied on four fixed-focus navigational deflectors. When the ship was in normal mode, these served as a backup to the main deflector dish.

NAVIGATION PROCEDURES

Navigating a starship required an enormous amount of data to help pinpoint the vessel's position relative to a fixed reference point in the Galaxy.

Federation starships navigate the Galaxy by combining a huge database of information with sophisticated onboard sensors that can pinpoint the vessel's position accurately. The *U.S.S. Enterprise* NCC-1701-D was capable of calculating its position relative to the Galactic center, or another 'fixed' reference point such as Earth, to within 10km; even at high warp, the ship could determine its location to within 100km. In close maneuvering of the kind required when docking, the *Enterprise* was able to maneuver within distances as accurate as 2.75cm.

NAVIGATING THE GALAXY

Navigational operations on the *Enterprise* were normally controlled from the conn after the commanding officer had given a destination or heading in one of five ways. The easiest method was to name the destination; when this was inputted into the conn, the ship's computers consulted the navigational database and plotted the ship's trajectory. Destinations ranged from planets and star systems to orbital facilities. If an area as large as a sector was specified, the *Enterprise*'s computers generated a flight path to the center of that area.

It was common for the conn to be given a moving destination, such as another ship. If the vessel was within sensor range, the computer could plot an intercept course. The conn officer inputted a velocity or intercept time, so that the course could be calculated relative to the position of the other craft.

Stellar cartography was a vital area aboard any starship. It gathered up-to-date information which supplemented the galactic condition database.

GIVING COORDINATES

Navigational instructions could also be given by specifying a destination's galactic coordinates; however, this method of navigation was rarely used, as it required personnel to either calculate or look up the relevant coordinate information.

Navigational orders were more often given as a relative bearing. This consisted of two figures which related to two perpendicular planes around the *Enterprise*: the first plane was horizontal, the second vertical. Each plane was divided into 360 degrees, with 0 degrees deemed to be straight ahead.

CHANGING ATTITUDE

Thus, if the *Enterprise* was given a heading of 000 mark 0, it would not change its course. On the horizontal plane, values increased to the starboard; in the vertical plane, they increased in the direction above the ship.

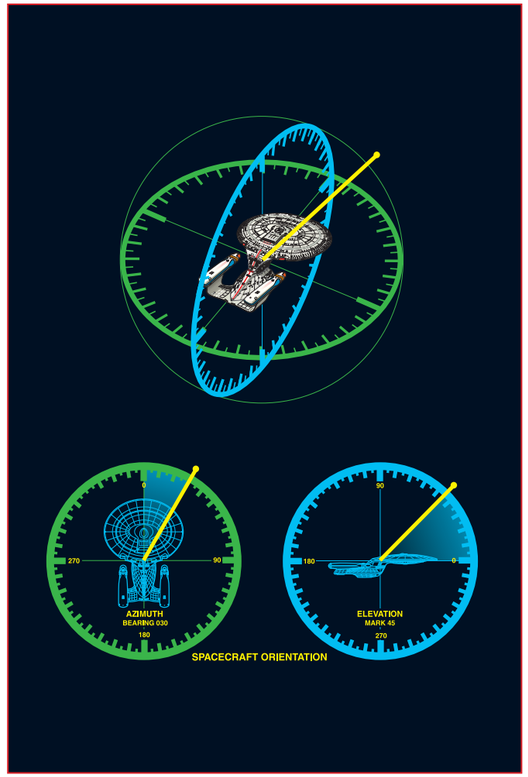
A heading of 150 mark 0 therefore meant that the ship would turn 150 degrees to starboard but not tilt up or down, and a heading of 150 mark 20 meant that it would turn 150 degrees to starboard and then angle its nose up by 20 degrees.

Navigational orders were also given as a heading. Again, this was stated as two figures, but these figures related to two planes around a notional line connecting the *Enterprise* with the center of the Galaxy. A heading of 000 mark 0 was directly toward the galactic center. This system was very similar to that used for navigating on a planet's surface, where headings were taken from the northern pole.

MAPPING SPACE

The instructions given might be simple, but calculating a course across interstellar distances is an extremely demanding task. This is because it is impossible to maintain an entirely accurate map of the Galaxy: all objects within the Galaxy are moving in their own direction, and many methods of observation involve a noticeable time lag.

Despite these difficulties, the Federation has charted a significant proportion of the Galaxy and uses information gathered from subspace relays, Federation vessels, probes, and sensor platforms to ensure that its map – which is known as the galactic condition database – is as up to date as possible.



Starfleet vessels often navigated through space via a bearing system that uses figures which relate to two planes around the ship. These combine to specify the intended direction.

Starfleet's stellar cartography division has plotted the position of stars well beyond the reaches of manned space exploration for many years. Facilities such as the Argus Array, located on the very edge of Federation space, gather data on the position and activity of star systems that are light years away from explored space. This data is constantly updated, and the new information transmitted back to Federation outposts.

Starfleet also updates its galactic database by regularly sending probes and deep space exploration vessels out into 'new' regions of space. These vessels record detailed information which is then transmitted back to other ships and Starfleet installations by subspace radio.

ADDING TO THE DATABASE

For example, the stellar cartography department on the *U.S.S. Enterprise* NCC-1701-D constantly observed changes in the position and movement of stellar phenomena across the Galaxy. When it reached a starbase or outpost, detailed logs were downloaded and transmitted back to Starfleet, and integrated into the galactic condition database. This was in turn distributed to all Federation vessels. Where accurate real-time information was not available, computers worked to predict conditions with reasonable accuracy.

COMBINING DATA

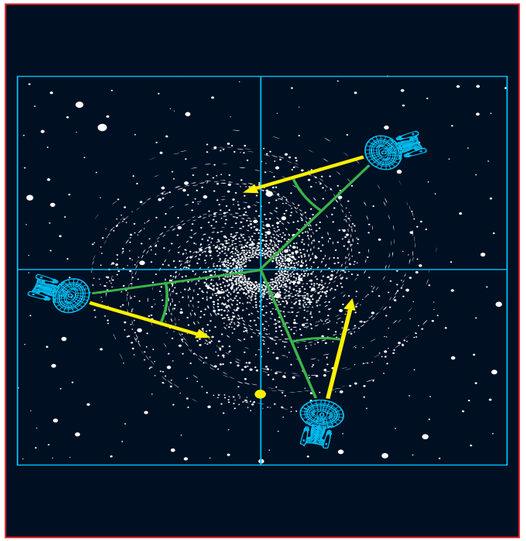
The navigational information which the *Enterprise* regularly received from the galactic condition database was combined with data gathered by the ship's own sensors on the position of stellar activity such as nebulae, pulsars, and a variety of subspace phenomena. These two sources of data were then combined to more accurately calculate the ship's location and the relative position of its destination.

The *Enterprise* was equipped with various sensors which ensured that reliable positional data could still be gathered even in difficult navigational conditions such as magnetic storms or solar flares.

During travel, it was essential for the *Enterprise*'s computer systems to be able to calculate velocity accurately in order to plot the vessel's position. An extensive network of Federation timebase beacons allowed the *Enterprise* to access the absolute time values used to calculate speed.

When the vessel was out of contact with the beacons, onboard timebase processors maintained records, but these were subject to some temporal distortion phenomena, and as soon as possible the *Enterprise* would synchronize them with a timebase beacon. Time distortion was particularly extreme at high impulse speeds, but the ship's guidance and navigation subprocessors could largely compensate for this.

When calculating a course, the *Enterprise* crew plotted a flight plan that avoided dangerous objects such as stars or other solid bodies. During travel, the computers constantly updated their flight plans, making the necessary course corrections as new information became available.



Galactic headings relied on knowing the relative position of the starship to the center of the Galaxy. Positions are given relative to a notional line drawn between the vessel and the galactic core. In this example, all the ships have a heading of 30 mark 0.

STELLAR CARTOGRAPHY

The *U.S.S. Enterprise* NCC-1701-D's stellar cartography room was an advanced scientific research area for providing accurate data for mapping stellar phenomena and new regions of space.

Like the vast majority of Starfleet vessels, the *U.S.S. Enterprise* NCC-1701-D was equipped to support a variety of scientific research teams. The ship itself could be viewed as a mobile research station: its primary mission was to explore the Alpha Quadrant, recording everything encountered along the way.

One of the many scientific departments aboard the *Enterprise* was stellar cartography. This department was responsible for stellar mapping, stellar observation, planetary surveys, and interstellar medium surveys for known and new regions of space encountered by the *Enterprise*. Stellar cartography was also responsible for the tracking, determination, and classification of the various stellar phenomena the ship encountered. The mapping of stars may seem to be dull, but it is in fact one of the most important functions of any starship's overall mission.

CELESTIAL STUDY

Secondary scientific research teams such as those assigned to stellar cartography focused work on the stars and planets in proximity to the ship; stellar mapping is not usually a mission in itself. However, due to the vast distances traveled, and the wealth of stellar phenomena encountered, the job is rarely dull. An assignment in stellar cartography aboard a starship is an opportunity for scientists to study a large number of celestial bodies.

The *Enterprise* had more than 40 sensor pallet assignments on the lateral array reserved for primary, mission-specific functions; these could be modified for secondary scientific studies. There were also 15 instrument-mounting positions within the long-range sensor array that were available for specific secondary scientific mission investigations.

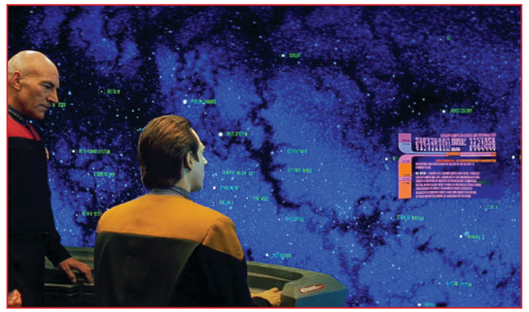
STELLAR MAPPING

A variety of skilled scientists have headed up stellar cartography, including Lieutenant Commander Nella Daren, who led the department aboard the *Enterprise* in 2369.

Stellar cartography crossed two decks. The actual mapping room was a circular room with a catwalk extending out to a small elevated platform in the center of the area. On the platform was a semicircular work station, comprising a control panel with a direct link to the main computer. This work station rotated to give the seated operator the best possible view of stellar space as it displayed on the walls of the room as a map. These were the room's only visible structures, but the area was actually a holodeck chamber, and the maps were displayed on the walls in the same way as one would call up a starscape as a romantic background in a recreational holodeck scenario.

The maps were displayed on approximately 75 percent of the wall area, accounting for the viewer's forward line of sight. The other 25 percent of wall area, behind the work station, held the entrance to the room and readout panels. The stellar maps themselves appeared as three-dimensional projections on the two-dimensional wall. The maps and varying perspectives adjusted depending on the viewer's required specifications and on which type of image best suited the research being carried out.

Other information was displayed on a superimposed overlay that appeared similar to the other console readouts throughout the ship. Specific portions of space the viewer wished to see in greater detail could be located by the mapping computer, targeted with a bullseye graphic, and then enlarged with adjusted perspective.



Console displays were placed over the map. These provided data on the area under study which may have a bearing on the research being carried out.

Stars could be displayed as pinpricks of light, or the perspective changed to show more detail, depending on which format best suited the research.

Stellar cartography had an important, ongoing mission to map all new stars and other space phenomena encountered by the *U.S.S. Enterprise* NCC-1701-D on its continuing mission through the vast reaches of the Alpha Quadrant.

SORAN AND THE NEXUS

On Stardate 48632.4, Captain Picard and Lieutenant Commander Data observed the path of a conflux of temporal energy, the Nexus ribbon, traveling through the Alpha Quadrant.

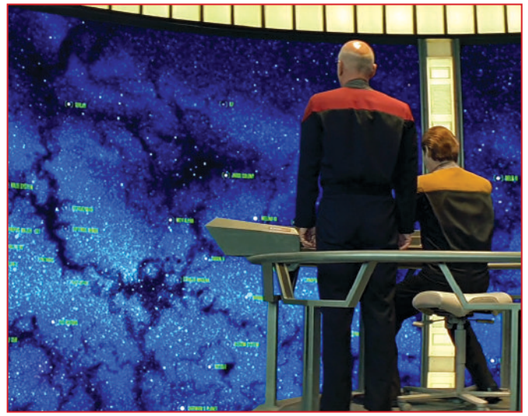
Their study of the path of the ribbon was necessitated when the destruction of the Amargosa star, caused by Dr. Tolian Soran, raised suspicions. The El-Aurian scientist was intent on reaching the Nexus once again and was willing to destroy whole star systems to do so. Picard and Data, using the stellar cartography computer to list anything affected by the star's destruction, displayed the results on the projected star maps.

FOLLOWING THE NEXUS

Once the Captain and Lieutenant Commander Data located and highlighted the positions of various celestial objects, taking into account such variables as shifts in the gravitational fields and gamma emissions, they were able to accurately project the course of the Nexus ribbon through the Galaxy. The phenomenon's path was then displayed on the star map. Picard and Data were able identify the specific star systems, planets, and their classifications. All the evidence gathered by the Starfleet officers led them to the third planet in the Veridian System.

While they were mapping the ribbon's course, the computer readouts informed them of relevant information, such as the *U.S.S. Bozeman* being forced to make minor course corrections due to the gravitational changes caused by the loss of the Amargosa star.

The captain was able to gather the data needed to track the Nexus, projecting that Soran would destroy the Veridian star and its planets to pull the ribbon to Veridian III. Picard was able to stop this cataclysmic event. The *Enterprise* was destroyed in the mission, but the information from stellar cartography saved countless millions of lives.



The main stellar cartography map screen provided a dynamic view of space that could be seen directly from the viewing platform..

COMPUTER CORE

Computer cores were the very heart of a starship's computer system. They provided enormous amounts of memory and faster-than-light data processing for essential ship operations.

The computer network of a starship was based around a system of redundant computer cores that processed data for all the ship's systems. Every single system, from life support to weapons arrays and shielding, depended on these computer cores. A *Galaxy*-class ship, such as the *U.S.S. Enterprise* NCC-1701-D, was equipped with three main processing cores, any one of which could, in an emergency situation, handle the operational computing load of the entire vessel.

CORE LOCATION

On the *U.S.S. Enterprise* NCC-1701-D, two primary computer cores were located across decks 5 and 14 of the saucer section; these usually worked together in sync and if one failed the other could immediately take on its load, with little or no disruption to starship operations. The third computer core crossed decks 30 to 37 in the engineering hull; it was a backup core and was normally only used if a problem arose with both of the computer cores located in the saucer section, or when the ship was separated.

Each core incorporated a series of miniature subspace field generators, which allowed data to be processed and transmitted at faster-than-light (FTL) speeds.

In a *Galaxy*-class starship, the computer cores were massive, cylindrical structures. The top level of each primary core, located on deck 5 in the saucer section, incorporated a systems monitoring room, the FTL nanoprocessor units, and access to the subspace field systems, which were located in a separate cylindrical structure to the side of the main core. This section was known as the upper core; beneath this were the six levels of the lower core.

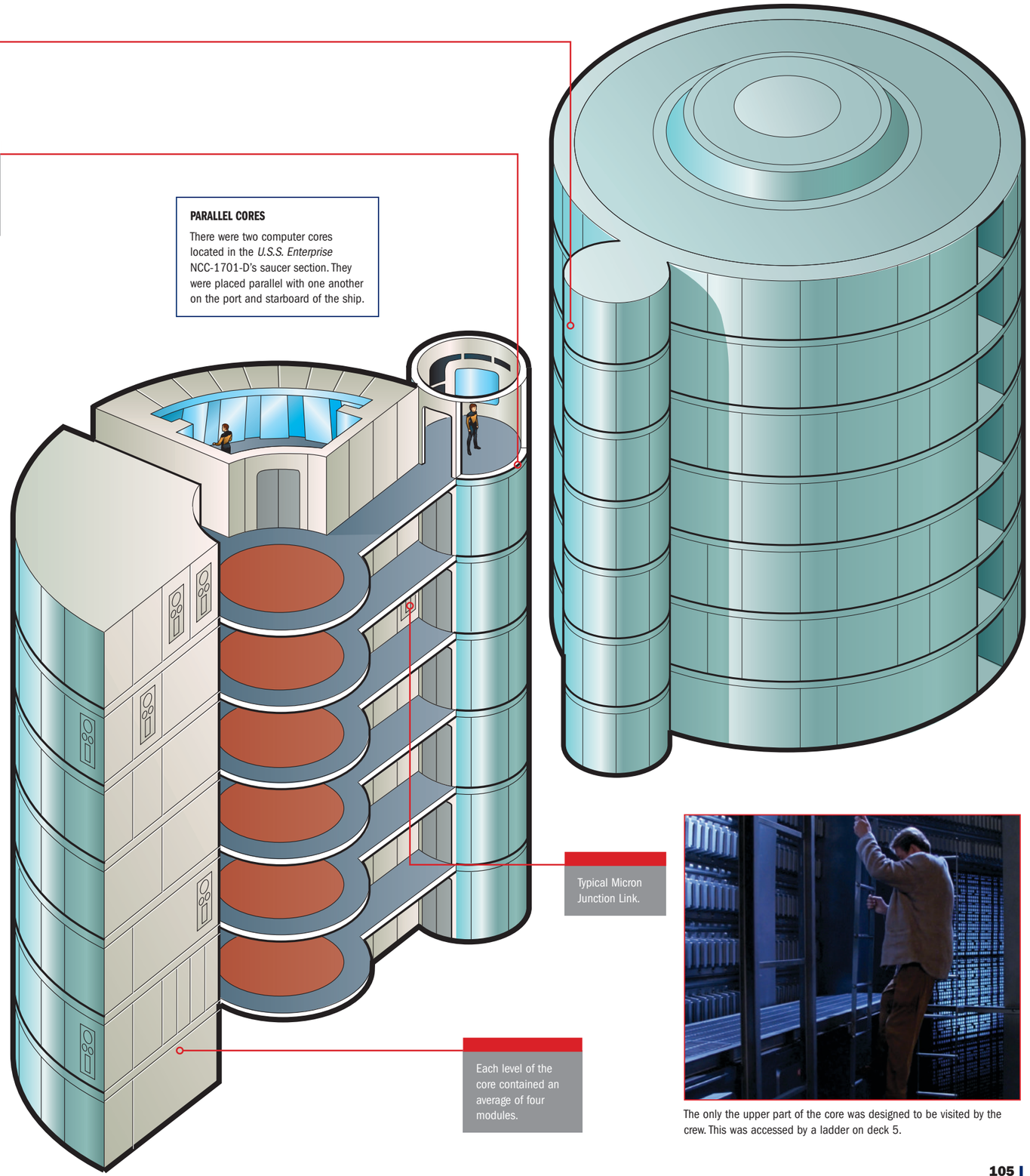
COMPUTER NETWORK

The ship's computer cores were connected to the Optical Data Network (ODN) by a series of Micron Junction Links (MJL). They were supported by a network of 380 optical subprocessors, all of which were linked to the ODN, and many of which were directly linked to the cores.

Virtually every sensor, console, replicator, PADD, and miscellaneous piece of hardware installed on the ship was in some way connected to the Optical Data Network and used the computer cores for data processing.

Backups, engineered redundancies, and automatic service reductions were built into the system to guarantee that basic computer functions always remained available in all but the most grave situations.

Pipelines for two additional ODN systems, located elsewhere in the ship, backed up the primary lines. These lines, between vital terminals and important systems, were also shielded, and if all else failed, the radio frequency (RF) system, through which the communicators ran, could also act as an ODN, albeit at a considerable loss of speed.



The bridge crew of the *Enterprise* rarely visited the computer cores, which received instructions through the ODN. However, in 2366 they went there to allow a race of sentient nanites to take control of Data and establish communications.

Visiting scientist Dr. Paul Stubbs was aboard the *Enterprise* to carry out a once-in-a-lifetime monitoring of a neutron star in the Kavis Alpha system that exploded every 196 years. The presence of the sentient nanites jeopardized the mission.

The only the upper part of the core was designed to be visited by the crew. This was accessed by a ladder on deck 5.

LCARS SOFTWARE

On a Starfleet vessel, it was essential to assimilate data and input commands easily. Interfaces on the *U.S.S Enterprise*-D were designed to make both tasks as efficient as possible.

LCARS, or Library Computer Access and Retrieval System, was an extremely flexible series of software routines that governed the usage of all computerized systems on Starfleet vessels and facilities such as the *Galaxy*-class *U.S.S. Enterprise*. Providing both keyboard and verbal interface capability, the LCARS system controlled everything from the display of requested information to the supervision of non-critical systems. The major databases governing astrometrics, sensor recordings, ship's logs, cultural, medical, and scientific information, were some of the most obvious examples of databases that would be called upon during a routine mission, but LCARS also controlled secondary systems.

ESSENTIAL STORAGE

The databases stored nutritional structure data for food, vast banks of arts-based information, and the complex programs used within the holodecks. Subroutine C-47, which controlled replicator selection and recreational programming, was an excellent example of the LCARS system. The storage of alien languages was also extremely important: Lieutenant Commander Data used visual representations of sign language stored within LCARS to learn this form of communication in 2365.

Starfleet computer interfaces and displays have always been designed to present enormous amounts of information and receive commands in a simple and easily understandable way. Computer panels were designed to accept voice commands, but by the 2360s the majority of personnel prefered to input data via keyboard interface.

Each display screen on the *Enterprise* was tied into a local subprocessor which had a record of predefined scenarios and operating procedures. This allowed the interface to anticipate demands and reconfigure the display screen appropriately. The LCARS system monitored an operator's habits and reconfigured the display terminal so that the most commonly used elements were easily available; specific controls and information became available as appropriate choices were made. The display panels provided tactile and auditory indications that controls had been activated.

PERSONAL PREFERENCES

Crewmembers could customize their operating station according to personal preferences. Stations could be reconfigured when a new crewmember took over. Software-definable interfaces allowed for smooth transition during system upgrades. Any crewmembers who had not been trained on the new interface configuration simply instructed the display to emulate the older interface.

The actual display panels themselves were made up of three distinct layers. The bottom layer was constructed of microfoamed polyduranide sheeting. This layer contained the optical nano-processors, which enabled individual displays to configure themselves once they had been initialized by the local processor node. This layer acted as a base on which the other two layers were anchored.

The next layer was a triaxial crystal display membrane, which produced the graphic interface. The top layer, which was chemically bonded to the display membrane, contained the sensor matrix, which detected user input. The matrix was imbedded in a 2.5mm thick tripolymer-coated transparent aluminum wafer.

The depth of a display panel was less than a centimeter. meaning that interfaces could be fitted on a number of surfaces. They were not only used on free standing stations, but suitable for use in tricorders and PADDs. The displays were extremely resilient and when, for example, fitted to a PADD, could withstand a fall from a height of 35 meters.

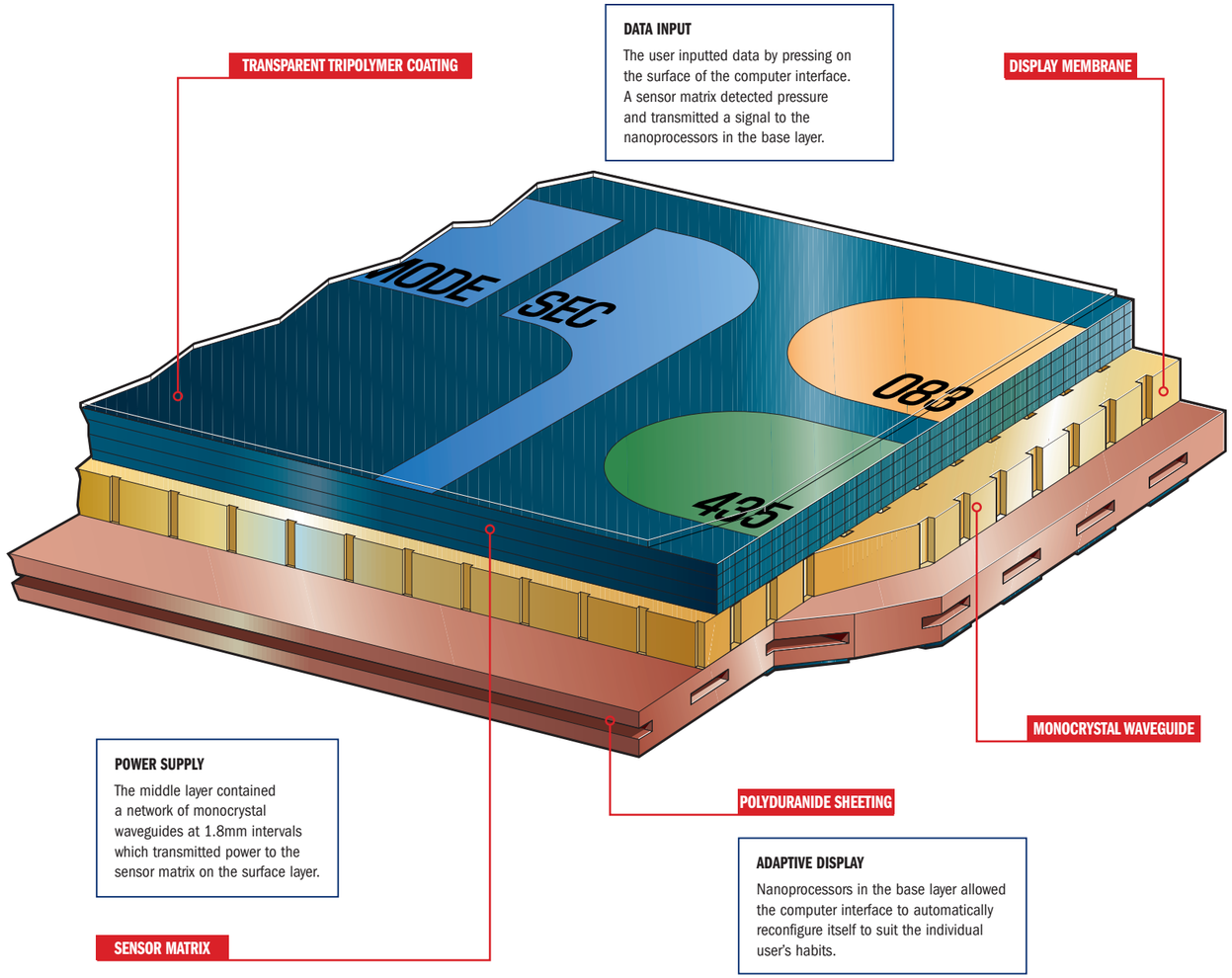
ALTERNATIVE DISPLAYS

Starfleet favored two-dimensional displays, but these were by no means the only display systems available to personnel. Small holographic projectors were relatively common and could be used to present three-dimensional information to large groups of people, a sign of the constantly evolving techniques of presenting and interacting with information aboard Starfleet vessels.

Computer interfaces were mounted on a number of surfaces, including the large security 'rail' located at the rear of the bridge on *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D

Standard display interfaces were thin enough and light enough to be fitted to handheld devices such as PADDs. The display screen was strong enough to withstand normal wear and tear or accidental damage.

DISPLAY PANELS



ISOLINEAR CHIPS

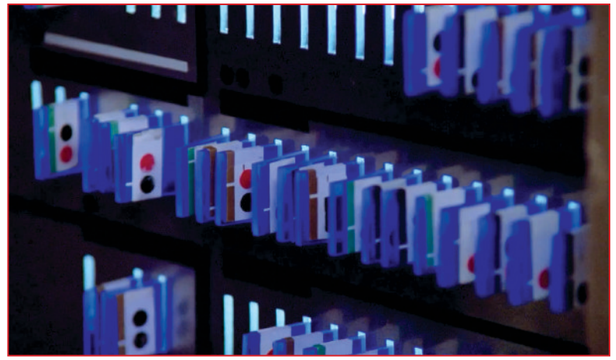
Starfleet computers could not function without isolinear chips, which were used in everything from computer cores to PADDs to store data and software routinely used in starship operations.

In the late 24th century, isolinear chips were the primary medium used to store computer data and software. Each chip had a storage capacity of 2.15 kiloquads, and had built-in nanoprocessors that managed data retrieval and could operate independently of Library Computer Access and Retrieval System (LCARS) control. The chips were 335 percent more efficient when they were installed in a computer core; the substrate of the chip was infused with trace quantities of platinum/irridium. As a result, when the chip was energized by the subspace flux of a computer core, it could operate at FTL speeds.

Chips were often used in portable devices such as PADDs. If they were intended for this use, the refractive interface surface was coated with a tripolymer sealant. The sealent rendered the chips robust enough to be handled without gloves.

DATA STORAGE

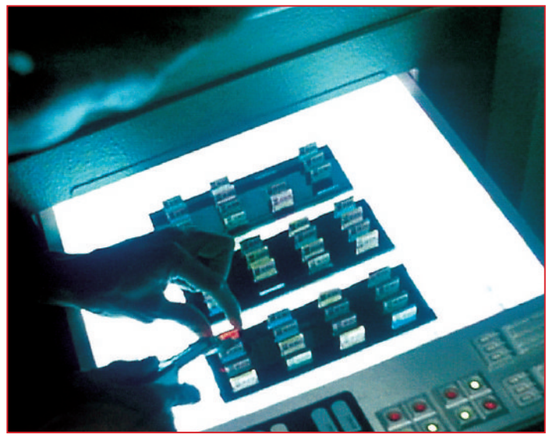
Isolinear chips are an essential part of any Federation computer system. They are used to store both software and data, and have only recently begun to be replaced by bioneural systems.



Many of the *Enterprise*'s systems were controlled by banks of isolinear chips located in Main Engineering. Chips could were also used in portable devices such as tricorders and PADDs.

Isolinear chips used a single-axis optical crystal layering.

Coding on the top indicated the chip's function and intended location within the system.



Ruggedized chips were extremely robust and could be carried in a pocket or a bag, but the chips used in the ship's computer cores could only be handled with gloves.

PADD: PERSONAL ACCESS DISPLAY DEVICE

The handheld PADD was a personal computer terminal designed to facilitate workflow on board Starfleet ships. Small, convenient and powerful, its uses ranged from data entry and retrieval to starship flight control.

The development and evolution of the Personal Access Display Device was one of the greatest spurs to the independence of crew members' ease of work and functionality in their shipboard tasks. It freed Starfleet personnel from mounted computer interfaces and terminals, and made it easier for them to communicate and transfer information.

The PADD was extremely powerful and, if properly configured for conn interface, could even be used to fly the entire starship from any location from crew quarters to a corridor – if memory and display limits were no problem. This ability reflected the Starfleet design goal of making handheld devices able to access any file or program in line with the user's security clearance.

The standard PADD design featured a basic three-layered construction of imbedded circuit-composite materials that are no more than 1 cm thick in total. A casing of boronite whisker epoxy carries the primary electronics bonded on, including the multi-layer display screen; it provides protection even when dropped from a height of up to 35 meters.

The PADD includes three replaceable elements: the isolinear memory chip, subspace transceiver array (STA), and sarium power loop.

The fully-charged sarium cell provides 16 hours of operation and is normally induction recharged when off-duty. When near exhaustion, it automatically flags the main computer to transfer its task to a working unit.

Memory capacity of the isolinear chip is 4.3 kiloquads. Like the tricorder, the PADD can dump its memory to a main computer in less than one second.

Finally, the STA allows a data link between the PADD and the ship's computers over the same range as a communicator. This means that away teams can use PADDs which can also provide a transporter lock-on signal. PADDs could also share computing functions and data transmissions with any other Starfleet device employing com protocols, as used for STA devices. Such transmissions were secured by encryption.

INTERFACE

A user interface was provided by both built-in electro-sensitive areas of the casing and touch areas on the display screen. These were operated like any other multi-layer panel found in modern starships. The interface areas were designed for specific data manipulation and storage functions, and could be used to personalize the default setup and offer a corresponding security restriction to a single user.

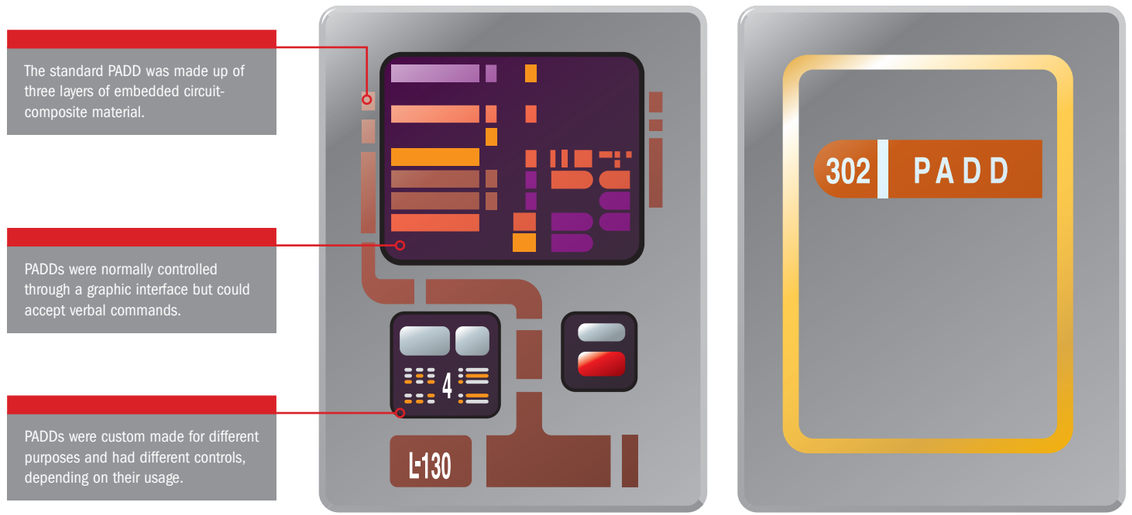
Custom models could be fabricated aboard *Galaxy*-class starships or any other replication facility equipped with custom isolinear circuit programming capability.

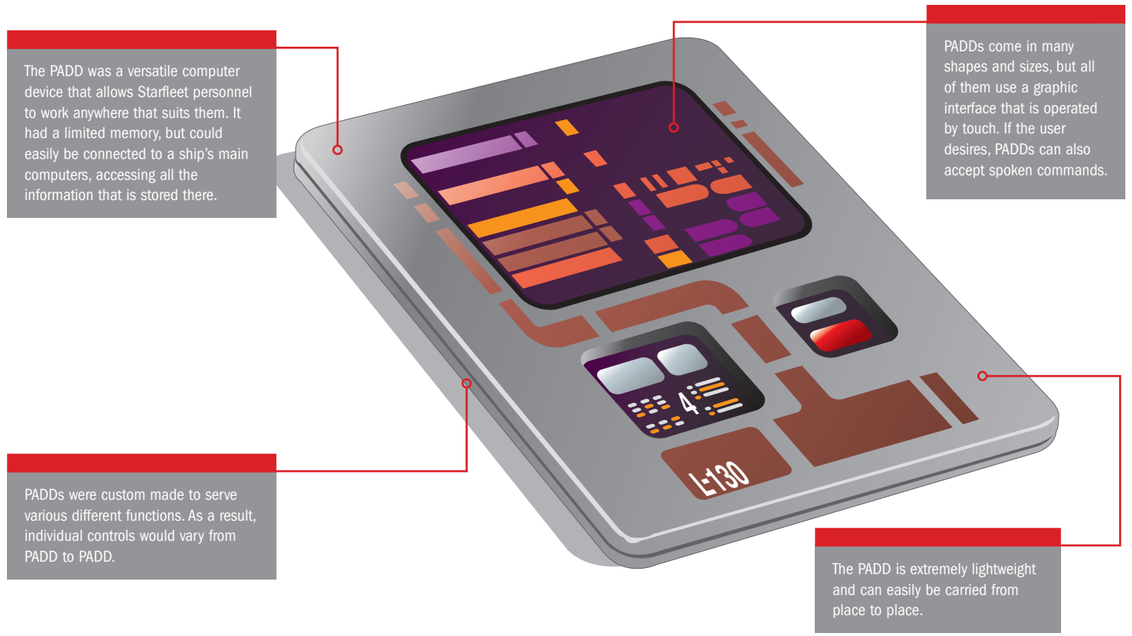
The earliest models of PADDs measured a standard 10 x 15cm and contained a display area 4.25 times larger than that of a tricorder, with generic control interface areas marked in brown. Later models varied in shape and size, with some offering larger screens and even more designated control surfaces.

The smallest PADDS were little larger than palm-sized; the largest are the size of a large tray. In all models, the screens allowed the user to control the PADD through a graphical interface.

PADDs were customized to meet the specific needs of the different ship's departments, such as medical.

On the *U.S.S. Enterprise*, Commander Riker and Counselor Troi used PADDs to perform personnel reviews in Ten-Forward.



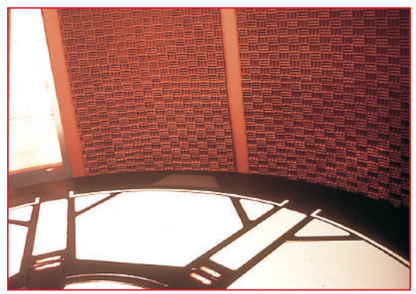


TRANSPORTER ROOM

The main transporter room was an important thoroughfare. It was the room from which away teams were dispatched, and the first area of the ship usually seen by visiting dignitaries.

People beamed in facing outward, toward the transporter operator console. This allowed them to be greeted either by the transporter operator or officers of rank, depending on protocol required.

An auxiliary storage access facility was located off to the side of the transporter chamber. This area served various functions, from storage of equipment to accessing system panels.



Above each of the six transporter pads was a glowing, circular light. This designated exactly where the person about to be transported off the ship should place themselves prior to beamout.

Objects were commonly sent or delivered by transporter. These included presents and gifts, such as the Betazoid gift box Lwaxana Troi sent to her daughter Deanna.

Transporter chambers followed a standard design, extending upwards from a circular platform. The area was lit at the back and from the top.

The pad on the floor of the transporter was divided into six sections. This was the maximum number of people able to beam in or out simultaneously.

To the right of the transporter chamber lay a storage area. System access panels were also located here.

The coordinates to which the travelers were to be sent were programmed in by the transporter chief. This key job held a great deal of responsibility, as the smallest mistake could cost lives.

A small, graduated step at the front of the transporter chamber ensured an easy and comfortable step up on to the main transporter pads.

A small step separated the storage area from the transporter room.

TRANSPORTER SYSTEMS OPERATION

Matter transporter system technology converted matter into energy and beamed it to distant locations, allowing objects and individuals to travel thousands of kilometers in seconds.

On a *Galaxy*-class ship the size of the *U.S.S. Enterprise* NCC-1701-D, efficient ship-to-ship and ship-to-ground transportation was essential. Instantaneous access needed to be provided to more than one section of the ship for both personnel and cargo and, in order to achieve this, the ship had a number of transporter rooms and platforms located in various areas on several decks. In addition to the transporters used in day-to-day operations, the *Enterprise* also contained further emergency transporters to be used if and when required.

LOCATIONS AND ACCESS

Crew members and their guests gained access to the *Enterprise* via one of four personnel transporter rooms located on deck 6 of the saucer section. These were all located in the very center of the ship, two at each end of the vessel's central core. Turbolifts close to the transporter rooms provided quick and easy access to and from all other important areas of the ship, including direct vertical access to the bridge on deck 1, the officers' quarters on deck 2, and the main shuttlebay on decks 3 and 4.

Two additional personnel transporter rooms were located on deck 14 in the engineering hull. These were again located in a central position which provided convenient access to the main areas of the ship. Under normal operating conditions, however, the majority of personnel were beamed aboard the ship to the saucer section.

CARGO BAY TRANSPORTERS

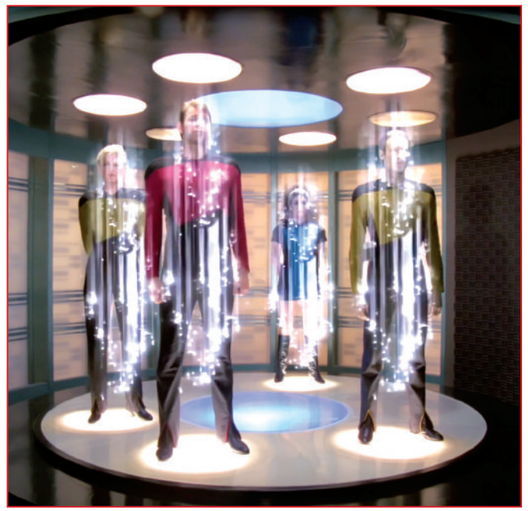
By the 24th century, most cargo and supplies were beamed aboard starships rather than being brought in by shuttlecraft. The *Enterprise*'s cargo bays contained their own transporter platforms, ensuring that the supplies were beamed to the most convenient location: directly to where they need to be unloaded or stored. This was especially convenient for supplies which simply need to be delivered from one starbase or planet to another, as they could be beamed onto the ship at the beginning of the journey, and beamed off at the required destination with minimal time and effort expended by the ship's crew.

The cargo transporters on the *Enterprise* were located on two decks. Four low-resolution transporters were utilized by the cargo bay complex on deck 4 of the saucer section, with a further four located in the cargo bay complex across decks 38 and 39 of the engineering hull. These transporters were usually set for non-life form transportation only, but could be modified for use by biological organisms. This was achieved by increasing the transporters' resolution, and resulted in a corresponding decrease in the mass they were able to transport at any one time.

EMERGENCY EVACUATION

The *Enterprise* is equipped with a series of emergency transporters which could be used for evacuating personnel off the ship in the event of an emergency such as a warp core breach. With more than 1,000 crew stationed on the *Enterprise*, the ship needed to be equipped with transportation facilities capable of dealing with large numbers of personnel in a short time.

Galaxy–class ships were fitted with six emergency transporters; four in the saucer section and two in the engineering hull. These transporters were used for beaming personnel off the ship only: they could not be used for beam-up as they were fitted with scan-only phase transition coils. The emergency transporters were designed to operate at reduced power levels and had a range of only 15,000km,



Transporters provided instantaneous transport from ship-to-ship, ship-to-planet-surface, and even from one area of the ship to another. The technology meant that ships no longer needed to have landing capability.

Four scanners provided a cross-check result of a transport while the transporter simultaneously runs a self-diagnostic test. In the case of a problem, the beaming process was halted and shut down.

In instances of malfunction, the crew were required to carry out a detailed analysis of the transporter. Before declaring safe to use, a test article such as a meter-high duranium cylinder was transported to ensure the system was working correctly.

whereas the regular transporters could beam personnel across distances of up to 40,000km. The emergency transporters provided a supplement to the regular platforms and could be used at the same time or independently.

Both the regular and the emergency transporters were linked to 17 emitter array pads located on the *Enterprise* hull. These ensure that transporter signals can pass on and off the ships with 360 degree coverage in all axes.

EVACUATION TO AND FROM THE SHIP

In the case of an emergency evacuation to the ship, all six regular transporters were used simultaneously. The main limitation was imposed by the duty cycle of the transporters which required, on average, 87 seconds cooldown time following every transport. Allowing for this, the *Enterprise* was able to beam personnel aboard at a rate of approximately 700 individuals per hour. If the cargo transporters were reconfigured for personnel beam-up, this could be increased to a rate of 1,000 per hour.

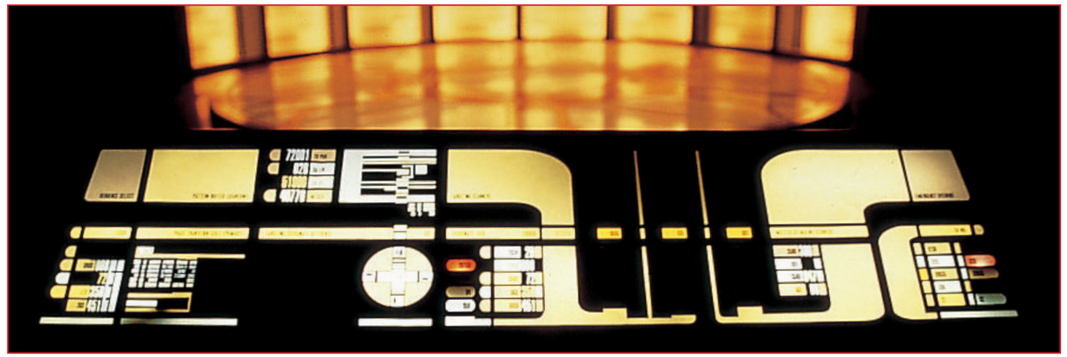
Evacuation from the ship could be achieved at a higher rate by use of the six additional emergency evacuation transporters. Combined, these could beam 22 personnel away at a time, increasing the numbers beamed off the ship to 1,850 individuals an hour. The entire starship crew could thus be beamed off the ship in just over half an hour.

As the emergency transporters operated on lower power than the regular transporters, they could still be used when the main transporters were offline. Because of the lower power requirements, these units also had a shorter recovery time; by using the emergency transporters only, the rate of transport was approximately 1,000 individuals per hour.

TRANSPORTER OPERATION

As transporter operations were extremely complex, and even the slightest error could result in death, most of the process was automated. However, to ensure safety, the operations were usually supervised by a Transporter Chief, who verified the transporter lock and system readiness. Transporter Chief is a very important job which required a high level of responsibility and awareness.

Transporters were precise and, by the 24th century, almost entirely risk-free. They delivered personnel to convenient areas of the ship and into the middle of the action on nearby planets, enormously increasing mission efficiency.



The control panel for the transporter, showing the amount of data necessary to ensure that all beaming was carried out precisely and safely.

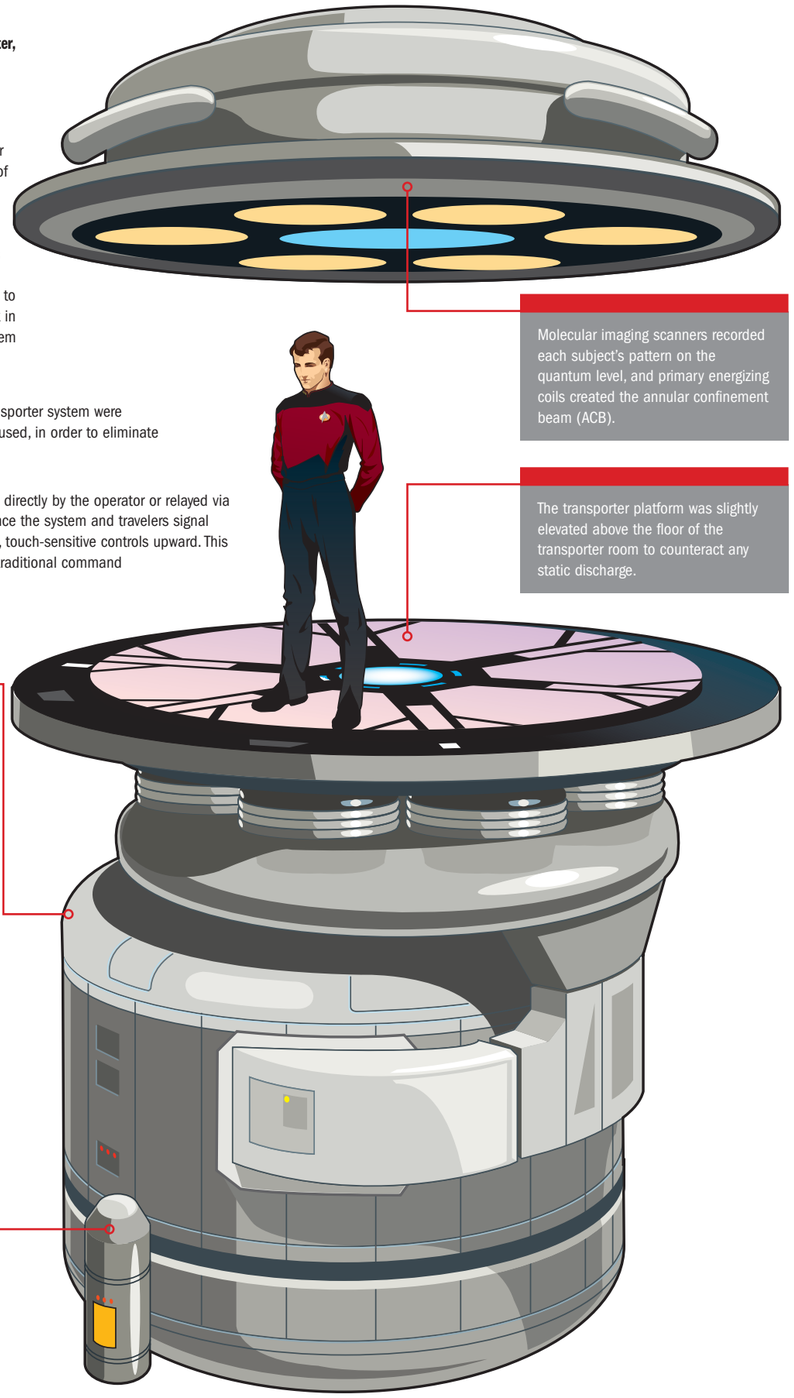
STAGE 1

There are many different types of transporter, but the basic principle remains the same throughout the Federation.

1 All those preparing to be transported entered the standard six-person chamber and took up their position on each pad of the transporter platform, which is elevated to prevent the chance of occasional static discharge. At this time, the transport operator used the system's automated controller – a dedicated subprocessor located in the consoles off to one side – to run a self-diagnostic check in order to verify that all of the various system components are in full working order.

2 All of the main components of the transporter system were checked automatically each time it was used, in order to eliminate any potential malfunctions.

3 The destination coordinates were input directly by the operator or relayed via computer from another ship's station. Once the system and travelers signal 'ready,' the operator moved the three red, touch-sensitive controls upward. This action was usually performed when the traditional command to 'energize' was given.



Molecular imaging scanners recorded each subject's pattern on the quantum level, and primary energizing coils created the annular confinement beam (ACB).

The transporter platform was slightly elevated above the floor of the transporter room to counteract any static discharge.

The pattern buffer was a 'tank' where each pattern was held briefly in mid-transport.

LONG RANGE DEVICE

A regular transporter could beam personnel across distances of up to 40,000km.

A biofilter screened out harmful foreign microbes from incoming objects.

STAGE 2

The person or object to be transported has their pattern stored, and a record of the procedure is made.

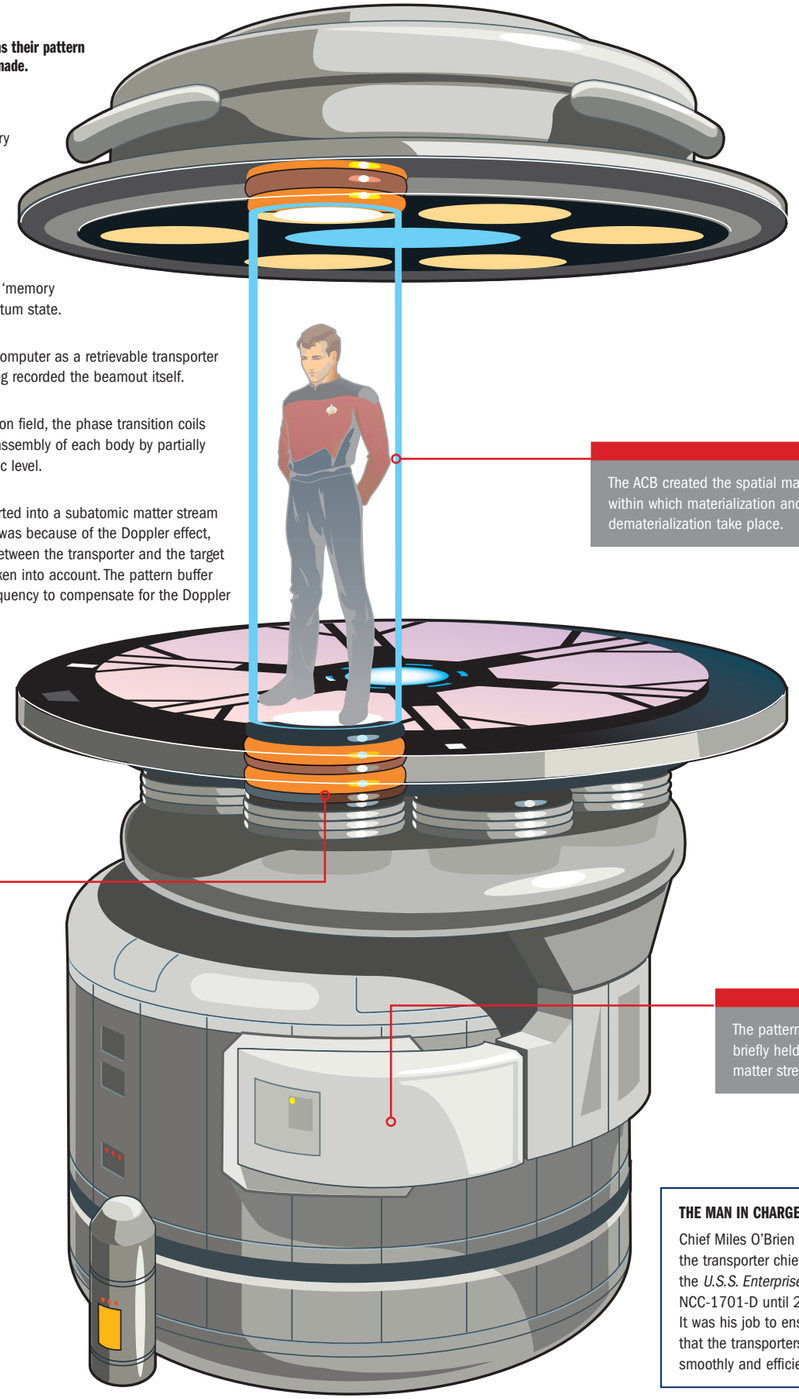
4 The annular confinement beam (ACB) created a spatial matrix from the primary energizing coils overhead. A secondary inner field was a backup safety feature, to prevent an energy discharge if the ACB is disrupted.

5 Four redundant molecular imaging scanners in the overhead pads made a 'memory file' of each transporting subject's quantum state.

6 The pattern was stored in the ship's computer as a retrievable transporter trace, and an entry in the transporter log recorded the beamout itself.

7 Using a widespread quark manipulation field, the phase transition coils in the lower pads began the actual disassembly of each body by partially unbinding their energy on the subatomic level.

8 Once the person or object was converted into a subatomic matter stream it was sent into the pattern buffer. This was because of the Doppler effect, which meant that any relative motion between the transporter and the target area to be beamed to needed to be taken into account. The pattern buffer therefore adjusted the transmission frequency to compensate for the Doppler shift, ensuring a safe transport.
The pattern buffer tank was normally located on the deck below the transporter room.



The ACB created the spatial matrix, within which materialization and dematerialization take place.

The phase transition coils started to disassemble the body of each person being transported.

PATTERN BUFFERS

To avoid transporter psychosis, a medical condition that affected the body's motor and higher brain functions, pattern buffers were used to enhance the accuracy of the molecular imaging.

The pattern buffer briefly held the matter stream.

THE MAN IN CHARGE

Chief Miles O'Brien was the transporter chief of the *U.S.S. Enterprise* NCC-1701-D until 2369. It was his job to ensure that the transporters ran smoothly and efficiently.

STAGE 3

The subject's pattern is then sent through an emitter array and beamed to the desired location.

9 Each pattern buffer tank was shared by a pair of transporters. In an emergency, the pattern buffer was capable of holding the entire matter stream for up to 420 seconds before degradation of a pattern occurs.

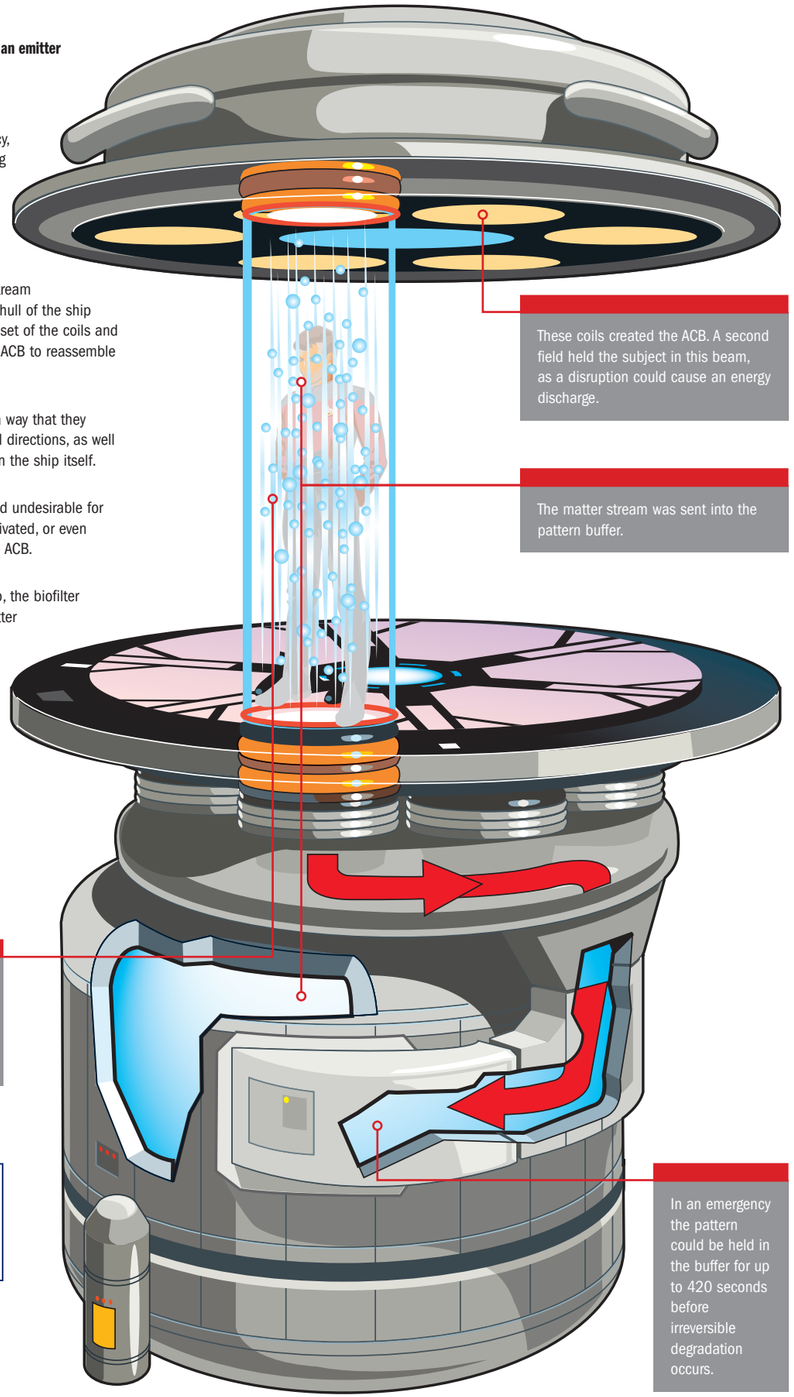
10 Once beamout was secured, an ACB 'carrier' directed each pattern's matter stream through an emitter array on the external hull of the ship toward the target coordinates. A booster set of the coils and scanners then work in reverse within the ACB to reassemble each pattern into its original form.

11 These emitter arrays worked in such a way that they could provide 360-degree coverage in all directions, as well as being able to transport subjects within the ship itself.

12 Weapons or other accessories deemed undesirable for security reasons may be detected, deactivated, or even removed from persons arriving within the ACB.

13 When beaming subjects onto the ship, the biofilter automatically scanned the incoming matter and detected and removed any known harmful virus or disease.

14 Targeting scanners located in the ship's sensor arrays determine the coordinates to which subjects are beamed and also provide environmental information on the target site.



These coils created the ACB. A second field held the subject in this beam, as a disruption could cause an energy discharge.

The matter stream was sent into the pattern buffer.

Living subjects were always transported at the optimal quantum level, but inanimate objects were transported at a lesser molecular level in order to conserve energy.

DISPERSAL

The *U.S.S. Enterprise* NCC-1701-D had 17 emitter array pads on the exterior of the hull.

In an emergency the pattern could be held in the buffer for up to 420 seconds before irreversible degradation occurs.

STAGE 4

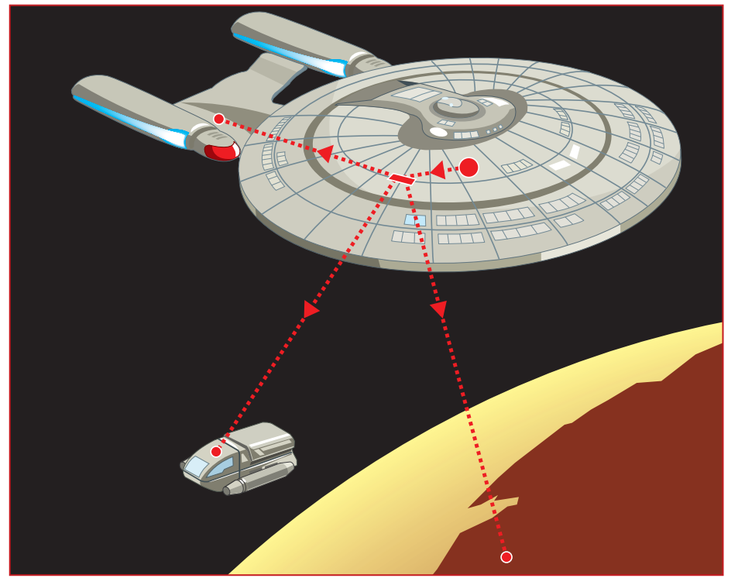
The final stage saw the subject appear at the designated coordinates.

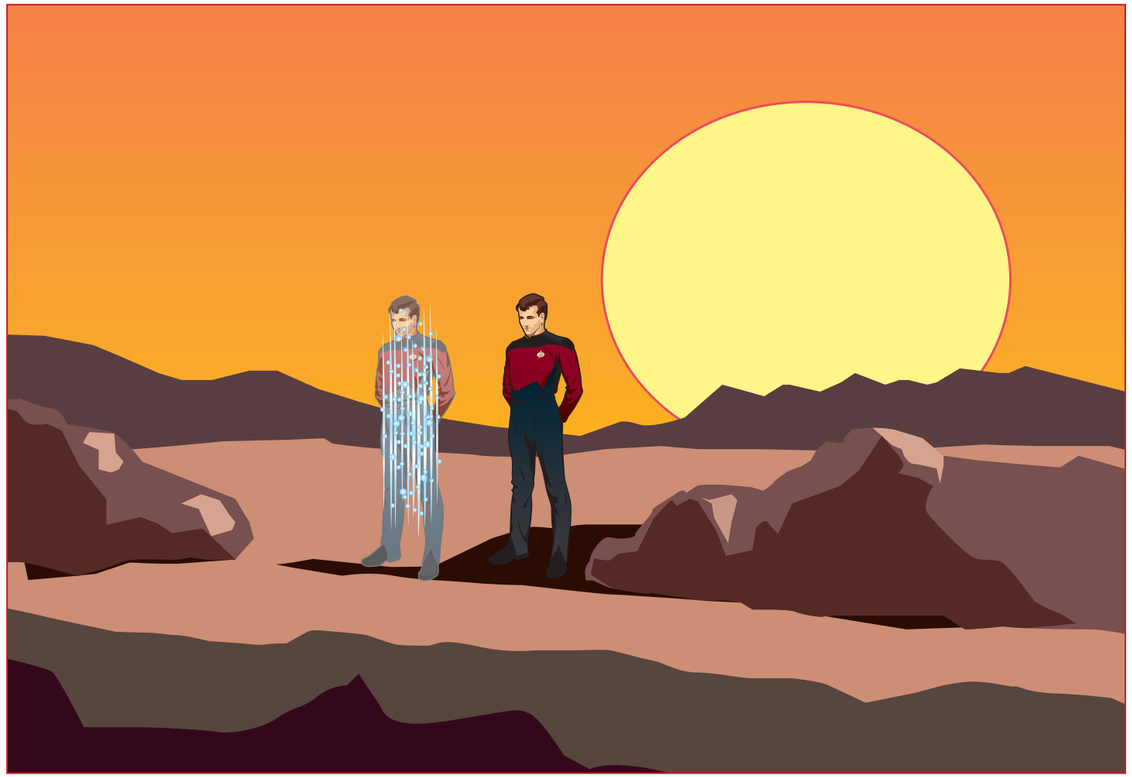
15 Because no special arrival apparatus was required, a transporter destination may be another point within the same ship, another vessel, or on a planetary surface. A destination site's transporter system could be used to aid reception, if so equipped.

16 Transport between two objects at warp speed was not possible unless the warp factor is matched and maintained precisely. The procedure requires an experienced operator.

17 Within five seconds of the initial energizing signal, the transported body was fully reformed at the target destination.

18 Transporter operations were highly complex and left little room for error, so much of the process was automated. However, the transporter chief verified the coordinates and regularly serviced the transporter systems.





PATTERN ENHANCERS

Pattern enhancers – also known as transport enhancers – were used in hazardous atmospheric conditions to boost an object or life form's molecular pattern, and ensure crew safety.

Pattern enhancers were one of the main tools developed to safely increase the range and effectiveness of transporter systems. The devices were used to boost the molecular pattern of an object or life form so that the pattern lock for transportation was stronger and more defined. These instruments were normally only needed to overcome interference caused by electromagnetic shielding or naturally-occurring phenomena.

HOSTILE ENVIRONMENTS

Pattern enhancers were portable cylinders about a meter tall, and were normally used in groups of three. They were chrome-colored, with a clear narrow dome on top that glowed when activated. A switch in the midsection released three legs from the base, allowing the unit to stand alone and remain balanced on uneven ground.

COMMUNICATIONS

The apparatus was activated by twisting the dome, and the black casing just below it, counterclockwise. When arrayed – typically seven meters apart in a triangle – the clear top acted as an emitter and conductor for a thin blue energy beam that connected all three units.

For portability on away-team missions, a hinged tri-fold case wrapped around the midsection of a set of three cylinders. The squarish case included a carry handle and a recessed, molded interior to cushion and protect the enhancers from buffeting.

SAFER TRAVEL

Pattern enhancers were key pieces of safety equipment, ensuring a safe transporter signal in cases where transporter lock was difficult to achieve. Before their invention, beaming up from certain planetary conditions could be dangerous and potentially fatal.

Under standard conditions, the shipboard transporter did not require a receiver or transmitter to transport crew members to a location without transporter technology.

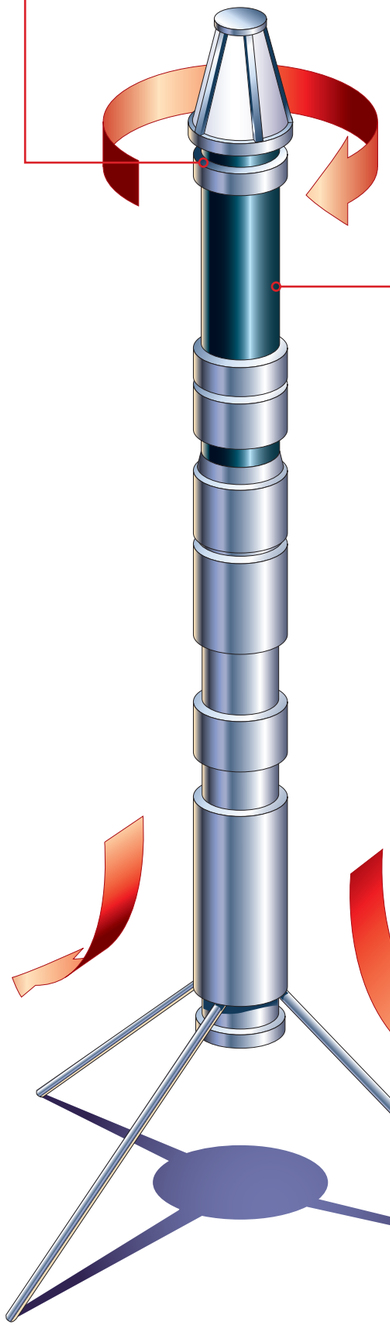
This specialized apparatus was often used to compensate for interference caused by electromagnetic storms or other atmospheric disturbances, and make transporting safer by amplifying the transporter signal lock. They were often carried by rescue teams sent into hazardous environments.

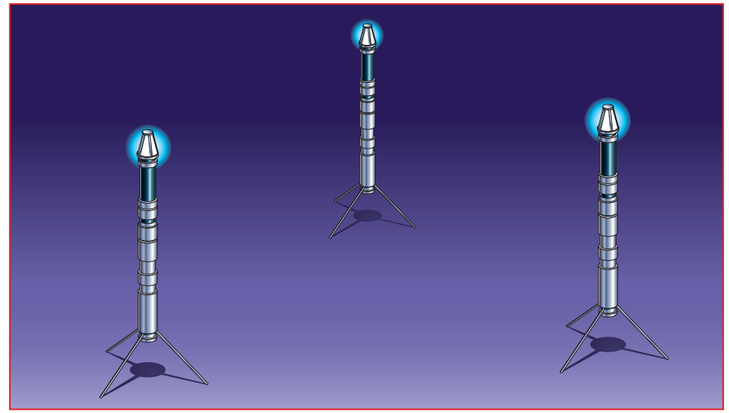
As the specialized apparatus had to be carried on small shuttlecraft, it was designed to be light and easy to carry.

Units were quick and easy to set up. Once the last unit had been activated, a beam of blue energy joined all the units together. This defined the space for the transportable matter and was effective immediately.

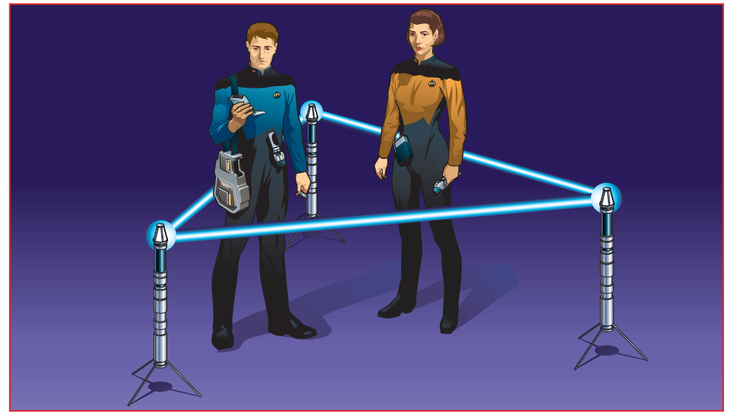
After use, the apparatus was abandoned in situ, as retrieval might further endanger lives of the crew.

Twisting the top section and the black panel below activated and deactivated these devices.





In ideal circumstances, the pattern enhancers were placed on flat ground in a triangular formation, one to ten meters apart. Set up followed a simple process as the equipment was designed for use in chaotic conditions.



The units were placed just a few meters apart from each other. When activated, they were linked in a triangle by a thin blue energy beam. Anything placed within the triangle had its matter pattern boosted for transportation.

The cylinder was made of lightweight metal.

READY TO USE

Pattern enhancers were usually used in sets of three, and were carried fully assembled. They needed only to be placed in the required location and activated to enable use.

JEFFERIES TUBES

The network of Jefferies tubes – or access tunnels – on the *U.S.S. Enterprise* allowed personnel to crawl through the ship to carry out essential maintenance and repairs.

In the 24th century, many Starfleet vessels were the size of cities and packed with complex systems that need to be easily accessed for servicing, repairs, and upgrades. While no one wants to see uncovered conduits and cables around the ship, it was equally important for the crew not to have to dismantle large areas of wall or floor to reach a minor fault.

A happy medium between these two options was provided by a system of small access tunnels called Jefferies tubes. Tucked away between the corridors and decks, these tunnels allowed easy access to components of every system or subsystem that might need physical testing, maintenance, or repair.

ACCESS ALL AREAS

On the *U.S.S. Enterprise* NCC-1701-D, Jefferies tubes provided support for the ship's service infrastructure. The tubes carried most of the utility conduits and waveguides. The system ran throughout the entire ship and provided easy access to all sections. Located within the Jefferies tubes were a variety of maintenance and testing points.

In the case of a turbolift malfunction, the Jefferies tubes could be used to move swiftly around the ship. They provided an additional link between many important areas and through many decks.

MULTIPLE HATCHES

Jefferies tubes on the *U.S.S. Enterprise* were lined with access hatches, each marked with a serial number, a descriptive name, and sometimes a message such as 'Warning: to be opened by qualified personnel only.' The components behind the hatches usually included banks of isolinear optical chips, and rows of circuit boards.

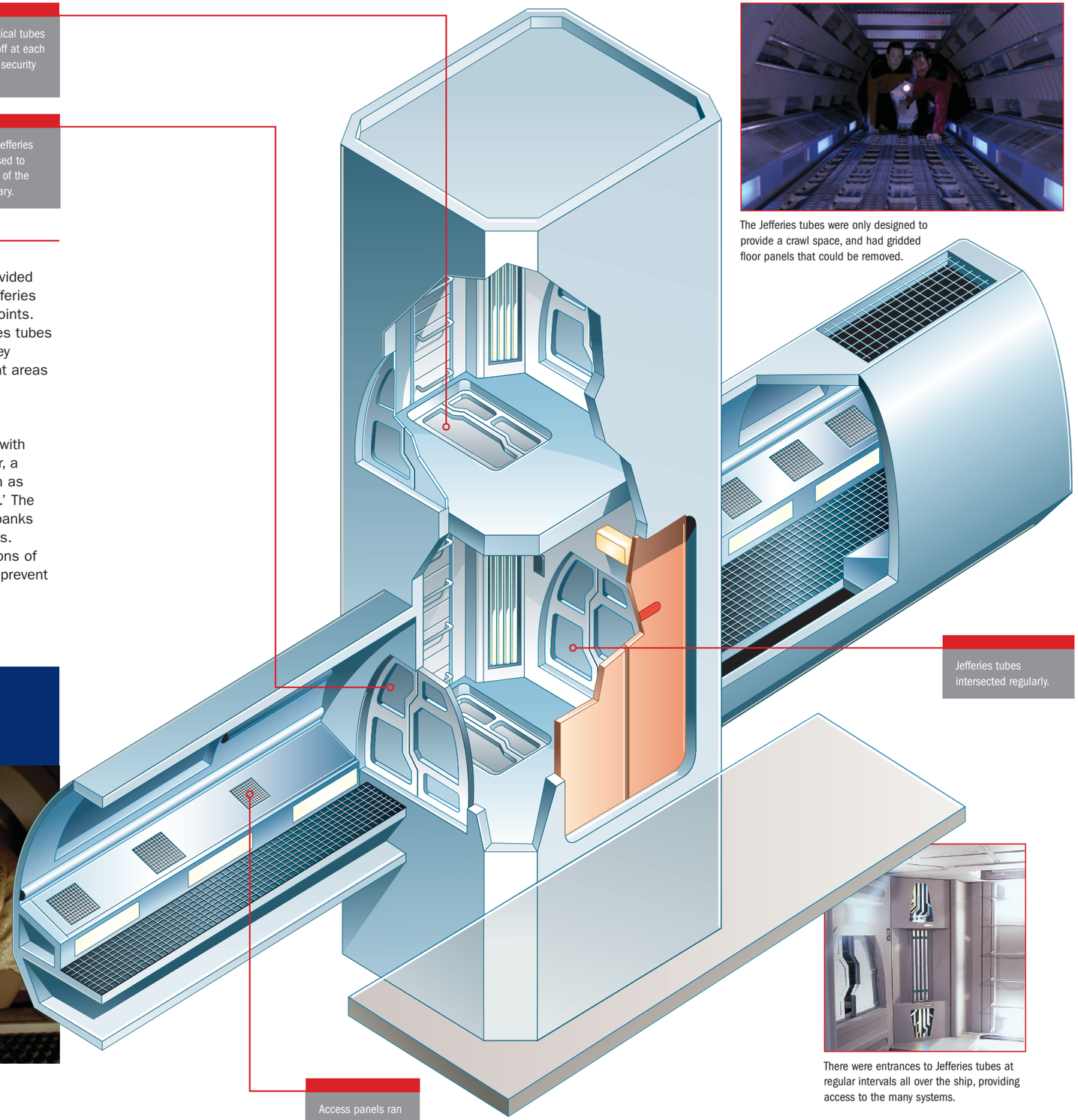
In the event of a fire or other such hazard, sections of the Jefferies tubes network could be sealed off to prevent further damage.

A PRIVATE RETREAT

Jefferies tubes have not always been used for the purpose the designers had in mind. Captain Picard and Lieutenant Commander Nella Daren used the network to perform music duets, having found them to be the most perfect accoustic spot on the ship.

Access to the vertical tubes could be sealed off at each deck, aiding both security and safety.

Doors within the Jefferies tubes could be used to block off sections of the network if necessary.



The Jefferies tubes were only designed to provide a crawl space, and had gridded floor panels that could be removed.

Jefferies tubes intersected regularly.

There were entrances to Jefferies tubes at regular intervals all over the ship, providing access to the many systems.

Access panels ran along the interior of the tubes.

CARGO BAYS

The cargo bays were some of the largest rooms on the *U.S.S. Enterprise* NCC-1701-D; many of them crossed two decks, and the largest bays spanned three decks.

The primary role of the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D was exploration, but there were many occasions when the ship was called upon to perform many other varied duties, including the transfer of essential medical and emergency relief supplies, the transport of less critical cargo, and the swift evacuation of civilian populations. During such missions, the enormous cargo bays of the starship proved invaluable.

CARGO HATCHES

Bulk cargo was generally loaded onto the *Enterprise* through six large iris and flexible planar bay doors. These bay doors were located in the aft hull undercut, the forward ventral side of the battle section, and the ventral side of the saucer section. The doors opened onto 18 individual cargo bays which served as both holding and storage facilities, as well as distribution points.

The cargo bays were normally pressurized and could accommodate living beings as necessary. During loading, atmospheric integrity was maintained by forcefields that sealed the doors. If necessary, the cargo bays, like the shuttlebays, could be depressurized.

In addition to the 18 cargo bays with exterior connect points, there was a network of smaller cargo bays located throughout the ship, to which area-specific material was routed for use during extended missions.

In many cases, cargo was moved between the bays by massive turbolifts – two of these ran through the saucer section – but it was often moved to the smaller bays by transporter.

CARGO TRANSPORTERS

Some cargo bays, which did not have external doors or cargo turbolifts, were serviced by large cargo transporter pads. The materials were beamed directly into the bays and monitored by computer.

Four cargo bay transporters were located in the deck 4/5 cargo bay complex, with four additional units located in the cargo bay complex across decks 33 to 39. These cargo transporters were designed for use at the low resolution, non-life-form molecular level, although they could be modified to transport life forms in emergencies.

INTERNAL NETWORK

Items requiring special handling or care, such as medical supplies or delicate instrumentation, were stored in smaller cargo bays. This made rapid distribution or setup, by either transporter or antigrav pallets, much easier for crew members to carry out.

Cargo bays could also be used for a wide variety of other functions as mission situations required. Scientific experiments requiring larger spaces than those provided by the usual lab facilities, such as analyzing wreckage from crashed or salvaged spacecraft, could be set up in empty cargo bays.

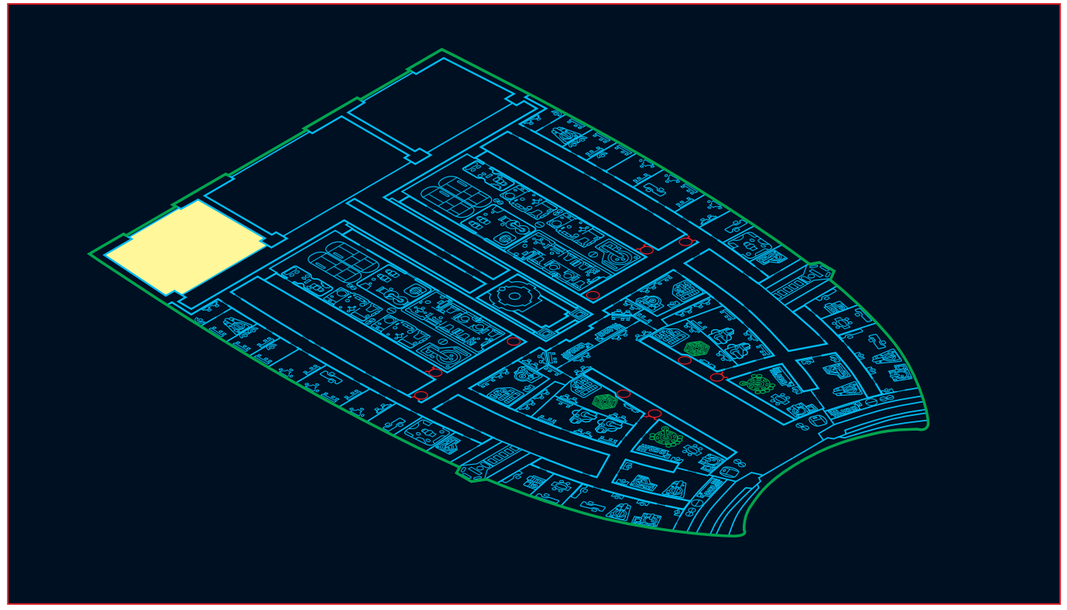
In a crisis, specified cargo bays could be converted into functional emergency evacuation centers for victims or refugees. For example, in 2365 a cargo bay on board the *Enterprise* was used to accommodate a party of Bringloidi colonists and their livestock after the nearby primary star in the system entered a period of flare activity.

Some cargo bays on the *Enterprise* were fitted with large transporter pads and their own transporter consoles. The transporters were normally set to a lower resolution but could be uprated to transport living beings.

The cargo bays were the ideal location for the Bringloidi to set up camp while being relocated by the *Enterprise*.

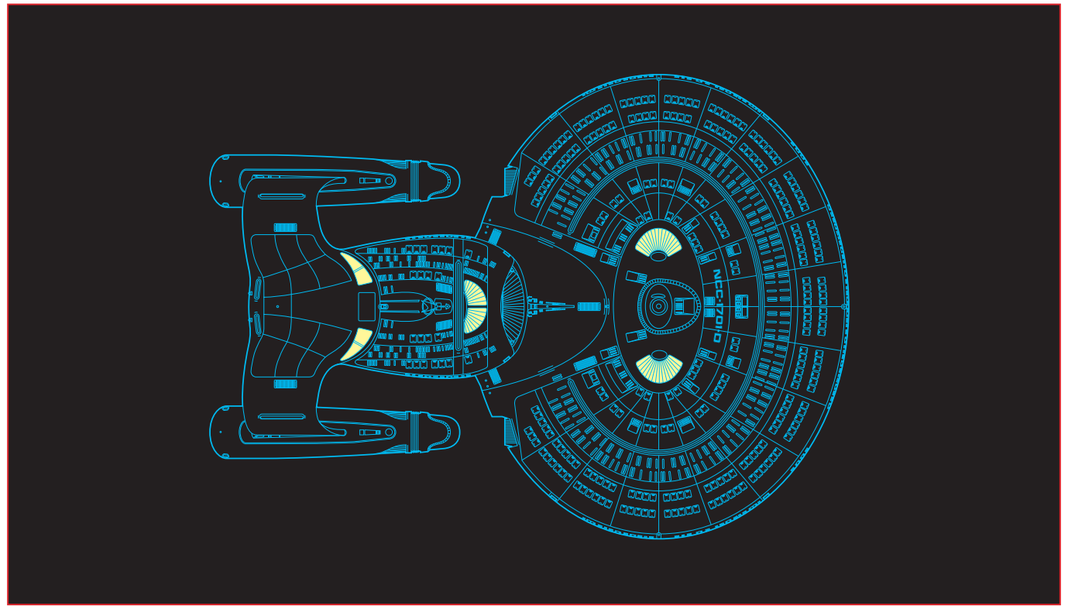
The cargo bay transporters were usually set to transport non-life forms only, and could beam cargo directly into the bays.

CARGO OPERATIONS



Cargo bays were located all around the *Enterprise*, but cargo operations were based on decks 37 and 38 in the main stardrive section. The massive cargo bays in this section ran the entire width of the ship and crossed three decks, extending into deck 39.

CARGO BAY DOORS



In the stardrive section, the cargo bay doors were located on decks 39 toward the rear of the ship, and deck 40 immediately behind the main deflector dish. In the saucer section, massive doors were located on deck 15 on each side of the captain's yacht, which was situated one deck lower.

The *Enterprise*-D's cargo bays were multi-function working areas that could be configured for a variety of mission situations and cargo storage, including hazardous materials.

Cargo was stored in a variety of containers that were designed for specific purposes, such as storing hazardous materials.

Large doors allowed cargo to be loaded directly from space.

The bay doors were controlled from consoles in the room.

Gantries around the room allowed the crew to access cargo that had been stacked.

MAIN SHUTTLEBAY

Shuttlecraft provided *Galaxy*-class ships with essential support on lengthy missions and the double-decked Shuttlebay 1 was the centre of shuttlecraft operations.

Shuttlecraft had long been acknowledged as vital in the support of large-scale vessels on extended missions, and the *Galaxy*-class ship held a wide variety of shuttlecraft within three specifically designed storage and maintenance areas.

OPERATIONS FACILITY

Located on deck 4 of the primary hull, Shuttlebay 1 was the largest facility dedicated to shuttlecraft operations. This vast area was designed for the storage, repair, and construction of at least six types of shuttlecraft, and was accessible via the main turbolift network. In common with all shuttlebays, Shuttlebay 1 was built on two levels, allowing for the successful launch and landing of shuttles through the large single external door, which faced aft of the saucer section. This door consisted of a strong, but flexible alloy, which retracted into the upper part of the doorframe on deck 3. There was no need to depressurize the bay, as a forcefield was activated when the bay doors opened, allowing shuttlebay crew and technicians to continue with their duties while shuttles are entering and exiting the area.

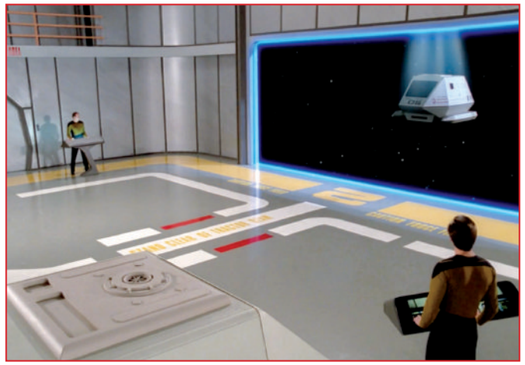
Shuttlecraft could be parked in a number of designated locations on the dark gray flooring that comprised the main deck of all shuttlebays. A series of thick white lines indicated where an individual shuttle should be located while being prepared for launch; similar yellow markings were found on the flat shelf that extended outward from deck 4 onto the exterior of the saucer section. These provided a high visibility visual cue for shuttlecraft pilots as they approached, and while entrance and exit to the *Enterprise* was usually automated, in cases of emergency these markings were critical in lining up the shuttlecraft for a successful landing within all three shuttlebays.

SEPARATE SECTIONS

Galaxy-class vessels consisted of two separate sections normally locked together for standard operation, although when the saucer section and stardrive sections separated, shuttlebay support was lost to one half of the ship. This was countered by locating Shuttlebays 2 and 3 to the rear of the Battle Hull on deck 13, in close proximity to each other. Deck 14 contained the main repair and maintenance facility directly underneath these additional bays, which had their own separate entrance doors located on either side of the stardrive's hull spine.

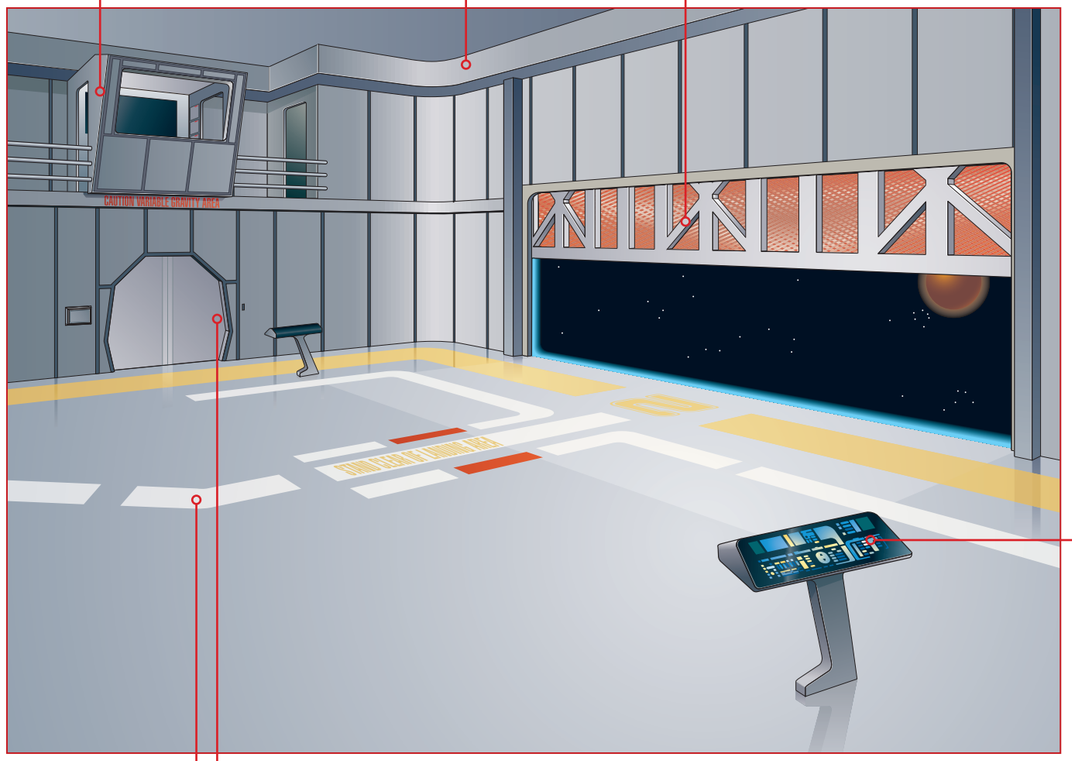
Dwarfed by Shuttlebay 1, Shuttlebay 2 was the smallest facility available to the *Enterprise* crew; it had a reduced storage area in comparison to Shuttlebay 3, which was located on the starboard side of the battle section.

Regardless of size, every shuttlebay was equipped with its own operations control booth, situated on the upper deck of the facility. They gave an excellent view of the entire area, and allowed prelaunch checks to be carried out on the resident vehicles. Permission to initiate prelaunch sequences, or even the launch itself, could be given from the operations control booth or from the operations station on the main bridge, with clearance for launch usually granted from the bridge. The status of all shuttlebays could also be monitored from the bridge, with unauthorized launches immediately being detected, although an override from the specific shuttlebay could not usually be reversed.



A forcefield is activated when the shuttlebay doors open for the entry and exit of shuttlecraft into the area. This allows the personnel to continue operating in the bay. Craft launching and landing procedures are also fully automated.

The launching and landing procedure for shuttlecraft can be overseen from the shuttlebay operations control booth or even from the main bridge. The operations control booth overlooks the entire area from a space built into the bay bulkhead.



DECOMPRESSION

Shuttlebays were busy areas designed for heavy duty use. Entered through a large double-latched door, the bulkhead walls comprised light gray interlocking panels, which, in common with the entrance doors, were reinforced to withstand accidental or deliberate decompression The loss of shields while the bay doors were open could lead to catastrophe if the interior was not able to withstand the sudden loss of pressure, so the entire area was able to protect the integrity of the ship if decompression occurred. Large visual written warnings stencilled on the upper parts of the walls reminded personnel about the dangers of decompression, although evacuation of the areas can be carried out extremely quickly in emergency situations.

The upper gantries of the shuttlebays were quite narrow, and the personnel working on these elevated levels were protected by a series of black railings. The operations control booth was located within a separate area, with a series of screens and controls located on the rear wall, allowing communication with the shuttles and the main bridge during vital away missions.

SHUTTLEPOD: TYPE-15

The type-15 shuttlepod was a basic vehicle designed for simple journeys. It had no warp engines and only light armaments. The shuttle did possess sensor arrays, and was capable of independent navigation.

The *U.S.S. Enterprise* NCC-1701-D was equipped with auxiliary shuttlecraft. The standard complement was ten personnel shuttles, ten cargo shuttles, and five special-purpose craft. The *Enterprise* also carried twelve two-person shuttlepods. Starfleet regulations required that at least eleven shuttles be at operational status at all times.

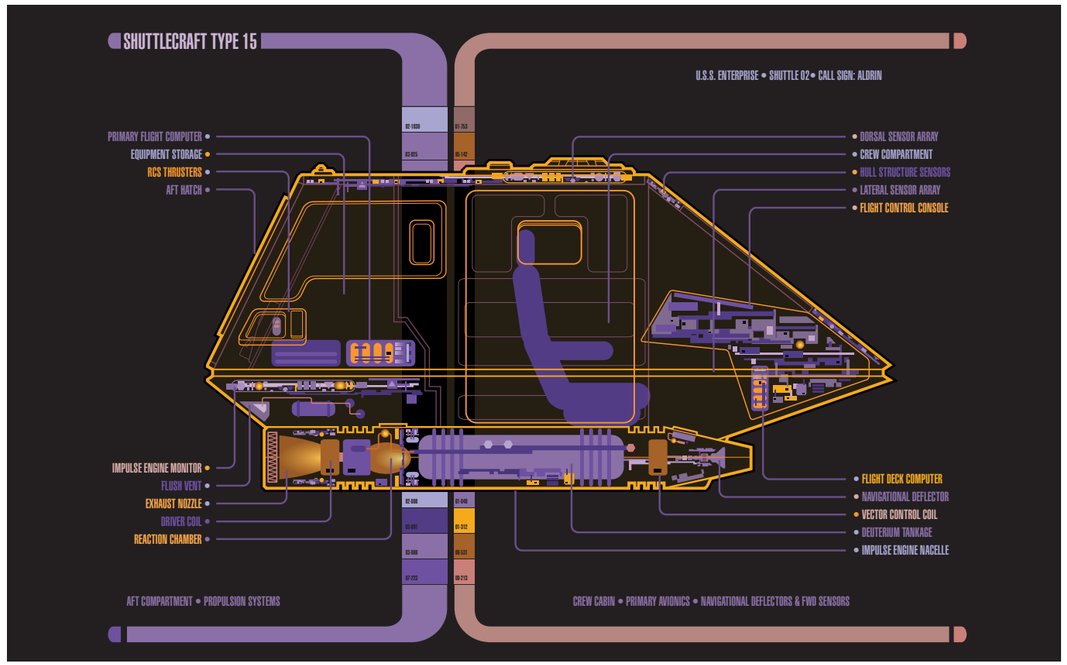
Cruise Mode operating rules required one standard shuttle and one shuttlepod as ready for launch with five minutes' notice. Four additional shuttles were available on standby for 30-minute launch, and an additional six maintained for launch within 12 hours. Red alert mode rules required two additional shuttles to be brought to urgent standby, and all remaining operational vehicles to be maintained at immediate standby status.

The type-15 shuttlepod was designed to hold only two crewmembers: a pilot and systems manager, and were often operated by a single person. Because of their small size they were designated shuttlepods, in contrast to the larger type-6 and type-7 shuttlecraft.

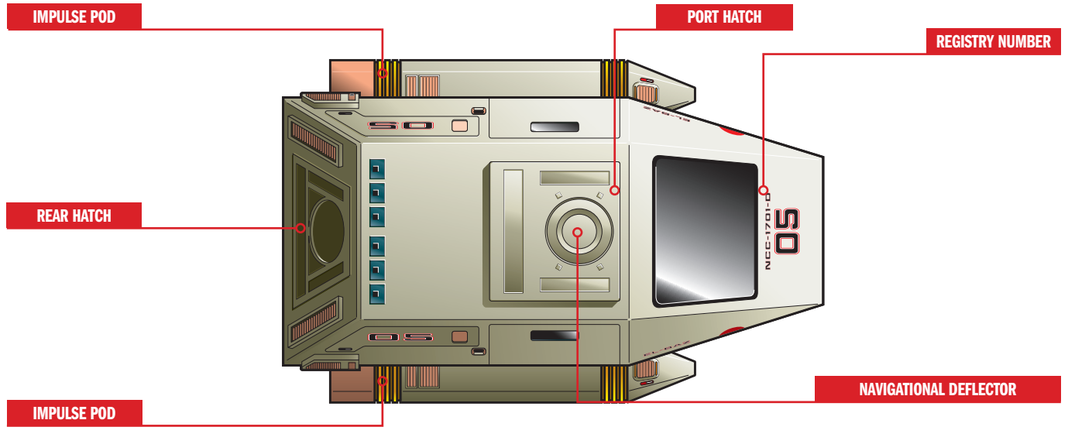
The type-15 shuttlepods assigned to the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D were manufactured at the Starbase 134 integration facility on Rigel VI. Type-15s were not warp capable and were typically used for short-range survey missions and to make journeys from the ship to a planetary surface where transporters were not appropriate, for example when they were rendered ineffective by electromagnetic storms or hyperonic radiation.

The shuttlepods could also be used to carry unstable materials such as hytritium, which could not be transported safely. The rear of the craft provided a small storage area for this kind of mission.

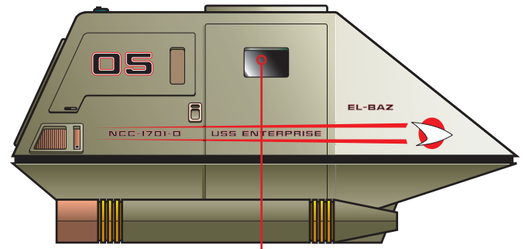
The standard version type-15 was powered by two 500 millicochrane impulse driver engines and relied on a primary deuterium supply and three sarium krellide storage cells.



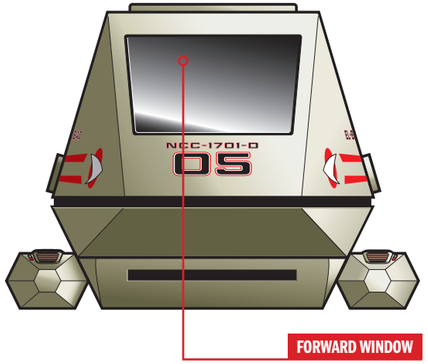
DORSAL VIEW



STARBOARD VIEW



FORE VIEW

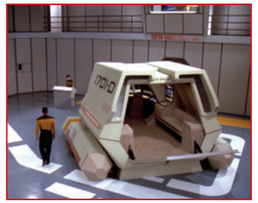


TYPE-15 SHUTTLEPOD SPECIFICATIONS

BUILT:	Starbase 134 Integration Facility, Rigel VI
TYPE:	Light short-range sublight shuttlepod
L/H/M:	Length: 3.6m Beam: 2.4m Height: 1.6m. Mass: 0.86 metric tonnes
CREW:	2
ARMAMENT:	Two type-4 phaser emitters
POWERPLANT:	Two 500 millicochrane impulse drive engines, eight DeFI 657 hot gas RCS thrusters, three sarium krellide storage cells
PERFORMANCE:	Maximum delta-v, 12,800 m/sec

SHUTTLE TYPE-6

The *Enterprise*-D's type-6 shuttlecraft was part of the starship's complement of auxiliary support craft. It was a multi-function ship capable of transporting passengers and cargo.



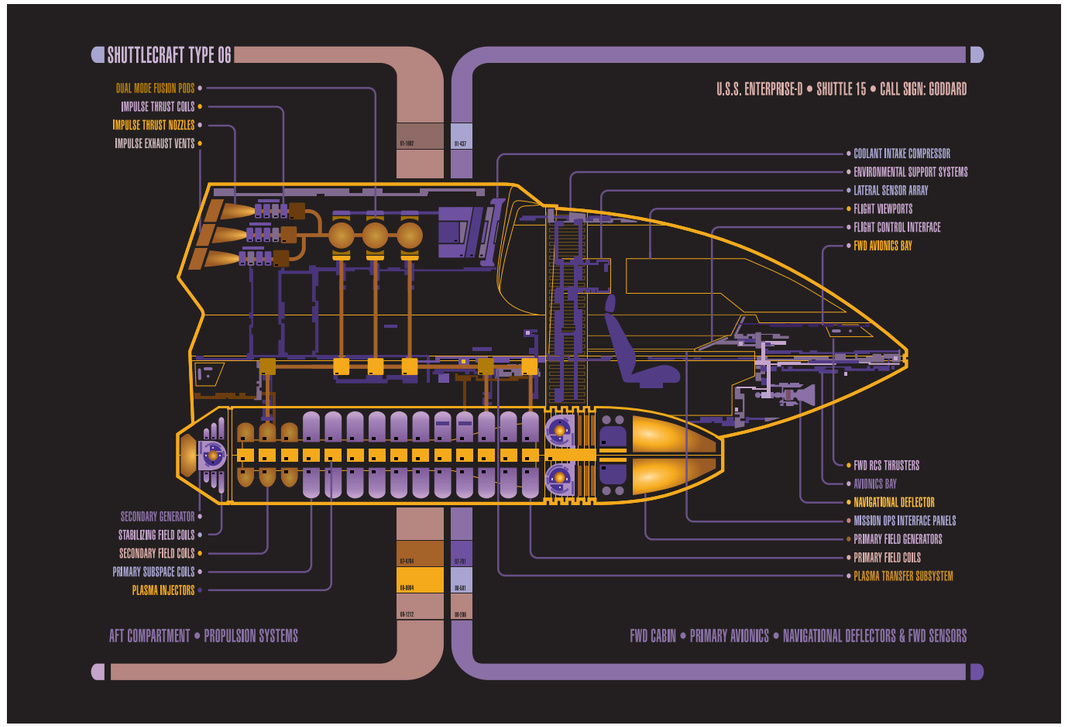
The Type-6 shuttlecraft *Goddard* was fitted with defense shields and minimal weaponry, including phasers and torpedoes.

The type-6 shuttlecraft was classified as a personnel shuttle and was exactly six meters long. The interior consisted of a single compartment that ran almost the entire length of the shuttle and was accessed from the rear, with the entire back wall folding down to form a ramp. *Galaxy*-class ships routinely carried five shuttles of this type; during the *Enterprise*-D's seven yeas of service these included the *Curie*, the *Fermi*, the *Justman*, the *Magellan* and the *Goddard*. The last of these was given Captain Montgomery Scott, who acknowledged that it was slow but insisted that it had its charms.

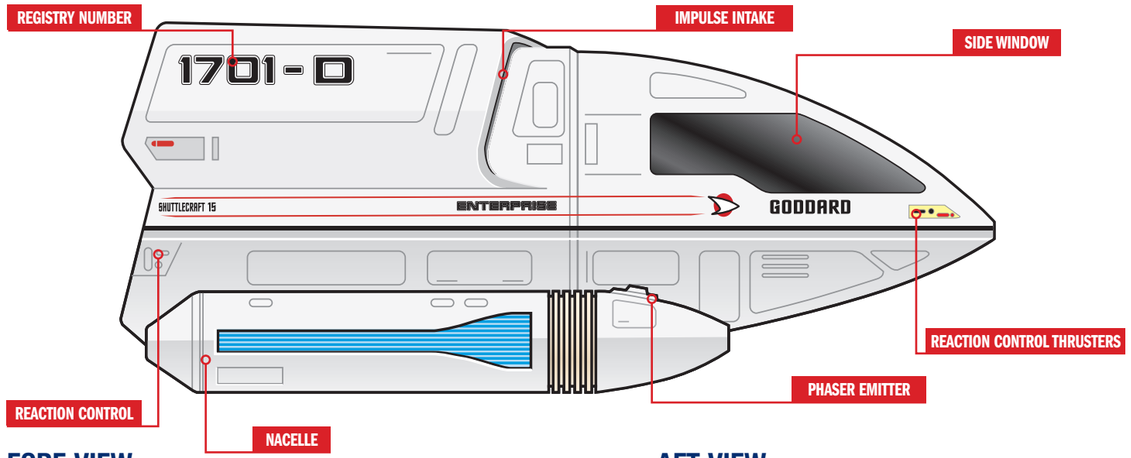
In its standard configuration the type-6 was a short-range, warp-capable vessel, that could maintain warp 1.2 for 48 hours or warp 2 for 36 hours. If necessary, it could be further uprated so that it could maintain warp 5 for up to 14 days.

Almost all of the shuttle's systems were installed in the hull around the cabin. In the most basic configuration the type-6 was powered by two 1,250 millicochrane fusion reactors that were capable of superheating plasma so that it could achieve warp speed. The fusion reactors also provided power to the impulse systems, which consisted of a pair of impulse thrust coil and nozzle assemblies on either side at the rear of the shuttle, and could be seen behind the grilles on either side of the rear hatch.

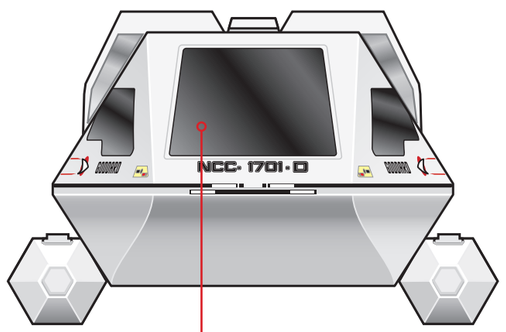
The type-6 used 12 DeFI 3234 microfusion RCS thrusters to maneuver. Unlike the *Enterprise*-D itself, the type-6 was designed to enter a planet's atmosphere and to land on the surface and it was fitted with an atmospheric airscoop and hover field antigravs that could only be operated within a planet's atmosphere.



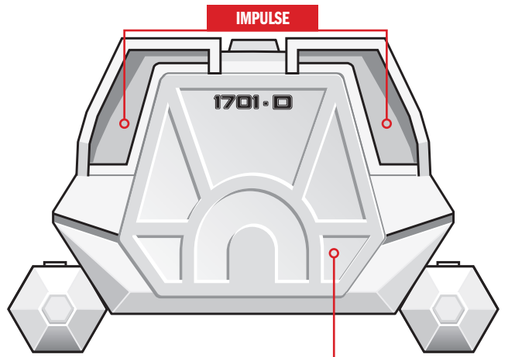
STARBOARD VIEW



FORE VIEW



AFT VIEW

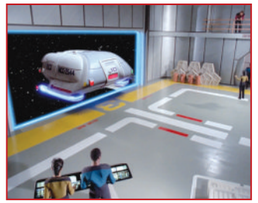


TYPE-6 SHUTTLECRAFT SPECIFICATIONS

BUILT:	ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars
TYPE:	Light short-range warp shuttle
L/H/M:	Length: 6.0m Beam: 4.4m - Height: 2.7m - Mass: 3.38 metric tonnes
CREW:	2, with 6 passengers (standard) or 2 (diplomatic operations)
ARMAMENT:	None (standard version); two Type-4 phaser emitters (special operations)
POWERPLANT:	Two 1,250 millicochrane warp engines, 12 DeFI 3234 microfusion RCS thrusters (standard model); two 2,100 millicochrane warp engines (upgraded version)
PERFORMANCE:	Warp 1.2 for 48 hours (standard model); Warp 2 for 36 hours (upgraded version)

SHUTTLE TYPE-7

The type-7 standard personnel shuttle on board the *Enterprise* served as crew transport, though could be brought into service for a variety of uses in support of the starship's mission.



The type-7, passing through the forcefield that maintained atmospheric pressure aboard the ship.

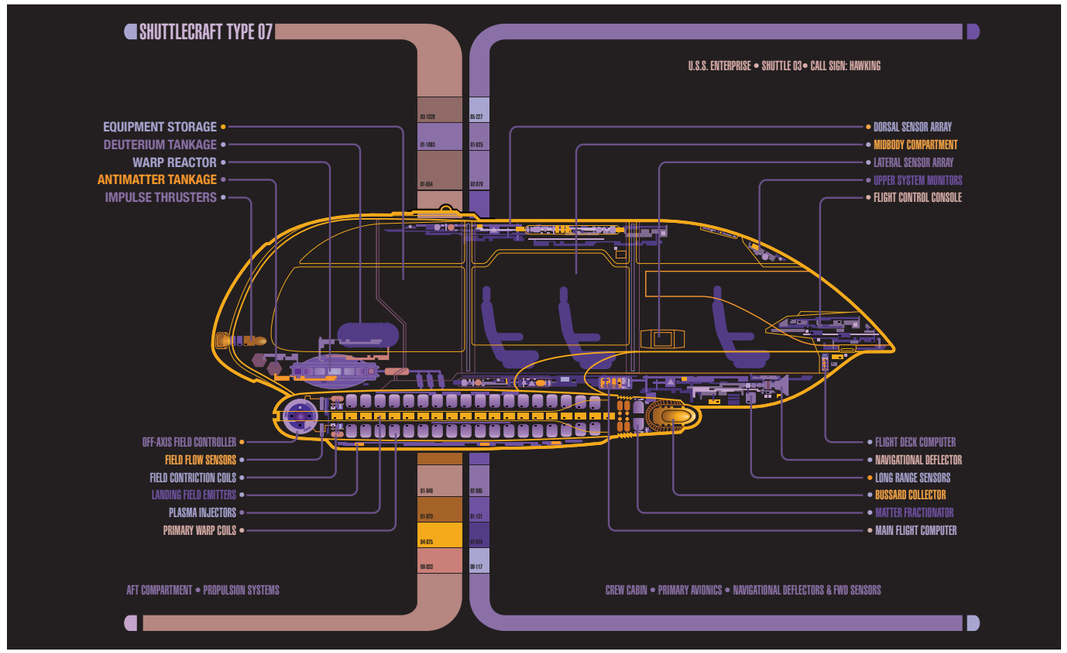
The type-7 personnel shuttlecraft was developed during the 24th century. Built at the Utopia Planitia Fleets Yards on Mars, it was designed for a number of mission types including reconnaisance and scientific surveys. It was capable of entering a planet's atmosphere when transporters were inoperative and was often assigned to perform planetary survey and search operations. The type-7s were used mainly for short or medium range journeys and were outiftted with three different engine specfications. They were all equipped with impulse engines located at the rear of the vessel.

In the standard configuration they were fitted with twin 1,250 millicochrane warp engines that could maintain a Warp speed of 1.75 for 48 hours. Some shuttles were upgraded with two 2,100 millicochrane warp engines that could achieve Warp 2 for 36 hours. A small number of type-7s only had impulse engines and were not designed for interstellar travel.

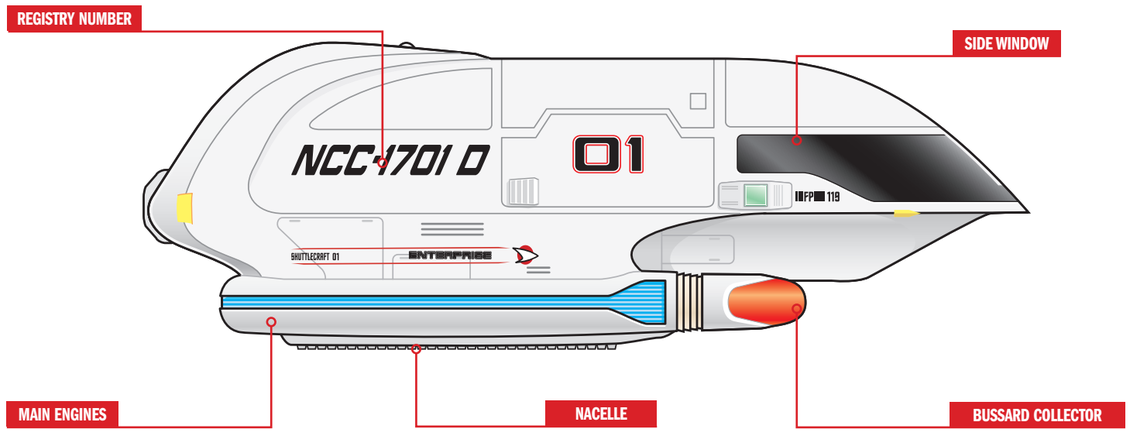
The type-7s were not designed to engage with hostile forces and, as a result, they normally carried no weaponry although for special operations they could be outfitted with two type-V phaser emitters. The type-7 also carried only minimal deflector shielding. A sensor control allowed the shuttle to conduct a variety of short-range scans such as the passive high resolution series, electro magnetic band, neutron densitometer and the positron emission.

Entry to the shuttle was through a rear hatch and the interior was very similar to the type-6 shuttle, with a cockpit and a rear compartment. A door could be activated to separate the two areas. In its standard configuration the rear compartment provided room for six extra passengers who were seated on benches along the sides.

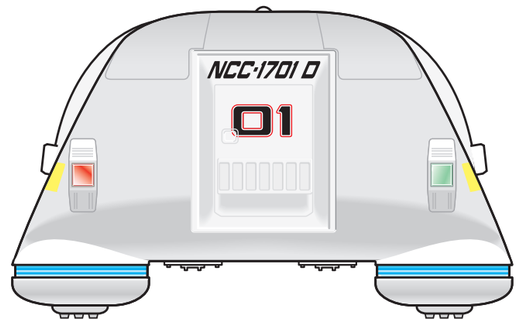
The shuttle was highly maneuverable and launched from the ship under its own power, however, when it returned to its mother vessel tractor beams were used to maneuver into the shuttlebay.



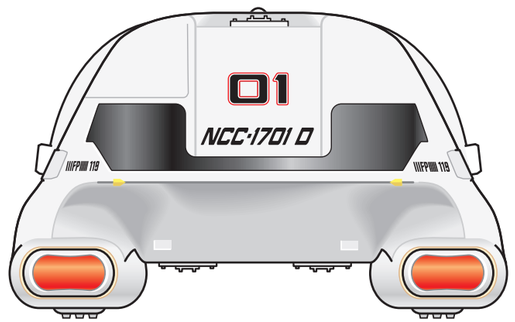
STARBOARD VIEW



FORE VIEW



AFT VIEW



TYPE-7 SHUTTLECRAFT SPECIFICATIONS

BUILT:	ASDB Integration Facility, Utopia Planitia Fleet Yards, Mars
TYPE:	Medium short-range warp shuttle
L/H/M:	Length: 8.5m Beam: 3.6m - Height: 2.7m - Mass: 3.96 metric tonnes
CREW:	2, with 6 passengers (standard) or 2 (diplomatic operations)
ARMAMENT:	None (standard version); two Type-5 phaser emitters (special operations)
POWERPLANT:	Two 1,250 millicochrane warp engines, 12 DeFI 3234 microfusion RCS thrusters (standard model); two 2,100 millicochrane warp engines (upgraded version)
PERFORMANCE:	Warp 1.75 for 48 hours (standard model); Warp 2 for 36 hours (upgraded version)

ESCAPE POD

The Autonomous Survival and Recovery Vehicles found aboard the *U.S.S. Enterprise* NCC-1701-D represented the latest development in lifeboat technology.

The *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D was equipped with small ejectable spacecraft intended to carry the crew to safety in the event of a catastrophic disaster. These lifeboats were contained at various locations throughout the primary and secondary hulls, and were intended to meet the short-term survival needs of the crew.

The ASRV measured 4x4x4 m and took the form of a truncated cube, with a total mass of 2.53 tons. Its internal spaceframe was based on a standard beam and stringer arrangement, constructed from gamma-welded tritanium and frumium monocarbonite. The frame was skinned with single-crystal microfilleted tritanium, with umbilical pass-throughs, conformal emitters, and sensors doped with hafnium cobarate for passive thermal control during atmospheric entry.

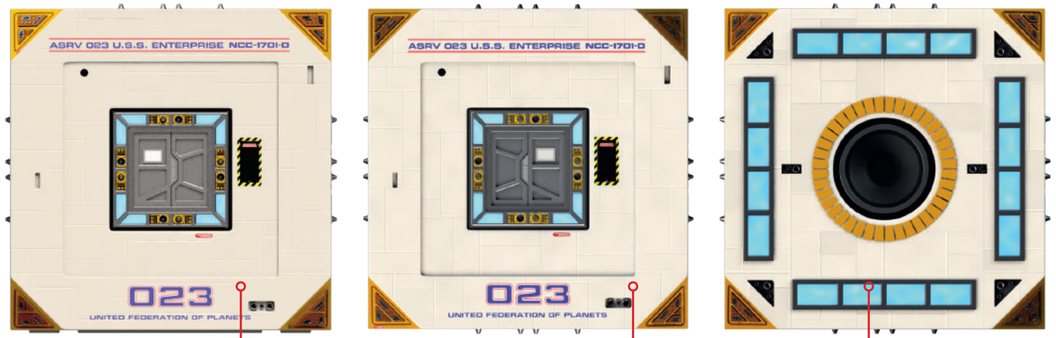
PROPULSION SYSTEMS

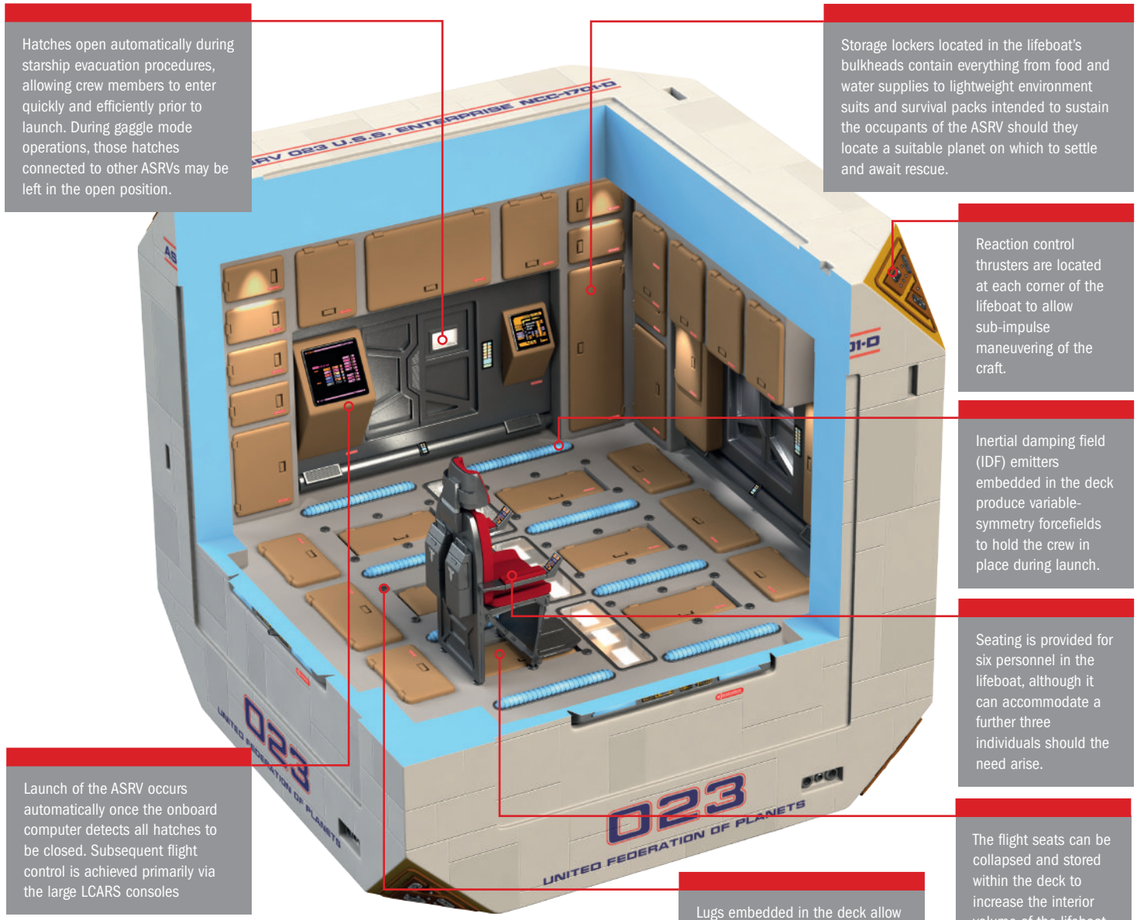
The lifeboat possessed three distinct forms of propulsion technology: ejection initiator, main impulse engine, and reaction control system. The ejection initiator was a single-pulse, buffered microfusion device that propelled the lifeboat through the launch channel and away from the ship. Power from the fusion reaction was also used to activate the gravity generator and spin up the lifeboat's inertial damping field, which protected the crew against the forces of acceleration. The main impulse engine, a low-power microfusion system used for all primary spacecraft maneuvering, was rated at 3,575 kg thrust for a maximum for five seconds, which could be throttled down to 90kg thrust, and was fed from a 268kg deuterium fuel supply. The small RCS thrusters located at each corner of the ASRV are used to perform all precise attitude and translation motions and maneuvering during planetary landing.

Life support aboard the ASRV was maintained by its automatic environmental system, which provided complete atmospheric composition, pressure, humidity, and temperature control. Food and water supplies, along with lightweight environment suits and portable survival packs for planetside operations, were stowed in lockers located in the bulkheads. Seating was provided for six personnel, but the lifeboat could accommodate as many as nine if the added evacuees were small children sitting in adult laps, or adult crew assumed correct floor positions to allow the IDF to cushion them as best as possible. A waste management system was also provided.

CREW ACCOMMODATION

Flight control could be accomplished at any of the LCARS panels located around the lifeboat, though the usual command locations were seats located next to the larger wall-mounted displays. Specific personnel placement in the seats was not an issue for initial escape from the starship. The launch event was triggered automatically once the onboard computer knew that all hatches were sealed and all evacuees were secured for flight. Once the ASRV moved to a safe distance, the senior crew member could move to one of the command seats for further maneuvering.





Hatches open automatically during starship evacuation procedures, allowing crew members to enter quickly and efficiently prior to launch. During gaggle mode operations, those hatches connected to other ASRVs may be left in the open position.

Storage lockers located in the lifeboat's bulkheads contain everything from food and water supplies to lightweight environment suits and survival packs intended to sustain the occupants of the ASRV should they locate a suitable planet on which to settle and await rescue.

Reaction control thrusters are located at each corner of the lifeboat to allow sub-impulse maneuvering of the craft.

Inertial damping field (IDF) emitters embedded in the deck produce variable-symmetry forcefields to hold the crew in place during launch.

Seating is provided for six personnel in the lifeboat, although it can accommodate a further three individuals should the need arise.

Launch of the ASRV occurs automatically once the onboard computer detects all hatches to be closed. Subsequent flight control is achieved primarily via the large LCARS consoles

The flight seats can be collapsed and stored within the deck to increase the interior volume of the lifeboat.

Lugs embedded in the deck allow the crew to arrange the collapsible seats in multiple configurations.

LIFEBOAT SEATING

Inertial damper field conductors are located in the footplates of the six collapsible seats to help hold crew members in place during launch of the ASRV.

GAGGLE MODE

A key feature of the ASRV design are four circumferential hatches, which allow several craft to dock together to form larger clusters. Gaggle mode must be terminated prior to entering a planetary atmosphere, however, as the structural loads involved in such a maneuver cannot be handled by the combined craft. All 430 lifeboats installed within the *Galaxy* class are equipped with the two additional docking ports around the 'equator' and one port above on the +Y axis to increase the density and structural integrity of the gaggle.

SPHINX WORKPOD

The Type M1 Sphinx workpod provided valuable support for maintenance and cargo movement around the hull of the *U.S.S. Enterprise* NCC-1701-D.

The adaptable and compact Type M1.

In addition to its complement of shuttlecraft, the *U.S.S. Enterprise* NCC-1701-D was equipped with several Sphinx workpods covering Types M1A, M2A and MT3D. The M1A was designated as a light industrial manipulator, the M2A a medium industrial manipulator and the more robust MT3D classed as a medium tug.

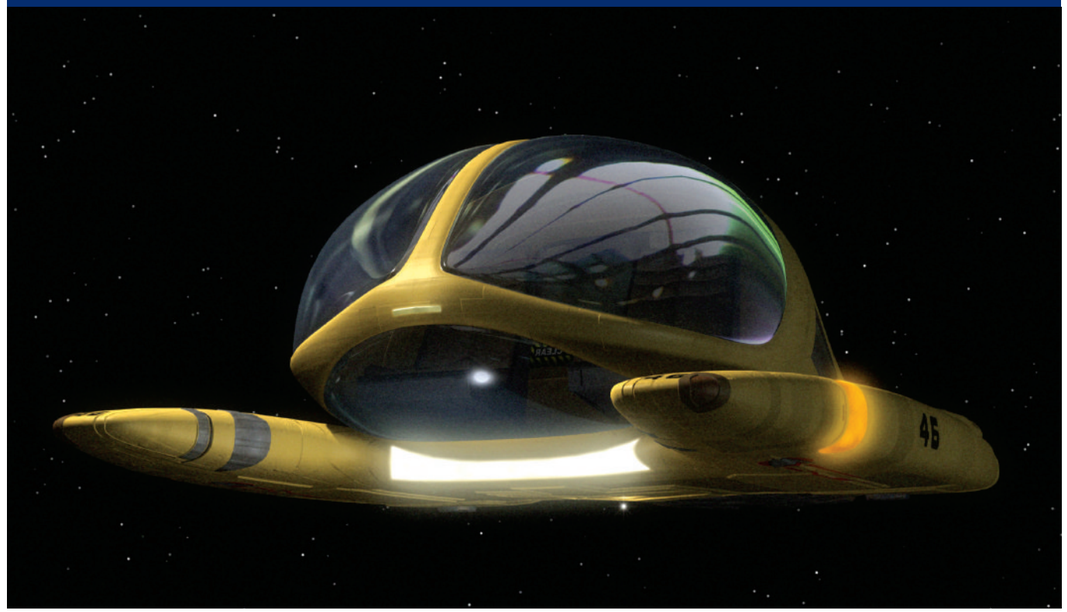
The Sphinx was a highly compact multi-function workpod, with a length of 6.2m and height of 2.5m, weighing 1.2 metric tonnes. These pods were utilised in a wide variety of tasks around the hull of the starship, including routine maintenance, urgent repairs and the movement of cargo. Both the M1A and M2A carried a single pilot, while the heavier MT3D had accommodation for a cargo specialist in addition to the pilot. Its design allowed the pilot and specialist a wide field of vision, improving safety and efficiency in all fields of operation.

The Sphinx was highly maneuverable thanks to two primary 4,600 Newton-second I_{sp} microfusion thrusters alongside 16 DeBe 3453 hot gas RCS thrusters.

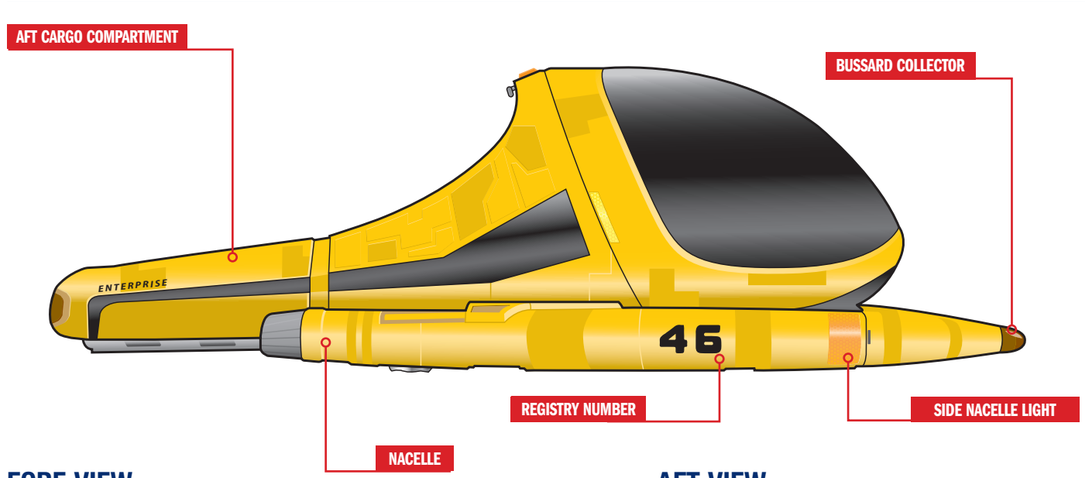
The craft-type was capable of maximum speeds of 2,000m/second with a maximum manipulator mass of 2.3 metric tonnes. The addition of a sled attachment to the workpod gave a maximum manipulator mass of 4.5 metric tonnes.

ANCIENT PEDIGREE

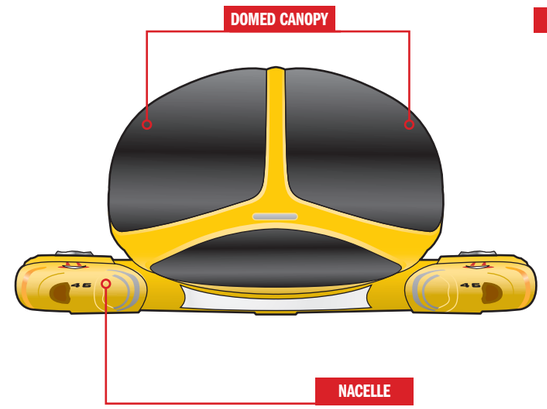
The workpod was standard issue on all *Galaxy*-class starships. The craft was named 'Sphinx' for the mythical creature of Earth, which had the body of a lion and a human head, and guarded the pyramid of Giza in Egypt.



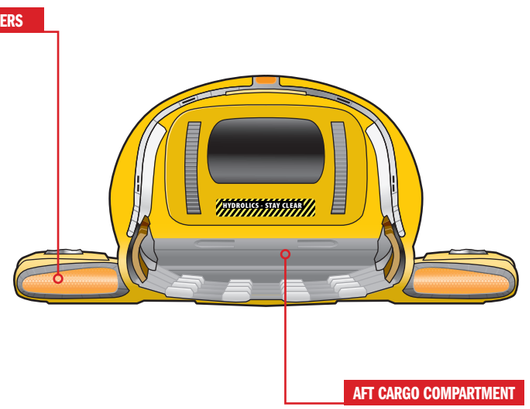
STARBOARD VIEW



FORE VIEW



AFT VIEW



SPHINX WORKPOD SPECIFICATIONS

BUILT:	Starfleet Plant #2, Utopia Planitia Fleet Yards, Mars
TYPE:	Light industrial manipulator (Sphinx M1A), medium industrial manipulator (Sphinx M2A), and medium tug (Sphinx MT3D).
L/H/M:	Length: 6.2m - Beam: 2.6m - Height: 2.5m - Mass: 1.2 metric tonnes
CREW:	Pilot (M1A, M2A); pilot and cargo specialist (MT3D)
ARMAMENT:	None
POWERPLANT:	Two 4,600 Newton-second I_{sp} microfusion primary thrusters, sixteen DeBe 3453 hot gas RCS thrusters. Four alfinium krelide power storage cells
PERFORMANCE:	Maxumim delta-v, 2,000 m/sec. Maximum manipulator mass, 2.3 metric tonnes. Maximum sled mass, 4.5 metric tonnes

CAPTAIN'S YACHT

The *U.S.S. Enterprise* NCC-1701-D carried a captain's yacht – a larger, more refined version of a shuttlecraft that was normally used for transporting important dignitaries.

Galaxy-class vessels such as the *U.S.S. Enterprise* NCC-1701-D were equipped with an auxiliary spacecraft that was normally used for diplomatic missions. This ship was known as the captain's yacht, and was larger than a normal shuttlecraft – it measured 18 meters long, 10 meters wide and 8 meters high, with a loaded mass of 95 metric tonnes. In its docked configuration the yacht was located in the center underside of the saucer section.

SIMPLE VESSEL

The *Enterprise*'s yacht was made largely from tritanium and duranium. It was designed to serve as a self-contained, multipurpose vessel, but was used almost exclusively to transport personnel and visiting dignitaries when transporters were inoperable or inappropriate. This kind of mission scenario was very rare, and as a result the yacht was seldom used.

The interior of the yacht consisted of a flight deck, two staterooms, accommodation for the flight crew, and a galley. Hatches allowed access to the engineering area and the impulse engines, which surrounded the habitat area. The ship was normally crewed by two pilots and a service representative who tended to and assisted any diplomatic guests.

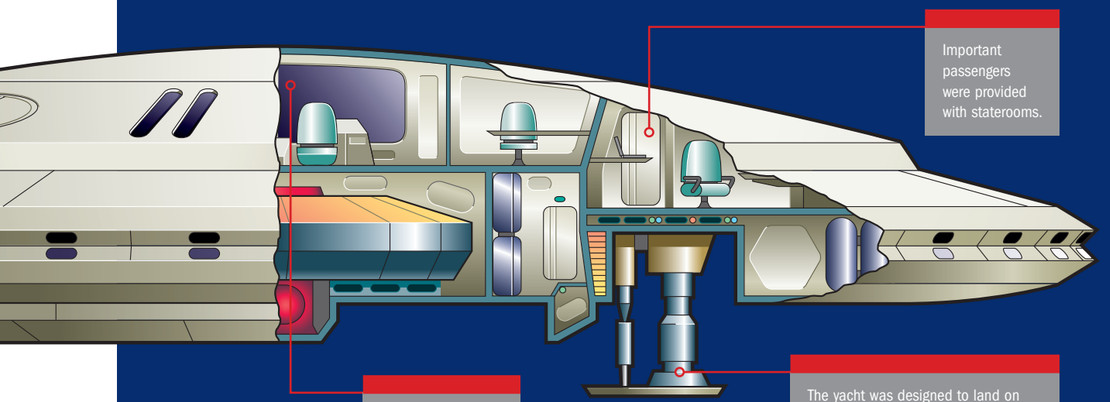
The captain's yacht was equipped with a deflector grid to remove interstellar debris from its immediate flight path. It also possessed impulse engines and aerodyne flight motors, which were used when the vessel entered a planet's atmosphere. In space, the yacht was capable of achieving velocities in the region of 0.65 of the speed of light; in atmospheric flight, it normally cruised at Mach 6, but could achieve velocities as high as Mach 20.

WARP SPEED

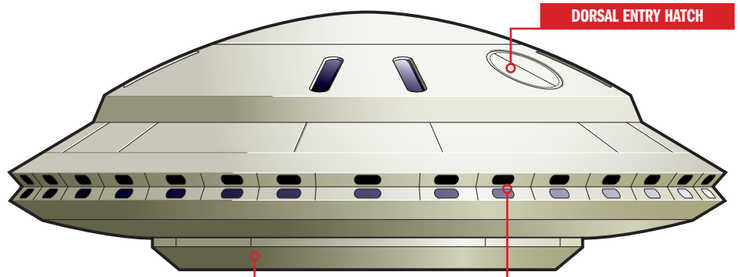
Unlike shuttles, if necessary the yacht could be launched at speeds as high as warp 7. Once it had separated from the main vessel, the yacht safely decelerated until it reached sublight operating speeds.

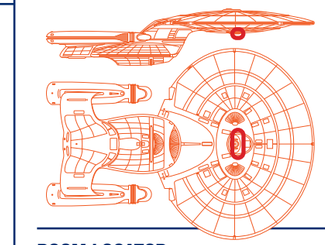
SELF-CONTAINED VESSEL

The captain's yacht provided a comfortable means of transporting diplomatic personnel over sublight distances. It was equipped with sequential beam fusion reactor chambers that fed a central toroidal coil driver, and was capable of achieving impulse speeds.

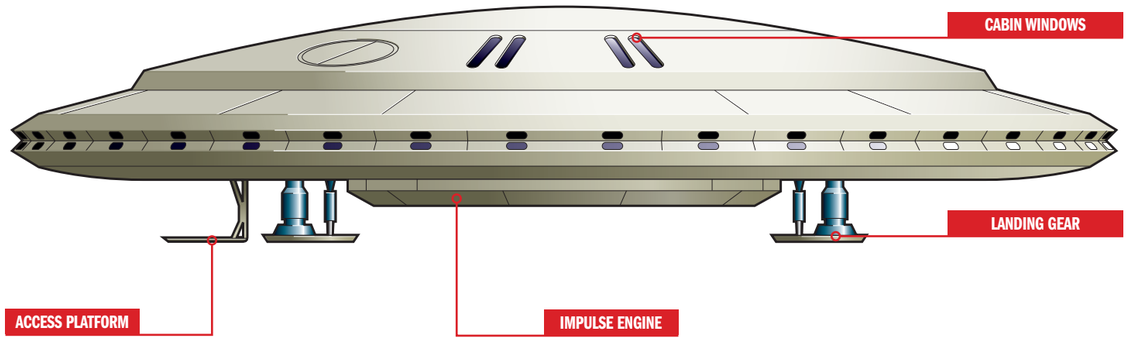


PROFILE VIEW

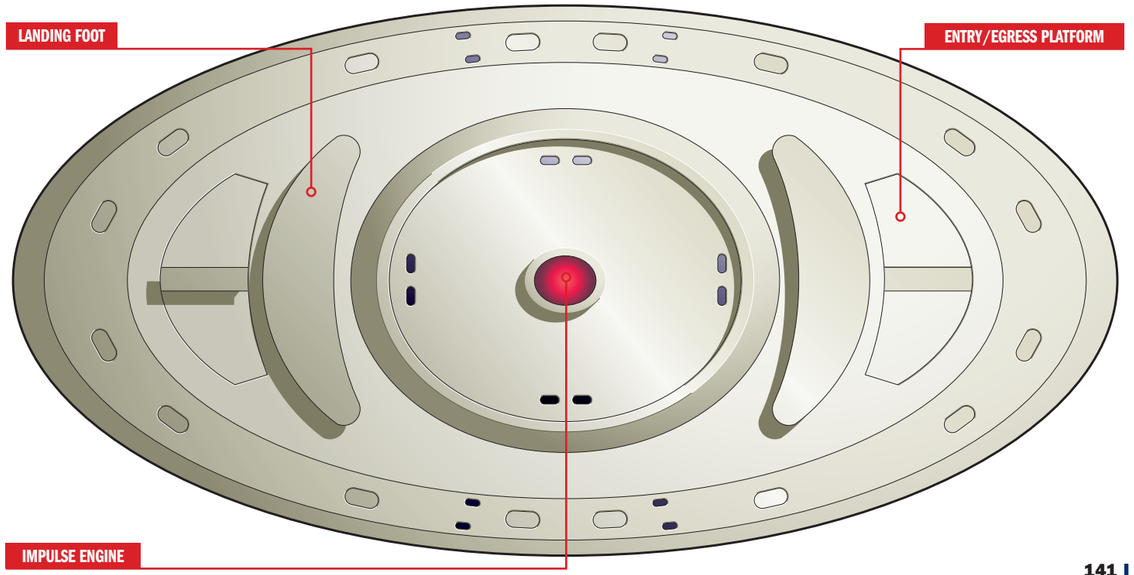




AFT VIEW



VENTRAL VIEW



THE BRIG

The brig – or security cell – aboard the *U.S.S. Enterprise* NCC-1701-D was designed to detain suspects and hold convicted felons while onboard the ship.

The brig facility consisted of two rooms – the control room and the single-occupant cell. From the control room the status of the forcefield surrounding the brig could be monitored, and activated and deactivated as circumstances required.

A security officer was usually stationed in the control room to manipulate the forcefield from a work station and observe the prisoner. When the forcefield was activated it was transparent, but illuminated strips girding the entranceway indicated that it was on. The containment field only shimmered when it was activated/deactivated or when an object made contact with it.

Walls of the brig were constructed from reinforced aluminum. The fourth wall is effectively a forcefield which can be set to varying levels of intensity depending on the strength and attitude and intention of the detainee.

THE CELL

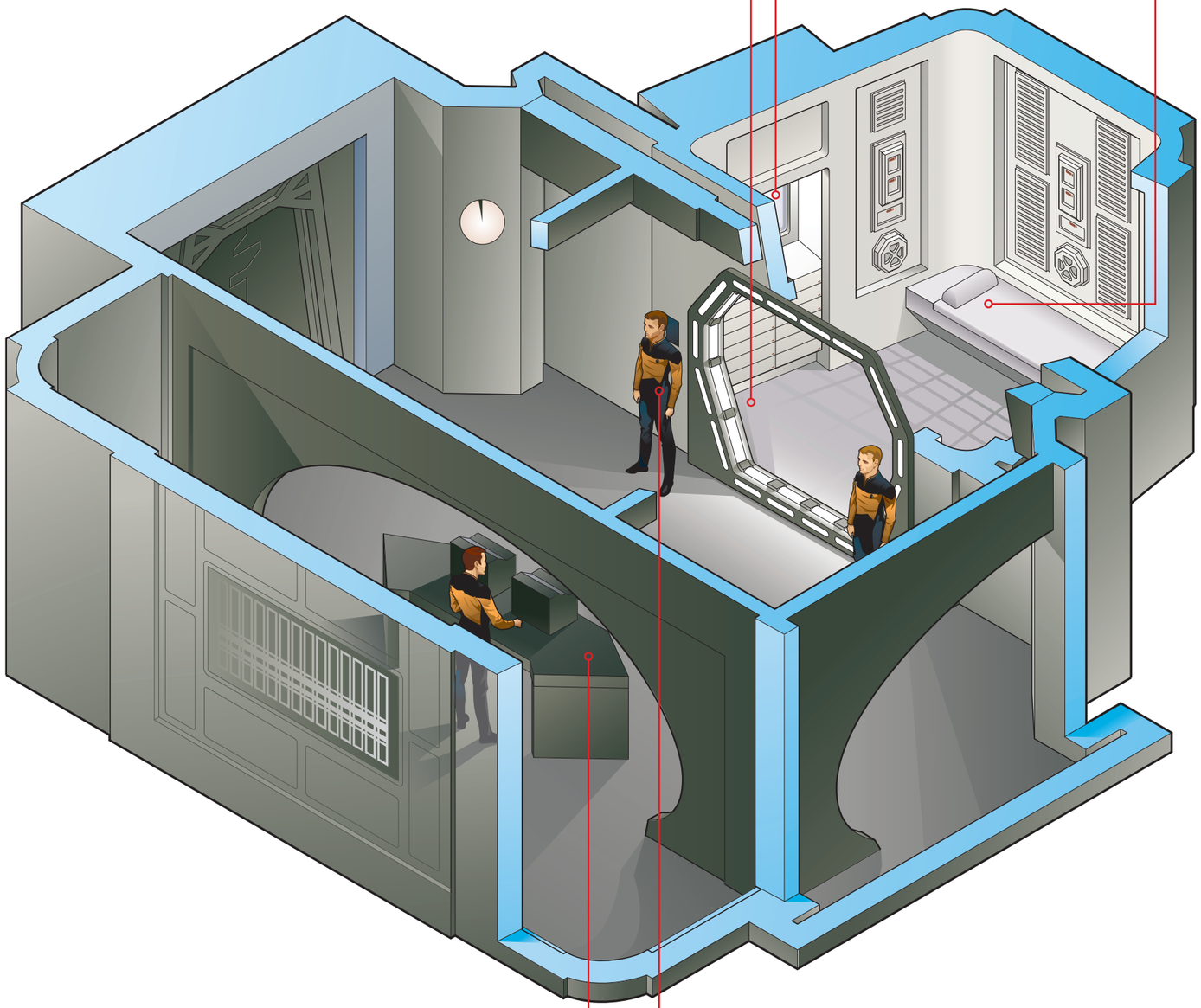
Unlike many other races, such as the Cardassians, the Federation penal system did not involve treating prisoners with brutality; consequently the brig quarters were spartan but comfortable. The accommodation was well illuminated and featured a mattress to allow the detainee to rest and contemplate the nature of their crime. A wide mirror was located to one side of the cell, and a drawer opened to reveal a washbasin that provided fresh water.

IN THE BRIG

The brig was designed to hold a single detainee in basic comfort, but could hold more in emergency conditions. The light, airy cell provided basic comforts but not privacy. The large octagonal door took up much of the cell's forth wall and thus the occupants could be kept under constant observation.

Prisoners held within the brig had access to hygiene facilities, including a wide mirror and washbasin.

The restraining forcefield within the brig section was visible only upon activation or when a person applied pressure to it.



TEN-FORWARD

One of the most important leisure facilities for personnel aboard the *U.S.S. Enterprise* NCC-1701-D was a popular bar known by the name of Ten-Forward.

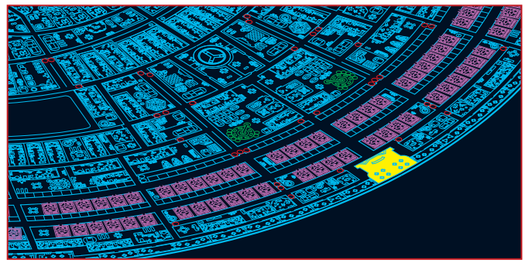
Ten-Forward was given its name because it was on deck 10 at the forwardmost point of the *U.S.S. Enterprise* NCC-1701-D. As the ship's bar, it provided a place where off-duty crew members could gather for social occasions or simply meet for a drink. The windows gave it a spectacular view of space directly in front of the ship.

The bar had civilian staff, and for most of the *Enterprise*'s career it was run by the El-Aurian Guinan. Replicators were able to provide a wide variety of food and drink – including synthehol – to order, but Guinan also kept a supply of rare drinks that could not be replicated.

Ten-Forward was also one of the *Enterprise*'s 52 designated emergency environmental-support shelters.

Ten-Forward was a large recreation room with comfortable seating.

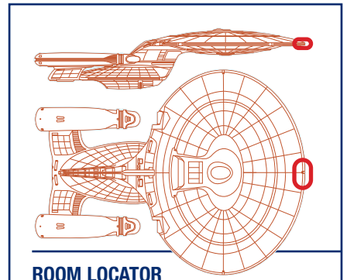
Food and drinks were available at the bar.

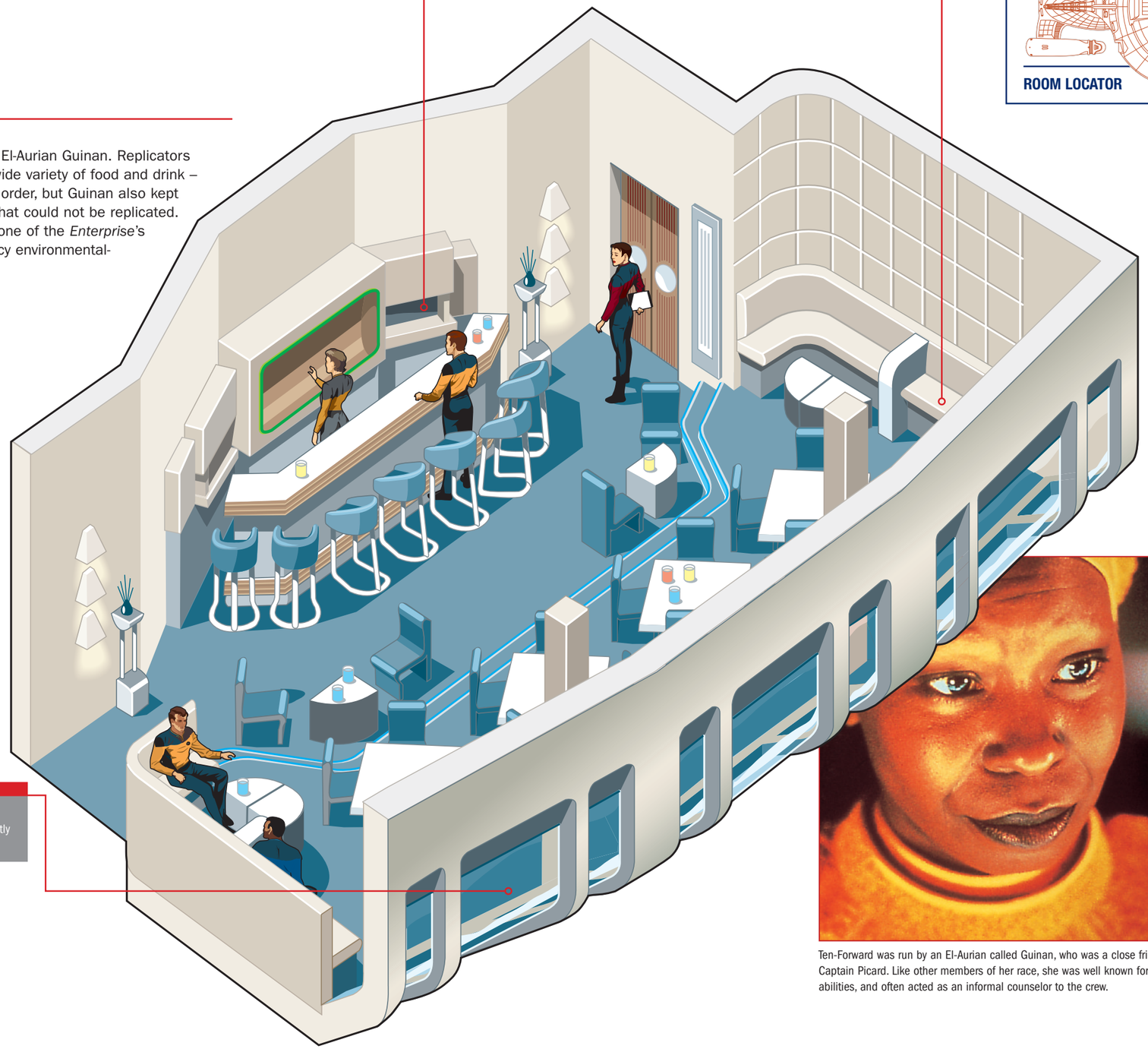


Other facilities on the deck included holodecks, crew quarters, the saucer impulse engines, and the stellar cartography section.

The replicators at the bar provided an enormous range of drinks.

Ten-Forward had a wide variety of seating and was an ideal place for crewmembers to meet.





The large windows provided a spectacular view of space directly in front of the ship.

Ten-Forward was run by an El-Aurian called Guinan, who was a close friend of Captain Picard. Like other members of her race, she was well known for her listening abilities, and often acted as an informal counselor to the crew.

HOLOGRAPHIC ENVIRONMENT SIMULATORS

The Holographic Environment Simulator, referred to as the holodeck, could create simulated experiences for passengers and crew, enabling them to travel to – any place, in any time.

Psychologists realized long ago that being locked up in an artificial environment for extended periods of time can be mentally unhealthy. Starfleet worked for years to create an energy-efficient, virtual reality system that offered a much-needed mental vacation. Holodeck technology became practical at about the time *Galaxy*-class ships were developed, and quickly became a standard basic requirement for most starships. The *U.S.S. Enterprise* NCC-1701-D was no exception. Deck 11 housed four full-sized holodecks, while decks 12 and 33 hosted 20 smaller holosuites for more individual use.

BLACK BOX

When the holodeck was not in use, it was simply a large, empty black room with yellow gridlines dividing the interior. Embedded in the walls were countless microminiature omnidirectional holo diodes (OHDs). The OHDs were the workhorses of the holodeck system. Each six-sided OHD contained an optic section and a forcefield section. Orchestrated by a computer, the OHDs created a world that appealed to all five senses. The more complex the simulation, the more memory and power were required from the ship's computers.

HOLODECK IMAGERY SUBSYSTEM

The holodeck imagery subsystem added depth to the simulated environment in two ways. First, it generated 3D projections of distant objects – city lights, rolling hills, a blazing sun – in a sophisticated extension of forced perspective. This subsystem also used concentrated forcebeams to give nearby objects the appearance of depth and substance.

MATTER CONVERSION SUBSYSTEM

The matter conversion subsystem used both the transporter systems and the replicator to create real matter within the holodeck environment.

The holodeck imaging processor created distant objects and background scenery. While the imagery subsystem could generate an image of a telephone on a desk, if a user was about to pick up the receiver and dial, the matter conversion subsystem created an actual telephone.

The holodeck produced incredibly faithful recreations of natural environments. The computer generated all the appropriate sounds and smells, and used various 'tricks' to persuade the user that the simulation was much larger than it really was.

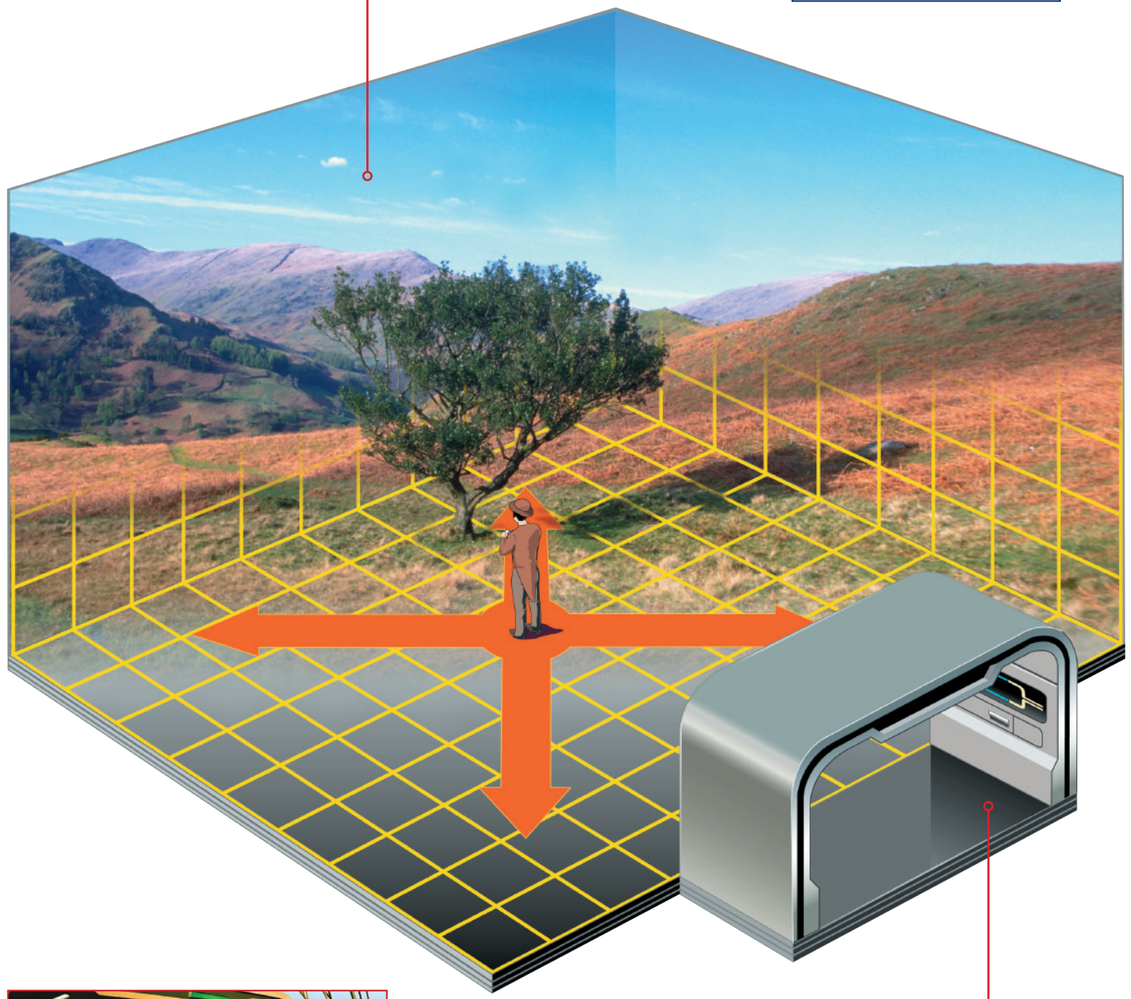
Holomatter objects were destroyed when they left the confines of the holodeck. Captain Picard demonstrated this fact to Professor Moriarty by attempting to throw a holomatter book into the corridor.

After being held in stasis for 75 years by a modified transporter beam, Captain Montgomery Scott used the holodeck to visit his old ship, the original *U.S.S. Enterprise* NCC-1701.

When a program was activated, the holodeck's yellow grid was replaced by simulated reality. Perspectives changed according to which direction you moved, and nearby objects given substance by concentrated forcebeams.

ON THE HORIZON

The simulated holo-environment appeared to extend beyond the holodeck's real walls.



Users entered and left the virtual world constructed by the holodeck through an arch that contained computer controls.

Crew entered the holodeck through the arch.

Transporter and forcefield technology was brought to bear to create life-like interactive beings. These characters had physical substance and were controlled by discreet forcefield and tractor beams.

Unlike holomatter, any matter created purely by the transporter or replicator could be removed from the holodeck. The object was real. However, if a character left the holodeck, it was no longer controlled by the computers. Without the forcefields generated by the holodeck systems the character would dematerialize.

PROGRAMS

Generally, holodeck reality was created from information in the ship's databanks. When Captain Jean-Luc Picard wanted 1940s San Francisco for his private detective adventure, he instructed the computer to use an amalgam of period detective novels as the basis for the simulation. Lieutenant Commander Worf had stored his own holodeck calisthenics program – complete with ax-wielding monsters.

CONTROLS

There were three sets of controls for a holodeck. A small command console allowed users to control the holodeck before entering. Traditional voice commands could stop, freeze, replay, or adjust any situation. The final control option was via holodeck arch controls. The arch controls appeared within an ongoing simulation, providing communications and non-holodeck computer functions.

ETIQUETTE

Chief among the holodeck etiquette rules was a ban on using a living person – especially someone serving on the same ship – as a model for personal fantasy fulfilment. However, there was nothing within the holodeck systems that prevented anyone from doing just that.

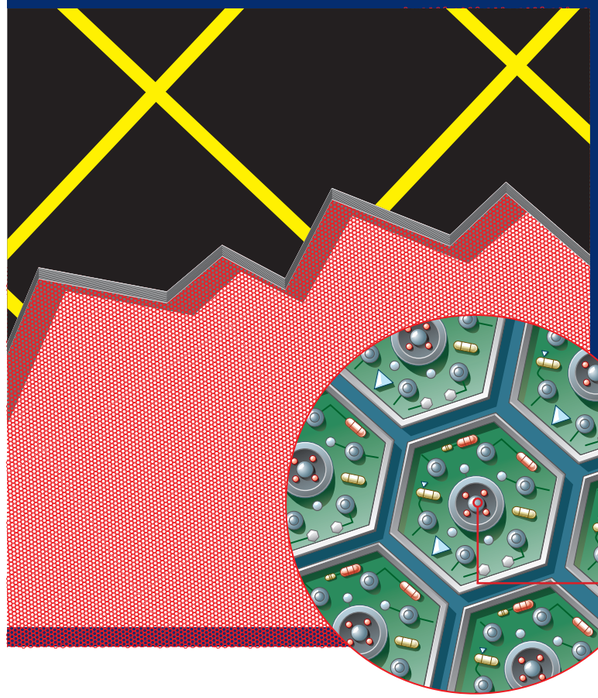
SAFETY

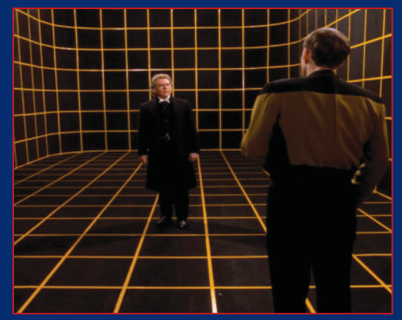
Although a crewmember could break a leg while skiing, safety parameters were built into the holodeck system that prevented serious injury or death. Safety systems could go off-line, but this was unusual, and normally the result of extraneous shipwide difficulties. Some individuals established a psychologically dangerous dependency on the holodeck. This condition was known as holodiction. While not common, it was often difficult to resolve, especially as holodiction usually masked deeper problems.

Most crew members simply enjoyed the ride and used the holodeck for its intended purpose.

OMNIDIRECTIONAL HOLO DIODE

Beneath the surface of the holodeck's surrounding walls and floor, the network of microminiature omnidirectional holo diodes were to be found. This advancement in holo technology allowed the holodeck to function in a truly immersive manner.





The holoprojectors were embedded in the walls of the holodeck, which had a simple yellow grid on them until they were activated.

RECREATING OTHER WORLDS

HOLONOVEL

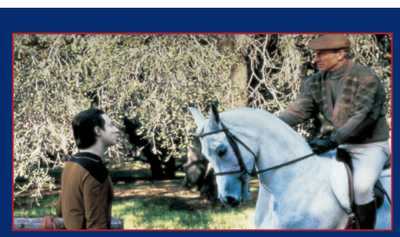
Holographic novels enabled crewmembers to play characters in a fictional story. Clothing was added to the 'player' holographically, helping generate the immersive experience and 'reenact' the book.

Captain Jean-Luc Picard enjoyed the Dixon Hill holonovel series, playing a 1940s Californian private investigator. Lieutenant Commander Data favoured Sherlock Holmes, taking great pleasure in solving the fictional dectective's mysteries. While a passive form of leisure for some, for others a holonovel program could become an addictive escape from reality. One of the most extravagant was Lieutenant Reginald Barclay's program of Alexander Dumas' *The Three Musketeers*, which he enjoyed with the characters resembling other members of the crew.

RESEARCH LAB

Holographic technology was a huge boost to science on board the *Enterprise*-D. A holographic research lab was equipped with holoemitters that allowed scientific hypotheses to be tested, investigations such as forensics and scene-of-crime to be carried out, and even complex engineering issues with the ship to be worked through.

Crewmembers could even consult the minds of great figures from the history of science to solve problems. After Lieutenant Reginald Barclay's IQ was raised significantly by interactions with a Cytherian probe in 2367, he used the holodeck to summon a recreation of 20th-century Earth physicist Albert Einstein to discuss advanced ideas relating to quantum electrodynamic calculations.



SPORT

The holodeck offered the opportunity to practice a number of sports, including rock climbing, cliff diving and kayaking. As well as providing an opportunity to train and improve their prowess, the holodeck promised a range of dangerous sports without the danger.

The *Enterprise* crew had favourite activities: Captain Picard was a keen horseman, and often chose to ride through a holodeck recreation of the Kabul river in the Himalayas on Earth. Wesley Crusher learned to ski using a Denubian Alps skiing simulation program; if he ever skied on a real mountain, he would be at no disadvantage from learning on a holodeck. Other sports were skills-based only, including 'Curtis Creek,' a fly-fishing program in a stream on Earth.

COMBAT

The crew could maintain and improve a wide range of combat skills using the facilities provided by the holodeck. The Klingon calisthenics program in the exercise menu was regularly used by Lieutenant Commander Worf to hone his battle reflexes. Listed in the exercise menu, it involved a fight-to-the-death with holographic characters manifesting in abandoned buildings in a steamy jungle environment. The program provided close-combat melee weapons and a range of suitably-armed alien foes to test the skills of the *Enterprise*'s security chief. This extreme hand-to-hand combat regime proved too violent for the majority of the *Enterprise* crew, though Commander William T. Riker is one of the few to have fought with Worf within the program environment.

VENUES

The holodeck created a huge variety of environments that were used in a number of ways. An 18th-century brig was used as a venue for Worf's promotion to Lieutenant Commander. The thousands of locations – from mountains to deserts – included many distant worlds, which provided a means for visitors and crew to tour the Galaxy's most beautiful destinations. Home planets and places – such as the Café des Artistes, Paris, Earth, recalled by Captain Jean-Luc Picard – helped quell feelings of longing for home. Programs included places in history, romantic settings for special meetings, and beautiful parklands and wooded glades for sad events such as funerals. The holodeck could also recreate environments that would have been uninhabitable in reality, allowing crew to float in space between asteroids or stand in the middle of a plasma storm.

CREW QUARTERS

Crew quarters on the *U.S.S. Enterprise* NCC-1701-D provided personnel with comfortable living spaces to spend their off-duty time away from ship activity.

Galaxy-class starships such as the *U.S.S. Enterprise* NCC-1701-D were among the largest vessels in Starfleet. Unlike earlier, smaller starships, the *Enterprise* closely resembled a floating city in space. This vast size allowed for shipboard living quarters to resemble those of a modern planetside apartment complex.

The *Enterprise* had everything necessary to sustain itself for extended periods away from a planet. The designers of the ship realized that its inhabitants needed living conditions that were as close to a real home as possible, in which children lived with their parents.

PERMANENT HOME

The *Enterprise* provided a permanent home – and comfortable living accommodation – for everyone onboard, from single officers, such as Captain Picard to families.

On average each member of the crew was assigned 110 square meters of living space. Each standard living unit consisted of a bedroom, a work and relaxation area, and a bathroom that was typically fitted with a sonic shower, though some crew members also had a bathing area with a tub that could be filled with water.

While the basic layout of each accommodation unit was similar, it was up to the individual occupants to determine the interior decoration, including furniture. The units were designed so that the walls could be removed to create the larger living spaces required by families.

The vast majority of the living quarters were located in the saucer section. Starfleet's intention was that if the ship separated in order to enter battle, the majority of the crew would be safe on the saucer. Standard living quarters were located on decks 12 through 20. These were intended for unmarried crew members. Crewman below the rank of lieutenant often had to share quarters, and these units were designed to house two or three occupants.

There were contingency crew dormitory units on decks 32 through 35. These were primarily assigned as temporary quarters when transporting non-ship's personnel or when additional crew members were assigned to the ship during training missions. While these were certainly adequate and comfortable, they had not been designed for long-term living.

Officers' living quarters were located on decks 3, 4, 5, 8 and 9. In addition, there were living quarters for junior officers on decks 2 and 9. Residential apartments, which were occupied by families, were located on decks 6 through 14. These were two- and three-bedroom units, in which children lived with their parents.

In many quarters, the sleeping and living areas were located in the same single room. In most of these, the bed was recessed into a wall and was opened out at night, leaving the room to function as a normal living space during the day.

PERSONALIZED QUARTERS

Furnishings such as a desk, table, and chairs were provided, but if someone was assigned to the *Enterprise*, they had the option of replacing standard-issue Starfleet furnishings with more personalized items. Most crew members chose to do this, especially if they came from ethnic backgrounds other than that of Earth.

Lieutenant Worf's quarters, for example, were distinctly

REST AND RELAXATION

Officers' living quarters were flexible and interior walls were configured to create spaces according to preference and need. Lieutenant Commander Data's room featured a large workstation, whereas others chose furnishings for relaxation and fun.

Data's working pattern was different to that of other crew members, as he could effectively operate for 24 hours a day. His quarters featured a significant computer station to enable him to continue his duties or explore personal projects.

Most officers chose to arrange their cabin space for leisure, supplementing standard issue couches, tables and beds with small personal touches. More senior officers had quarters at the ship's edge, with windows on to space.

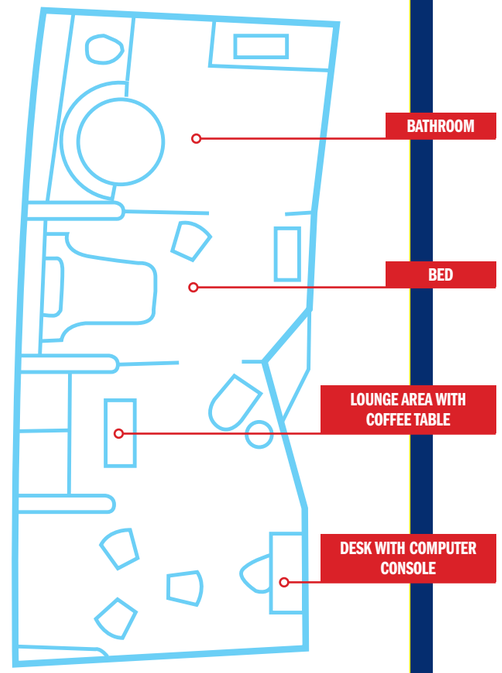
Communal areas were provided for dining but some preferred the more intimate settings of their quarters for special meals. Replicator technology allowed full table settings, as well as any dish in the ship's database, to be created from raw matter.

Junior officers shared accommodation on the *Enterprise*-D, but enjoyed separate sleeping areas. Communal spaces were large enough for social gatherings, and young crew members regularly met for poker games.

Officers above the rank of lieutenant had individual quarters with a single bed. The temperature and lighting were controlled by computer.

DR. CRUSHER

Dr Crusher's quarters were typical of those assigned to senior officers. The rank of commander meant a spacious living area: a separate bathroom and bedroom, and a large, comfortable space which was partially divided into two reception rooms.



Dr. Crusher prepared to receive her mentor Dr. Dalen Quaice in the VIP guest quarters. These were situated at the edge of the saucer for their views of space. They were comfortably furnished and maintained in readiness for visiting dignitaries.

The VIP quarters were decorated to suit the tastes of most guests. Unfortunately, they did not always please every visitor. The Betazoid Ambassador Lwaxana Troi, for example, was rarely satisfied with the quality of her accommodation.

further two percent of the quarters could be altered to provide for personnel from Class N and N(2) environments.

Although junior officers and crewmembers did not have as much physical space as that assigned to senior officers, they also had the option of furnishing their private living spaces to represent their diverse backgrounds, human or alien. When two or three crewmembers were assigned to the same unit, they shared a common living-room area, but each person had their own individual sleeping space.

WORK AND LEISURE

The crew quarters provided personnel with a place where they could work and part of every unit was given over to a desk and computer terminal. The computer system wasn't exclusively used for work and could also be used to access all the music and recorded entertainment in the ship's database. All quarters were also fitted with a communications system that allowed the occupant to hail or be hailed by the rest of the crew and to make subspace calls to colleagues, friends and family on other Starfleet facilities. Quarters were also fitted with replicators as standard issue, which could be used to provide food, drink or clothing as the user required.

The crew quarters also provided relatively private spaces where personnel could socialize. For example, Commander Riker regularly hosted a poker night in his quarters that was attended by most of the members of the senior staff.

Adjacent to the crew quarters on each deck were recreational and study areas. There were also playrooms and other facilities specially designed for children near the family quarters.

LUXURY QUARTERS

VIP accommodation for visiting dignitaries was provided within both the saucer and the stardrive section. The engineering hull's main VIP quarters were located on the port outer edge of deck 19, within the area's connecting spine. The quarters comprised a series of interlinked rooms, which were in close proximity to the vessel's main turbolifts.

Visiting dignitaries to the *Enterprise* were divided into three categories – senior Starfleet officers, Federation representatives, and non-aligned government officials or guests. Suitable accommodation for each was at the discretion of the captain, and the environmental conditions, food replicators, and security details were adjusted to suit most eventualities. Security was often an important issue for dignitaries, especially if the vessel was acting as a liaison between warring factions. The supervisory duties regarding VIPs were often divided between the first officer and the head of security.

Directly beneath the guest quarters on deck 20 was further VIP accommodation, provided for any consulting engineers that might be visiting the *Enterprise* for an inspection, or to carry out evaluation of the ship's systems. Located adjacent to the alternate captain's quarters, they allowed easy access to the engineering section and were in close proximity to the chief engineer's private quarters.

The primary VIP facilities were located on deck 5 of the saucer module, toward the middle of the oval-shaped deck. Designed to offer the highest standards of all facilities, the VIP quarters were relatively luxurious compared to many of the senior officers' living spaces.

The accommodation area within the saucer section was also convenient for the banquet and conference suite, the most high-profile VIP room aboard the *Enterprise*, located on the port side of deck 12.

FLEXIBLE SPACE

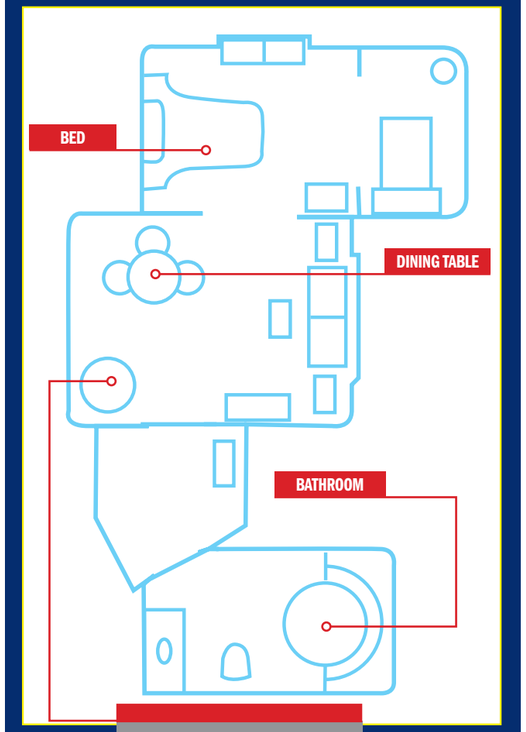
In all, the *Enterprise* had a total of 1,421 sleeping spaces available, with room for further expansion or modification if and when required. Large areas of decks 9, 11, 33 and 35 were left unoccupied but could be configured as short-term living quarters. This was so the ship could accommodate mission specialists or if the ship was required to respond to a medical emergency or other form of evacuation. The guest quarters on decks 5 and 6 were specifically designed so they could be converted in additional medical facilities. They had special hookups for biomedical telemetry.

Lieutenant Commander Data kept a cat named Spot in his quarters. Crewmembers on the *Enterprise*-D were free to keep pets, as animals helped to provide a touchstone to the family lives, easing feelings of loneliness and homesickness.

El-Aurian bartender Guinan's quarters were an example of extreme adaptation and were tailored to her own unique taste. Located atop the saucer section, she created a luxurious retreat, even choosing to change the floor.

WORF'S ROOMS

Officers who held the rank of lieutenant and lieutenant commander also had separate living and sleeping areas, although the overall floor space was less than that of a higher-ranking commanders' quarters. Like officers higher up the chain of command, they had single accommodation units and were not expected to share.



The sleeping and living areas are open-plan, and are separated from the bathroom by a small hallway.

Worf chose to decorate his quarters with objects reflecting his Klingon heritage, including Klingon art and trophies. Crewmembers from non-human backgrounds were also free to replace furniture with items more to their personal liking.

Senior officers enjoyed a degree of privacy in their quarters and many were configured for both married couples and families. This helped crew members adapt to long space missions far from their home planets.

CAPTAIN'S QUARTERS

As befits the commanding officer of a Starfleet ship, the captain's quarters on the *U.S.S. Enterprise* NCC-1701-D were large and offered all the comforts of home.

On *Galaxy*-class starships, the captain's quarters were located on deck 8. The quarters comprised an open-plan suite of rooms that were primarily the captain's private living space, although they could also be used to entertain guests or as an office. Located at the very front of the saucer section, the large windows provided a dramatic view into space.

LARGEST QUARTERS

The captain's quarters were larger than those of any other crewmember, but the furnishings were not noticeably more luxurious, and followed the utilitarian designs found elsewhere on the ship. The open-plan suite was divided into different areas, separated by shallow partitions that divided the area while still giving the illusion of space. The four main areas of the quarters were the dining area, which also doubled as a meeting table; the office area; a lounge area with comfortable, informal couches; and the sleeping area.

ALL AT HAND

Deck 8 of the *Enterprise* held many other important areas of the ship, including the battle bridge and stellar cartography section. Turbolift destinations within only seconds of the captain's quarters carried him to important strategic areas of the ship, including the main bridge, where most of his day-to-day work and duties took place.

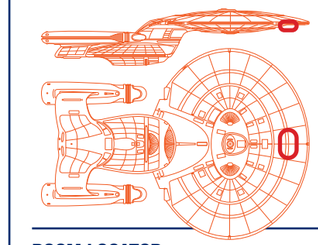
Opposite the more formal work area, the captain could relax on a comfortable couch or the easy chairs positioned beneath a series of large windows.

The pastel colors of the decor and upholstery made the room seem light and uncluttered, emphasising its spacious proportions.

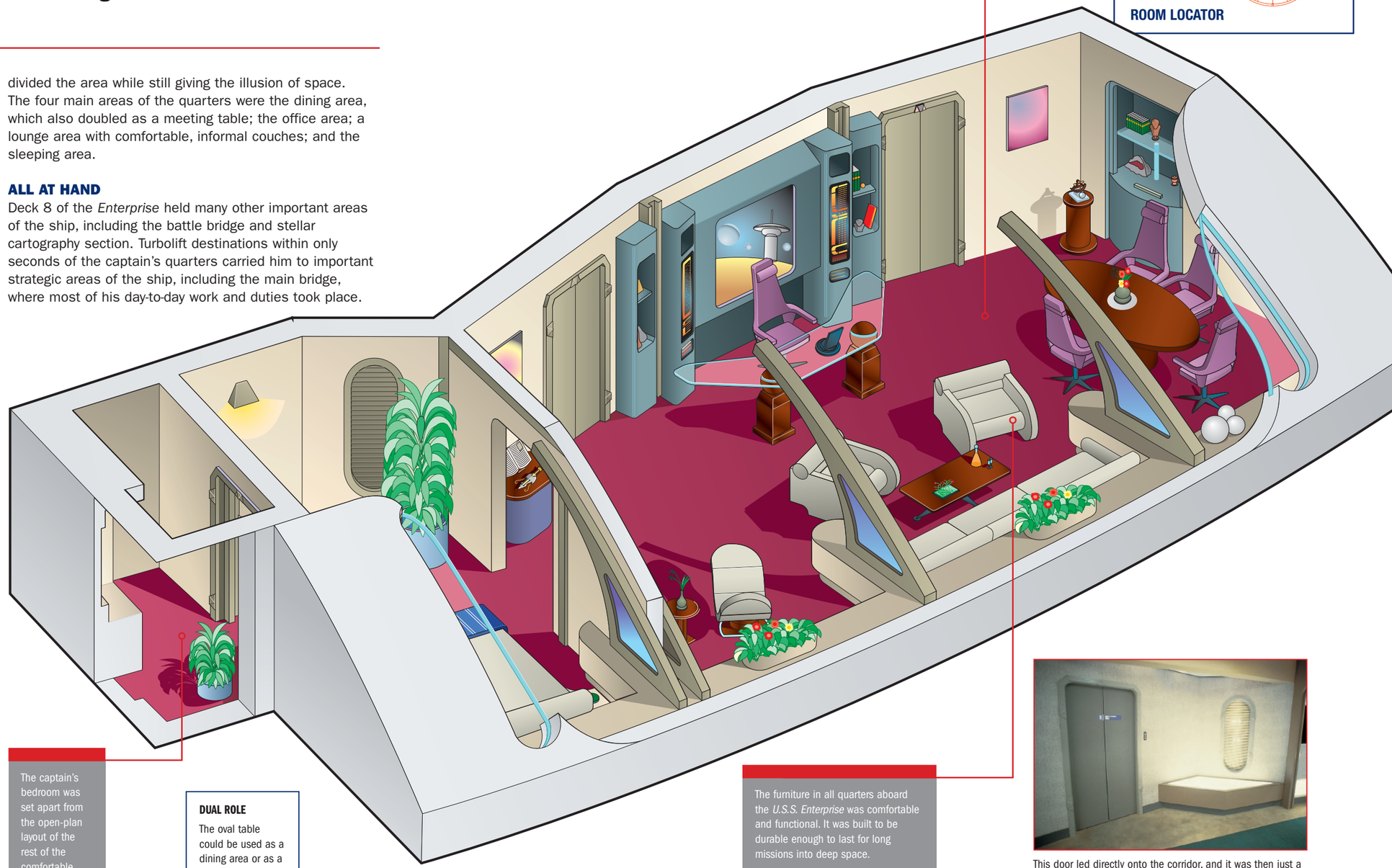
The wide, open-plan main area of the quarters contained what was essentially a series of smaller rooms, including a lounge area, a work desk, and a dining/meeting table. The clever design meant that the quarters were ideal for both official and personal use.

DECORATION

Captain Picard adorned the wall behind his desk with an image of a Federation starbase.



ROOM LOCATOR



The captain's bedroom was set apart from the open-plan layout of the rest of the comfortable quarters.

DUAL ROLE

The oval table could be used as a dining area or as a meeting room.

The furniture in all quarters aboard the *U.S.S. Enterprise* was comfortable and functional. It was built to be durable enough to last for long missions into deep space.

This door led directly onto the corridor, and it was then just a short walk to the nearest turbolift.

REPLICATOR TERMINALS

In the early days of space flight, crews were fed by reconstituted rations or old-fashioned cooking. On the *U.S.S. Enterprise* NCC-1701-D, replicators provided a low-energy but tasty alternative.

A replicator was a device equipped with a low-resolution transporter. It transformed raw matter into any inanimate object, as long as a molecular template was stored in the memory. The introduction of replicator technology in the first half of the 24th century transformed space travel.

Starship systems generally included two replicator systems: food replicators and hardware replicators. On a *Galaxy*-class starship such as the *U.S.S. Enterprise* NCC-1701-D, the replicator system headends were found on deck 12 in the saucer module, and in Main Engineering on deck 34. Access to the system was via replicator terminals.

ADDITIONAL SYSTEMS

Specialized terminals appeared in several venues and included medical replicators in sickbay, which generated rare medications and medical supplies.

The hardware replicator, found in engineering, manufactured parts and tools, although an in-depth inventory of emergency spare parts was also maintained, since the replicators might go offline during emergencies.

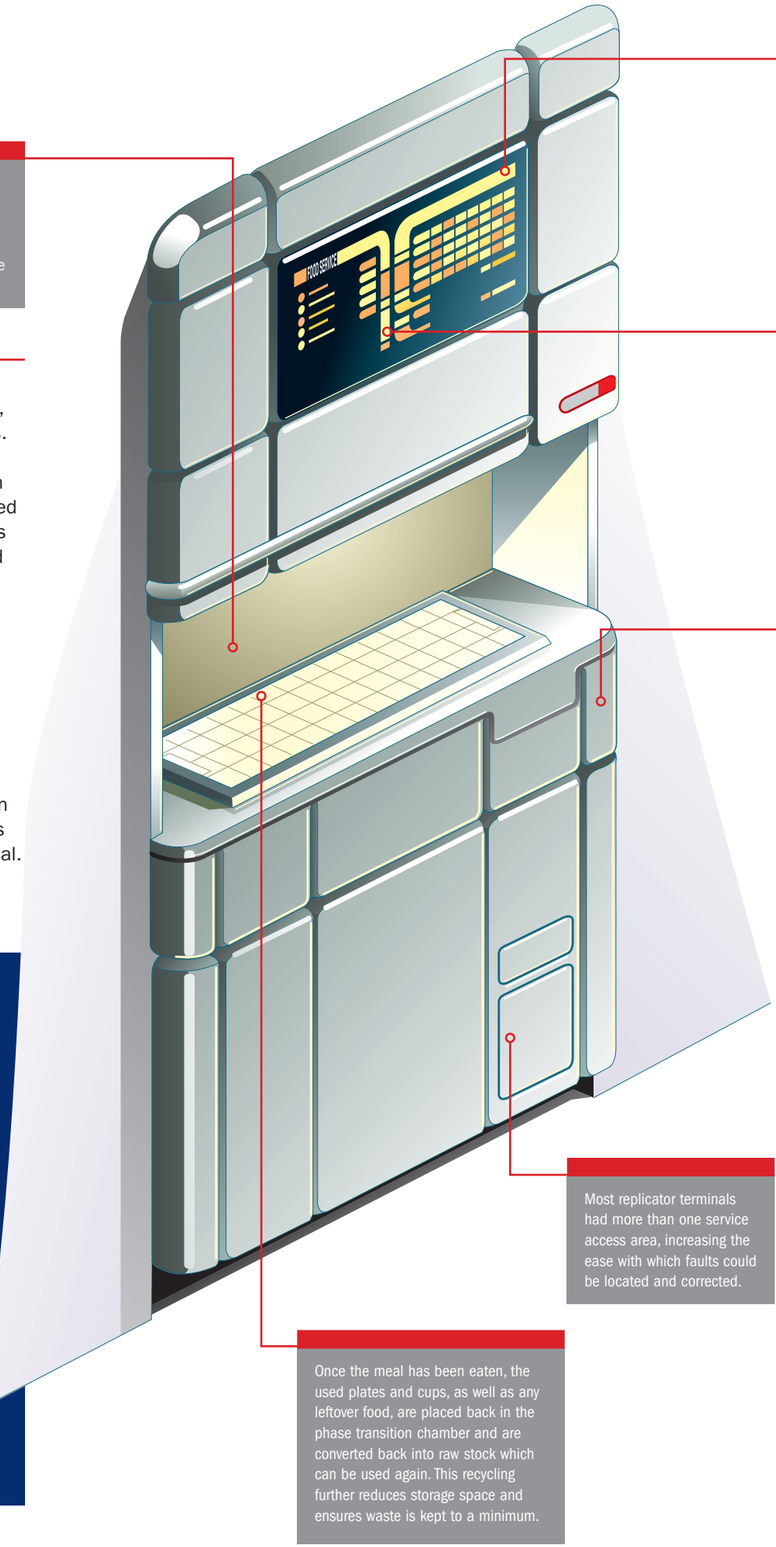
In the Replicating Center a commercial replicator tempted the crew with non-standard issue items, while in the waste management department, the largely automated recycling system used replicators to transform dangerous toxic waste into inert objects, and to transmute cleansed waste products into raw matter which was recycled.

FOOD AND DRINK

The process of getting a meal through the replicator was both simple and miraculous. The crewmember stands before a replicator terminal and gave their meal order, either verbally or via the terminal's user control pad.

The order was matched to one or more of the 4,500 templates stored in the database. Once the templates were in the memory, the food replicator dematerialized an appropriate volume of special raw matter stocked for this purpose. This matter was then routed back to the terminal.

When the raw food stock had been transformed into the selected foodstuffs, it appeared in the phase transition chamber.



The user control pad displayed all the necessary information in a format which was clear and easy to understand. The most difficult part of the process was deciding what to choose from such a wide selection.

The controls permitted the method of presentation to be chosen as well as the food or drink itself. A meal could be ordered hot or cold, a drink chilled or piping hot, extending the available choices even further.

Service access areas on the replicator provided easy access to the internal workings, ensuring that any repairs could be carried out efficiently.

Most replicator terminals had more than one service access area, increasing the ease with which faults could be located and corrected.

Once the meal has been eaten, the used plates and cups, as well as any leftover food, are placed back in the phase transition chamber and are converted back into raw stock which can be used again. This recycling further reduces storage space and ensures waste is kept to a minimum.

Replicators which synthesized food were found throughout 24th-century starships. This modern technology replaced old-fashioned, messy galleys with a convenient, cleaner system offering a much wider choice.

Replicators differed in design depending on their location and main function. Here, the user control pad was located at the side of the phase transition chamber, rather than above it, as is the case on larger models.

The meal materialized in the phase transition chamber. The cycle took no more than a few seconds.

Food replicator raw material was carefully engineered organic particulate suspension matter, with a structure that closely matched replicated food. This guaranteed that the time and energy required to reorganize this material is a fraction of that needed when starting from alien base material.

Although replicated food looked and tasted like the real thing, the templates only contained digital image data created at the molecular level. In contrast, transporters used quantum-level measurements stored in digital image format to safely process live beings.

NOT QUITE GOURMET COOKING

The replicator template utilized such tricks as repeating instructions and averaging to further reduce the size of the template. A disadvantage of this is that replicated foods often contained any number of single-bit errors. Although the taste and nutritional content of the food was essentially unaffected, some found their favorite dishes 'not quite right' when replicated.

EXTENDED VOYAGES

Replicators often appeared as a sidebar story in the transporter technology chronology, but their place in space travel history should not be underestimated. In short, replicators made extended voyages practical.

EXTENDED MENU AT A TOUCH

The many food replicators found on a starship were simple to use, and catered for a variety of individual tastes and requirements. Lavish meals, a light snack or a hot beverage were produced in a few seconds.

The user control pad was simple to use. It was easy to key in a chosen meal preference from any one of several thousand combinations stored in the replicator's extensive data banks.

Seconds after the order had been placed, the raw matter contained in the system was converted to the food or drink of choice. The desired meal or snack shimmered into existence.

The chosen item was presented as lavishly or as simply as the user chose. As well as food and drink, the replicator also produced the crockery and containers. These items were recycled by the replicator after use.

SENSOR SYSTEMS

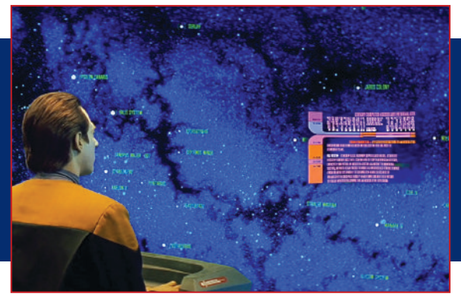
The primary mission of the *U.S.S. Enterprise* was to explore uncharted reaches of the Galaxy. The advanced flagship was equipped with the ultimate in Federation technology.

The *U.S.S. Enterprise* NCC-1701-D was equipped with a remarkable array of sensor systems that provided the crew with vital environmental information on stellar objects and phenomena, planets, and lifeforms. The ship had several sensor arrays located at a large number of points around the outer hull.

There were three distinct types of sensor packages installed around the *Enterprise* at various points, each of which had its own individual functions and specific tasks to aid the crew during missions: the long-range sensors, the lateral sensors, and the navigational sensors.

LONG-RANGE SENSORS

The long-range sensor array was at the front of the engineering hull, behind the main deflector dish. The normal operating speed of the long-range sensors was approximately five light years at high-resolution mode, and lower-resolution levels could extend the range of the sensors to 17 light years. The sensors' primary purpose was to detect and protect against interstellar debris that could be disastrous if impacted, even at sublight speeds.



The primary role of the ship's long-range sensors was to scan ahead and detect objects directly in the *Enterprise's* flight path.

Lateral sensors provided data on the conditions immediately around the ship thanks to sensor pallets located across the hull.

LATERAL SENSORS

Like human skin, the surface of the *Enterprise* was instantly aware of changes in its environment due to a series of lateral sensor arrays positioned all around the hull. Each array consisted of a rack of individual sensor instrument pallets; there were 144 of these, distributed on the primary and secondary hull lateral arrays. In all, there were 284 available pallet positions; special designation pallets could be installed for specific missions.

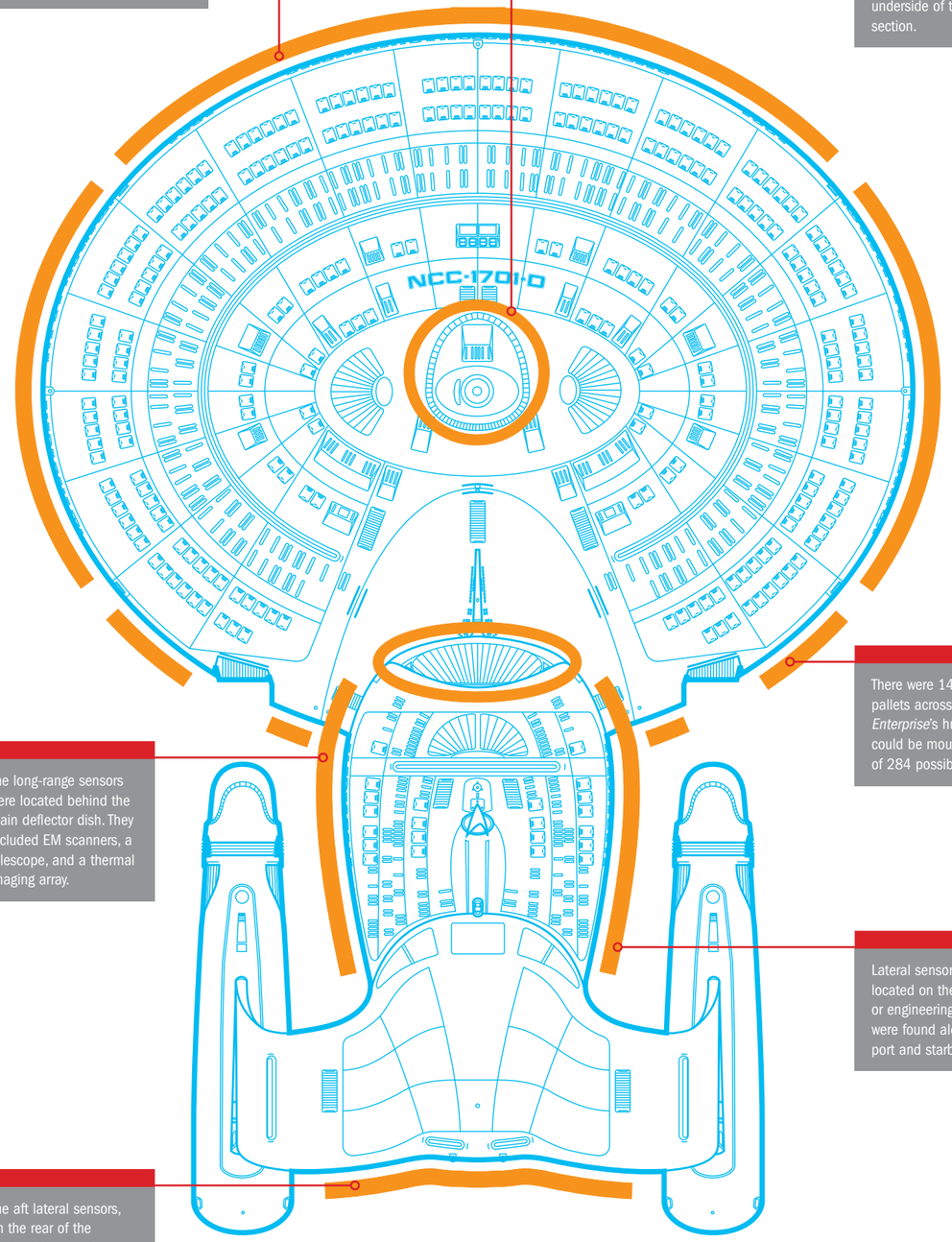
NAVIGATIONAL SENSORS

Multiple navigational sensors fed raw data to the ship's navigational processing computers in a continuous stream. This data was then converted into readable information on the ship's position and velocity. There were two types of navigational sensors on the *Enterprise*. Long-range sensors were used when traveling through 'empty' space, often at warp speed. However, within a star system, or when orbiting a planet, short-range sensors were used.

Navigational sensors allowed the *Enterprise* to safely maneuver around celestial objects.

The primary hull lateral sensors were located around the edge of the saucer section.

The lower sensor platform was located in the area of the captain's yacht, on the underside of the saucer section.



There were 144 sensor pallets across the *Enterprise*'s hull. Each could be mounted in one of 284 possible positions.

The long-range sensors were located behind the main deflector dish. They included EM scanners, a telescope, and a thermal imaging array.

Lateral sensors were also located on the secondary, or engineering, hull. Most were found along the hull's port and starboard sides.

The aft lateral sensors, on the rear of the engineering hull, insured that data was collected on the area behind the ship as well as in front.

SENSOR MAINTENANCE

In order to ensure that each sensor aboard a Starfleet vessel was working optimally, the condition of each device could be monitored and adjusted directly from the sensor maintenance room.

As part of their mission of scientific exploration, vessels such as the *U.S.S. Enterprise* NCC-1701-D were equipped with an enormous number of sensors. In fact, sensor arrays were mounted on every aspect of the ship, on both the primary and secondary hulls. Each of these arrays was made up of six sensor pallets, each one containing a variety of scanners. In total there were 144 sensor pallets, all of which were connected to the sensor maintenance room by a series of Optical Data Network (ODN) links. From here, officers could monitor and maintain the condition of any of the sensor pallets.

MAINTAINING THE SENSORS

Sensor maintenance duties fell within the remit of the ship's helmsman, who relied on the data the sensors provided to navigate an efficient course. Given that all three of the separate sensor systems – the long-range sensors around the deflector dish, the lateral arrays across the hull, and the navigational sensors – were in constant operation, a certain amount of sensor drift was inevitable. The teams assigned to the sensor maintenance room insured that this stayed within acceptable limits by tuning the sensors using the consoles located throughout the room.

Technicians working in the sensor maintenance room used a stylus instrument to fine-tune the sensors.

Senior officers visited the sensor maintenance room to modify sensor sensitivity.

A large computer monitor was fitted to one of the walls behind the central work station and was used to conduct sensor analysis by crew technicians.

The entrance to the sensor room was through a set of sliding doors.

There was one work station in the sensor maintenance room aboard the *Enterprise*, used by crew to tweak the sensors.

Small desktop computers run diagnostics of the variety of sensors all over the *Enterprise*.

MAIN SICKBAY

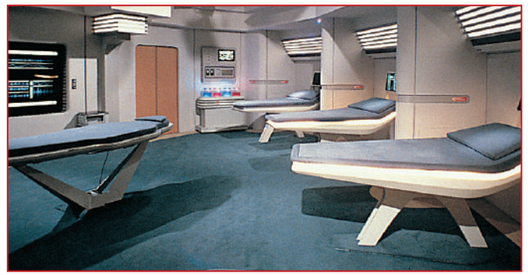
The *U.S.S. Enterprise*'s sickbay was equipped with sophisticated diagnostic tools and biosensors that could handle most medical problems among the ship's multi-species crew.

The medical department on the *U.S.S. Enterprise* was located on deck 12 and was split into two sickbay facilities. Primary sickbay was located on the port side of the ship and featured a room with a number of biobeds (including a primary biobed for surgery), a laboratory, the chief medical officer's office, and a nursery. A second sickbay was located on the starboard side of deck 12 and featured two surgery rooms, a physical therapy facility, a zero-gravity therapy ward, and another nursery.

Sickbay had to be able to cope with a wide range of lifeforms, and so was equipped with advanced bio-assay and lifeform analysis technology; the medical laboratory capabilities could also be supplemented by the laboratories in the other science departments.

BIOBEDS

The orthopedically designed biobeds in the main room featured an array of biosensors, while the primary biobed was equipped with a surgical support frame or 'clamshell' that maintained a sterile environment and provided diagnostic and recovery tools. An additional sensor was built into the ceiling above the biobed that provided backup for the surgical support frame and could create a semi-sterile environment for recovering patients.



The spacious sickbay complex on deck 12 provided plenty of room for Dr. Crusher and her medical team to do their work.

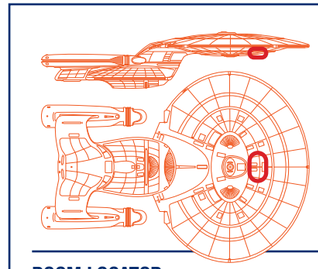
Beverly Crusher was appointed chief medical officer of the *U.S.S. Enterprise* NCC-1701-D in 2364, but took a year's leave of absence from the ship in 2365.

In 2365, Dr. Pulaski joined the *U.S.S. Enterprise* as Dr. Crusher's replacement. Pulaski's medical skill was augmented by her ability to empathize with patients.

This door led to the medlab.

The wall was equipped with biosensor displays.

This door led through to the secondary medical ward.



ROOM LOCATOR

The main doors to sickbay led through to a waiting room outside the chief medical officer's private office.

An overhead surgical light was built into the ceiling above the primary biobed. This light also housed an array of biosensors and a low-energy forcefield generator.

The primary biobed in sickbay was equipped with a surgical support frame that created a sterile surgical field around the patient's body.

STAFF PROTOCOLS

Sickbay had to be staffed by at least four medical personnel at all times, one of which had to have full training in emergency medicine.

CHIEF MEDICAL OFFICER'S OFFICE

This office featured a large desk, a replicator, a standard terminal to access the medical library, and an electron microscope capable of obtaining cellular scans.

Diagnostic biobeds that featured biological sensors lined the walls.

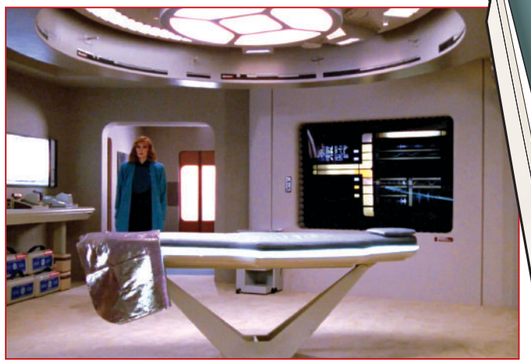
DIAGNOSTIC BIOBED

The *U.S.S. Enterprise* NCC-1701-D's primary sickbay was equipped with four standard biobeds to assist medical staff in diagnosing and treating a vast range of injuries and illness.

The *U.S.S. Enterprise*'s medical staff relied very heavily on biobeds in the diagnosis and monitoring of patients. A series of biofunction sensors were built into the diagnostic beds, and could provide a wealth of information on the patient's condition. Basic information on vital signs, such as the patient's body temperature, blood pressure, and respiration quality was constantly displayed on a unit situated at the bed's head. Other, more detailed information could be accessed by tying the bed's sensors into a variety of remote medical instruments, such as the tricorder.

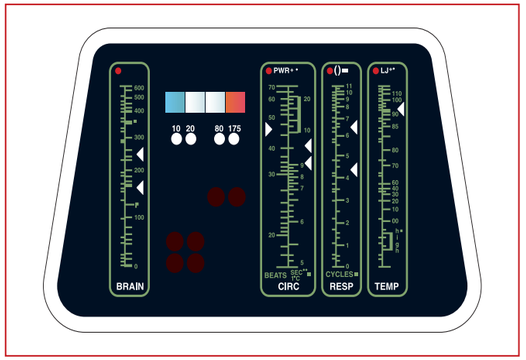
The standard biobed also had connection points for medical gas and fluid units, including the surgical support frame, which among its many functions maintained a sterile environment during surgery, and could administer intravenous medication.

In normal conditions, the central biobed was used for surgery, whereas the standard biobeds located around the edges of the main sickbay were generally used for recovery following surgical procedures. In order to make long stays in these beds more comfortable for patients, they were designed with a tilting headrest.



The biobed in the center of the sickbay was used to perform major operations.

The *Enterprise*'s main sickbay had enough recovery beds for four people, and there were other medical facilities located at points around the ship.



The diagnostic unit at the head of the bed was constantly updated with vital information about the patient's condition. Other information could be accessed from nearby terminals.

SURGICAL BIOBED

Complex medical procedures required advanced equipment, and the *U.S.S. Enterprise* NCC-1701-D was equipped with a surgical biobed designed for major surgery.

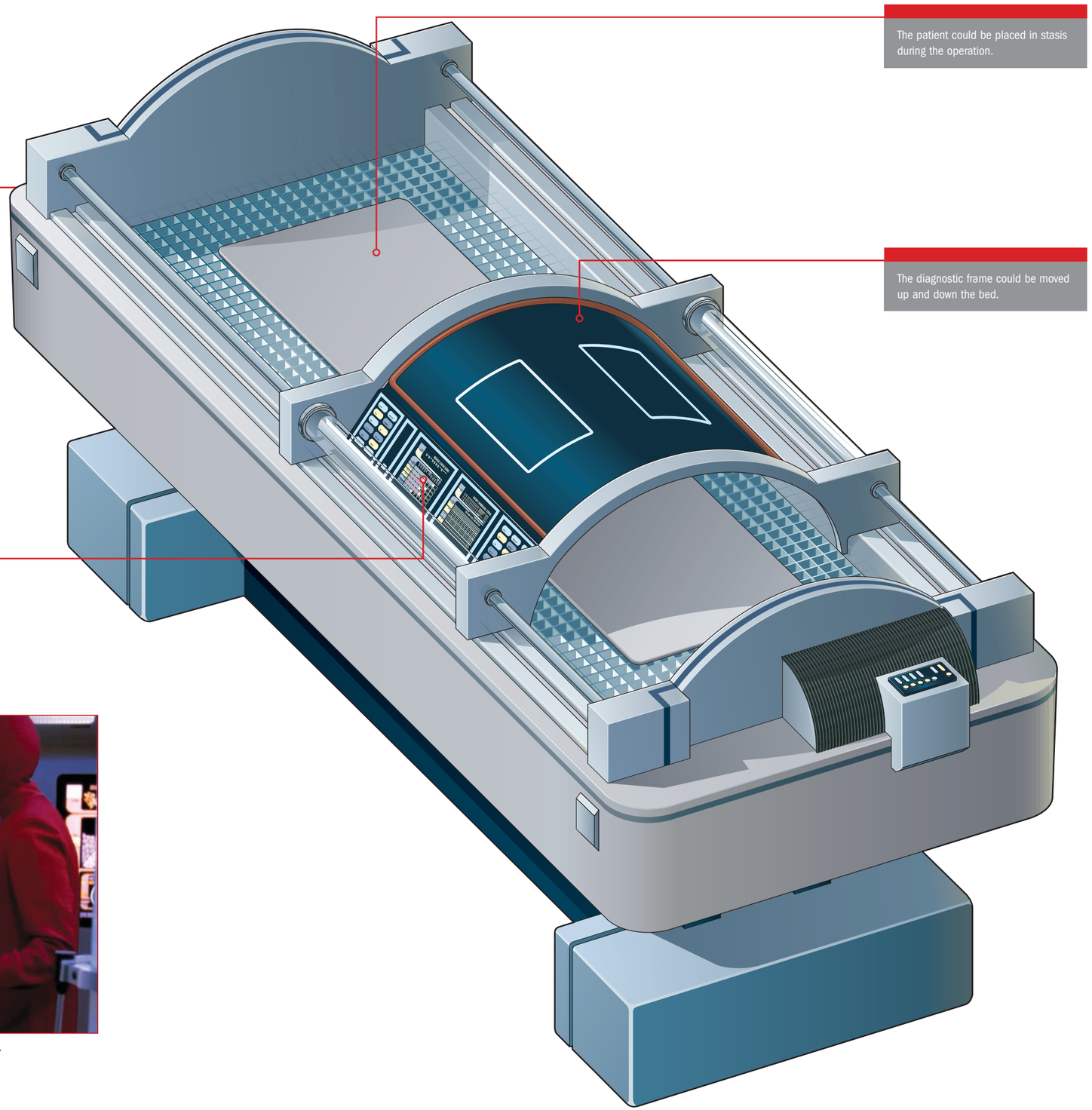
Almost all surgical procedures could be performed on a standard biobed fitted with a surgical support frame, but the Enterprise was also equipped with advanced surgical biobeds that were needed for some more complicated procedures, such as the operation Dr. Toby Russell performed to replace Worf's spinal cord in 2368.

These biobeds followed the same principles as their counterparts in the main ward, but contained more sophisticated sensors and an extended clamshell unit that was used to cover the patient's entire body, establishing a larger sterile field that was needed in major surgery. One of the bed's most impressive features was a sliding diagnostic unit that provided incredibly detailed information on the area being worked on.

An overhead sensor cluster abve the bed provided additional diagnostic and biofunction information.

OPERATING TABLE

The surgical biobed was used to treat badly injured patients who needed to undergo major surgery, as it provided the most effective form of life support.



The surgical biobed stood alone, isolated from other beds. This meant that several surgeons could take part in a single procedure.

MEDICAL HYPOSPRAY

The hypospray is a hygienic, painless and instantaneous means of delivering medicine into a patient's bloodstream using a high pressure microscopic stream.

The 24th century hypospray was descended from a primitive device called a hypodermic syringe. Both devices were used to inject a suspension into the body, but whereas the syringe accomplished this through the use of a fine, hollow needle, the hypospray achieved this goal without using a needle, making the procedure pain free.

The hypospray was operated by holding the nozzle firmly against the patient's arm or neck, and pressing a trigger on the head of the device. This converted the medication into a high-pressure, microscopic, aerosuspension stream that could penetrate both clothing and the epidermis, before passing into the patient.

The hypospray could be adjusted for a wider distribution pattern that yielded a high absorption rate. However, in this configuration the medicine could not be injected into areas of the body deep beneath the skin.

The hypospray was usually applied to the carotid artery on the neck. The width of the suspension stream could be adjusted from a narrow jet to a much wider spray.

MEDICAL CONTENTS

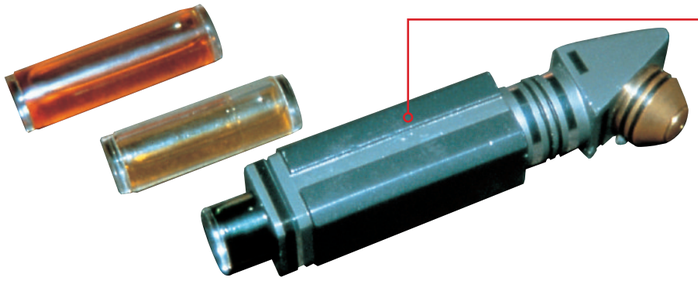
The hypospray delivered small amounts of medication from a vial, which contained a reservoir of the appropriate medicine. These small vials plug into the base of the hypospray.

The preferred point of injection was usually the large carotid artery on each side of the neck, though many innoculants were administered to the upper arm.

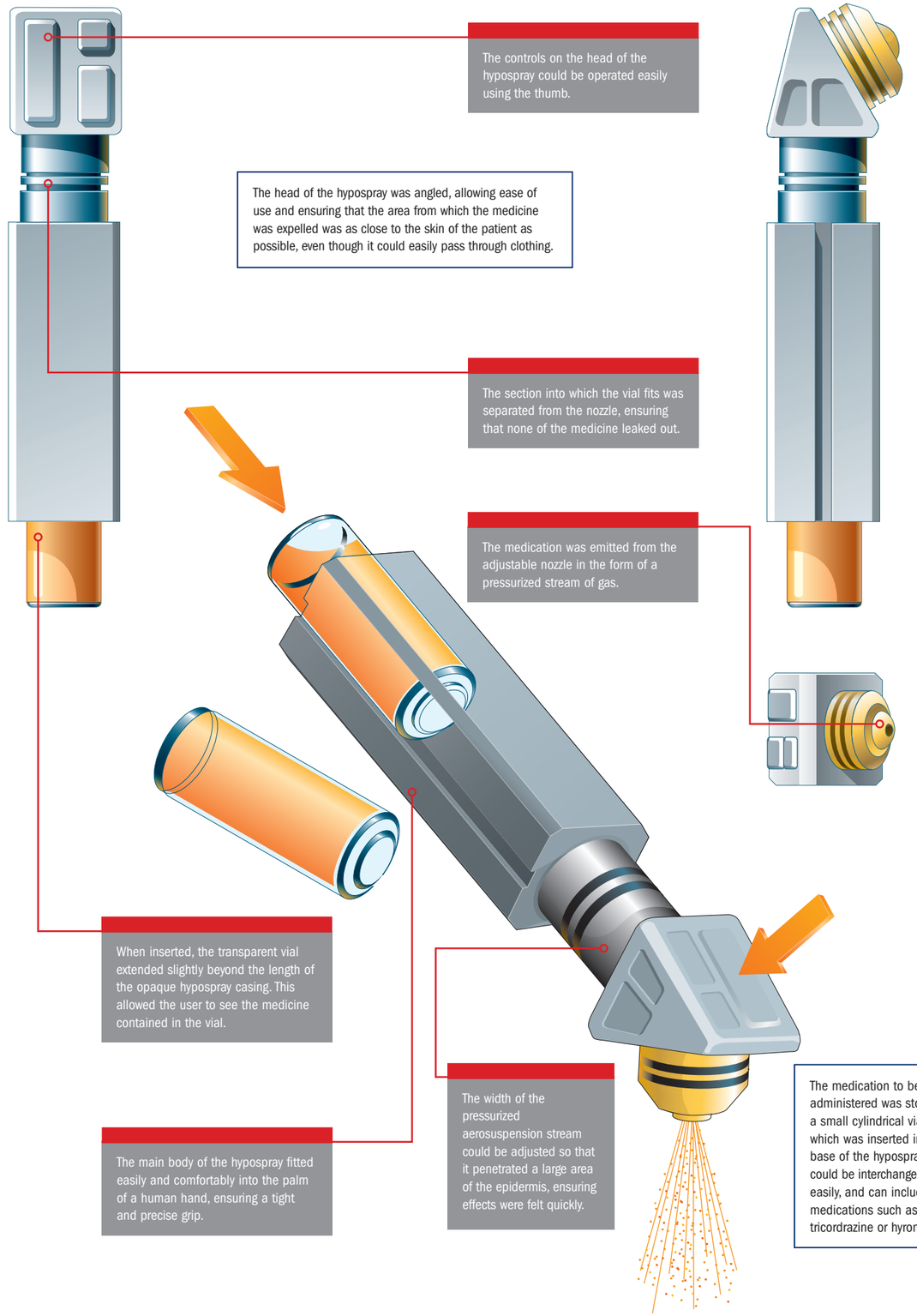
A second model of hypospray, the field hypospray, was standard issue with every Starfleet medkit. These hyposprays were intended for medical emergencies outside sickbay, or when basic resources were not accessible.

The field hyposprays hold five different medication ampules at one time. These concentrated emergency medicines were already loaded into the hypospray as standard, and are automatically diluted with a saline solution when the device is activated.

The angled head of the hypospray made it easy to administer the medicine into a patient's upper arm with great accuracy.



The hypospray worked on essentially the same principles as the ancient syringe. Vials were placed into one end of the barrel and their contents squeezed out through the other, ensuring a steady flow into the patient. Unlike the old syringe needle, however, the hypospray itself did not penetrate the skin – a much more hygienic arrangement.



MEDICAL TRICORDER

The difference between life and death for Starfleet personnel often rested on a small, simple-looking box called a medical tricorder, containing data for a range of races.

The underlying design of the medical tricorder was a standard tricorder – a handheld, multi-functional device that integrates computers, scanning sensors, and data storage. Gathered information was analyzed by an internal computer which displayed the results on a small screen built into the tricorder.

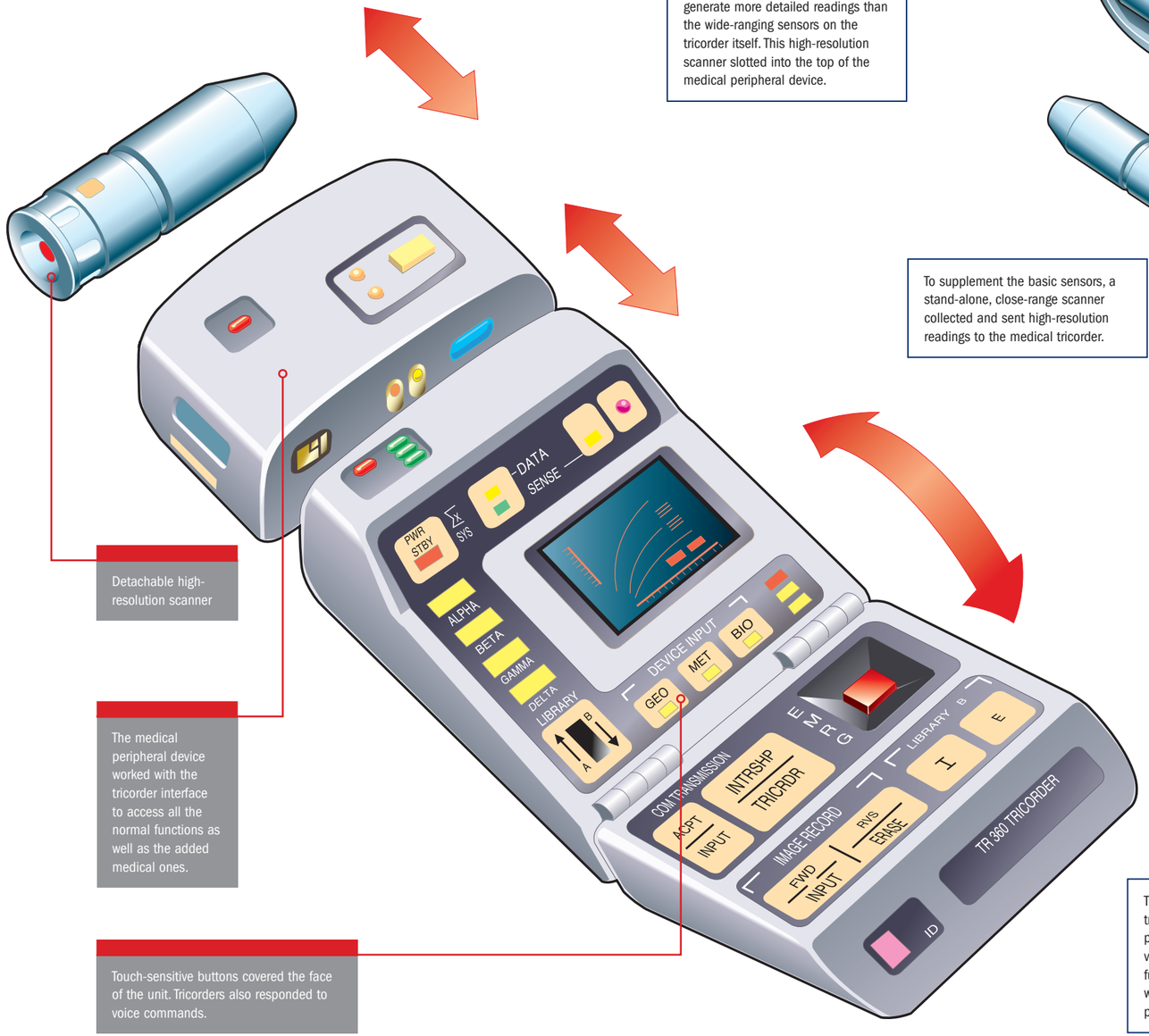
The differences between a medical tricorder and the standard tricorder model lay in its dedicated life-sign sensors, medical analysis computer, and library modules.

PERIPHERALS

It also had an optional medical peripheral (MP) device, measuring 8.5 x 3.0 x 3.0 centimeters, which is essentially a clip-on sensor and processing device. It was powered separately and had a total operation time of 18 hours. Housed inside the MP is a removable scanner that supplemented the basic sensors by collecting and sending high-resolution readings to the tricorder. Normally, the medical tricorder's internal sensors detected objects directly in their path to produce information on the body's overall processes, including electromagnetic conditions, organ functions, and dangerous organisms. The tricorder could coordinate 86 electromagnetic devices, which were installed in its internal frame, exterior sides, and exterior top.

Current medical tricorders were outfitted with 14 nickel carbonitrium crystal wafers, three isolinear optical chips, and an interchangeable library chip. In practical terms, this meant a medical tricorder contained medical data for humans and most humanoid types, plus information on 217 DNA-based species of non-humanoids.

The medical tricorder contained information on many non-human races, making the instrument equally effective for treating other life forms.



Detachable high-resolution scanner

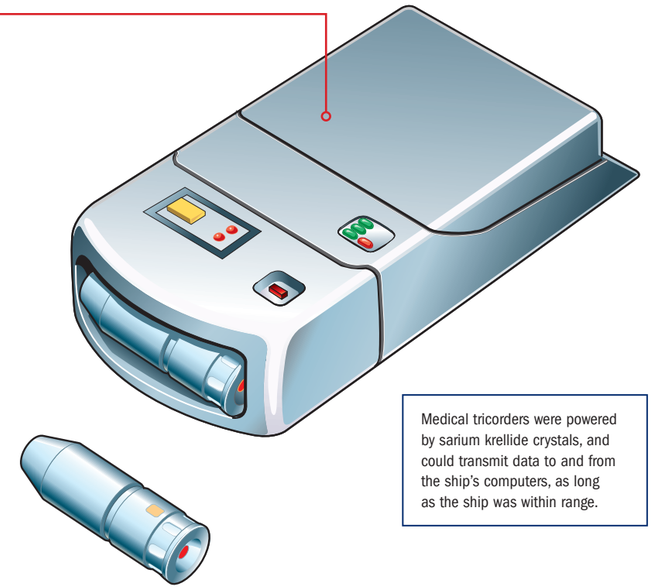
The medical peripheral device worked with the tricorder interface to access all the normal functions as well as the added medical ones.

Touch-sensitive buttons covered the face of the unit. Tricorders also responded to voice commands.

Even with the medical peripheral device attached, the tricorder could still be folded into a compact package, weighing 430 grams.

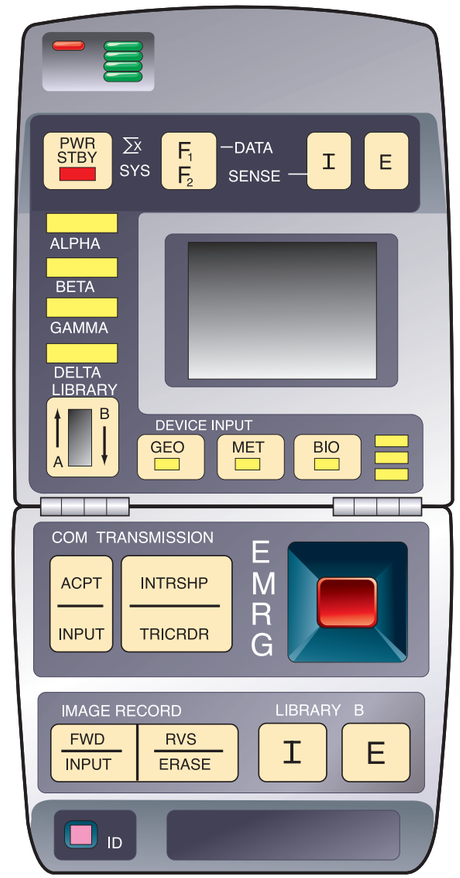
ADDITIONAL SCANNER

At times, all versions of the medical tricorder needed a boost from a specialized scanner, which could generate more detailed readings than the wide-ranging sensors on the tricorder itself. This high-resolution scanner slotted into the top of the medical peripheral device.



Medical tricorders were powered by sarium krellide crystals, and could transmit data to and from the ship's computers, as long as the ship was within range.

To supplement the basic sensors, a stand-alone, close-range scanner collected and sent high-resolution readings to the medical tricorder.



The medical tricorder could provide a wide variety of functions without the peripheral unit.

MEDICAL KITS

The medical kit design changed slightly over the years, but its function remained the same: to provide a wide range of medical equipment in emergency situations.

Starfleet medical kits were compact cases that stored a selection of sophisticated devices, designed to provide essential equipment to treat injuries and disease.

MEDICAL AID

Medkits were stored in bulk on board starships and were primarily used on away missions and during emergency relief aid, such as helping populations suffering from viral outbreaks or epidemics.

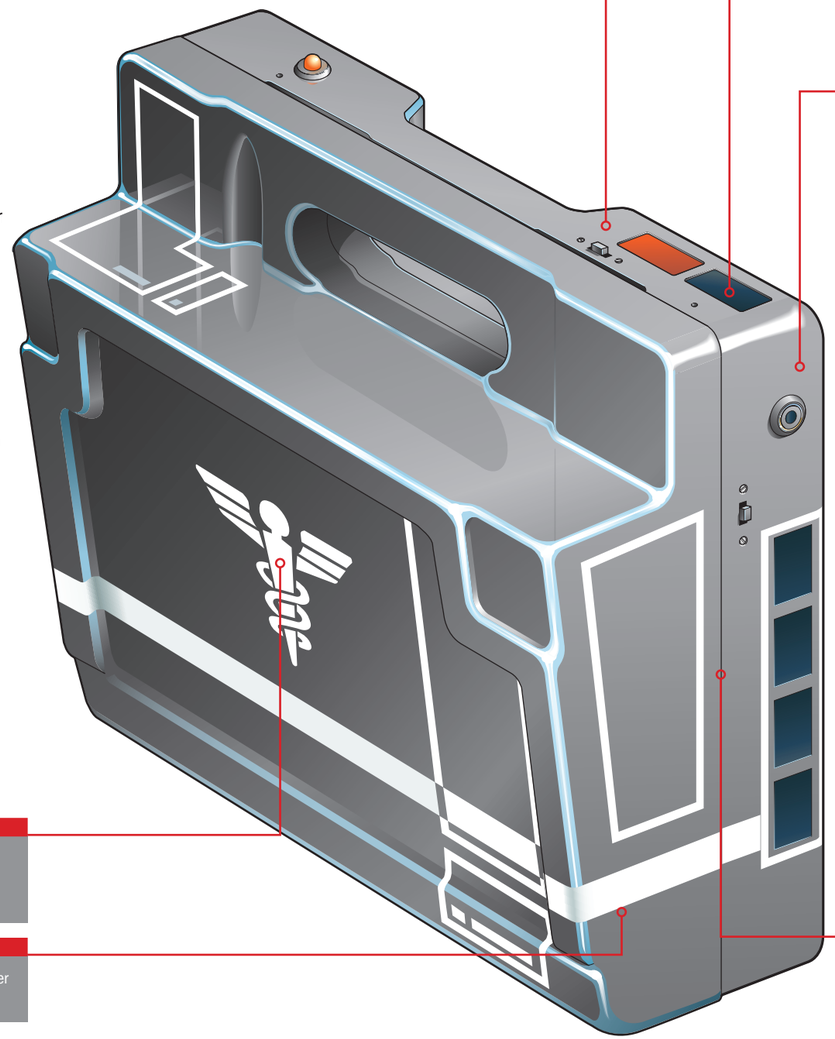
The most important piece of equipment in the medkit was the medical tricorder. This device scanned the patient to find the extent of the injury or the type of disease. Other devices normally contained within the kit included a respirator, a field hypospray, drugs, and a defib module. Each kit could be modified for a particular mission by taking the items that were most likely to be needed.

CHANGING DESIGN

In the early to mid 2360s medical kits were carried by a handle and split into halves like a briefcase. Starfleet equipment was always being updated and improved, and in the late 2360s the medkit was redesigned so that it resembled a rucksack and was carried over the shoulder by a single strap. The other major change was that rather than having to open the case to find the tricorder, it now slid out of a specialized compartment.

The medkit was light and easy to carry, resembling a briefcase. It was easily transported on away missions.

EARLY 2360s KIT



The medical kit was opened by touching a button near the handle.

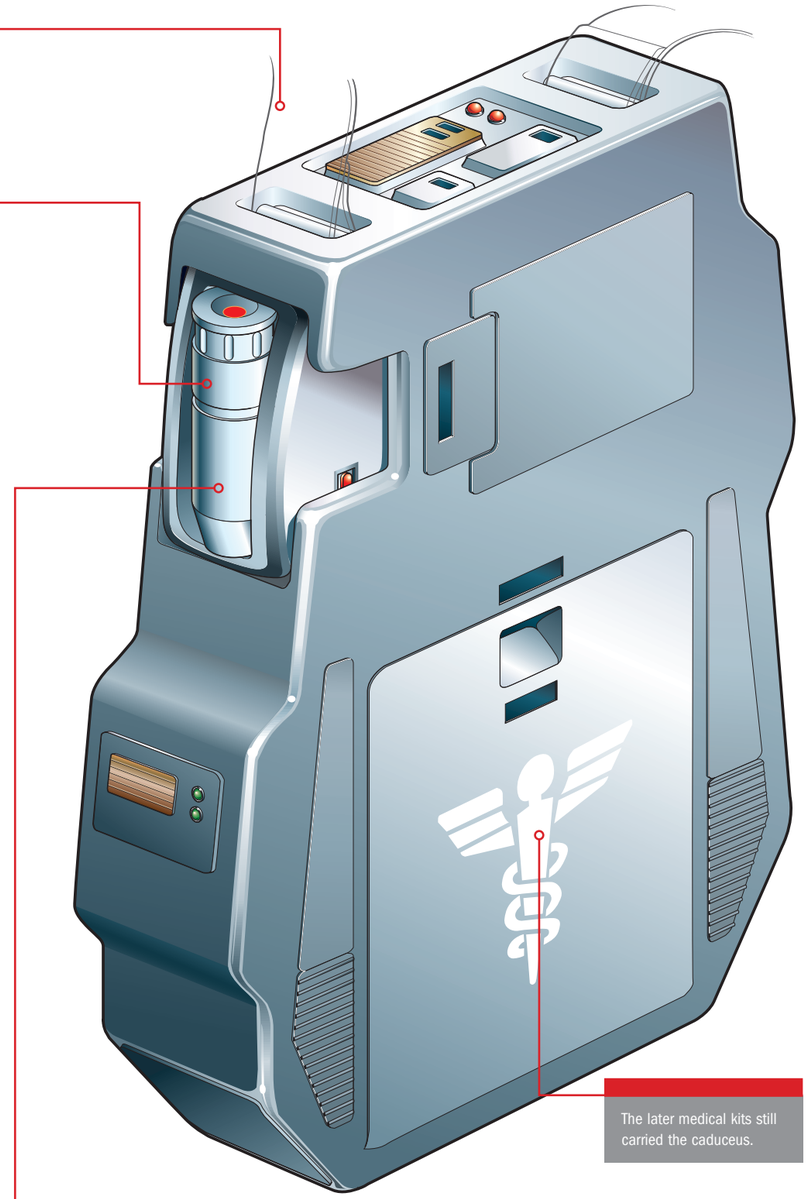
The casing was of a hard, rugged construction, protecting the sensitive medical equipment from damage.

The case displayed the sign of the caduceus, the universal symbol of a physician.

The color of the casing was gray/silver with white lines running around it.

The medical kit opened into two separate parts. The inside had special protective padding.

LATE 2360s KIT



When closed, the medkit is a compact device. The straps are attached to the top, allowing easy access to the main body of the kit.

It is vital that diagnostic equipment, such as the scanner, can be quickly located.

The earlier model of the 2360s kit had a more rectangular shape.

The later medical kits still carried the caduceus.

The important medical tricorder was easily accessed from the front of the kit, where it slots into the casing.

UPDATED MEDKIT

The most recent medical kit design was first seen in the late 2360s. It was worn with a strap, leaving the doctor's hands free; there is was a separate compartment for the medical tricorder.

ISOLATION ROOM

Starfleet quarantine chambers were used to isolate patients who had contracted highly contagious conditions, preventing them from infecting the rest of the ship's crew.

Advances in medical technology had successfully eliminated all but the most virulent strains of infections by the 24th century. Even so, there were still many hazardous conditions for which there were no known cures, and Starfleet medical practitioners sometimes found they had no choice but to isolate contagious personnel or restrict access to locations known to be contaminated.

In 2364 Dr. Beverly Crusher was forced to activate a quarantine field after an inorganic entity known as a microbrain projected a deadly energy field into the *U.S.S. Enterprise* NCC-1701-D's medical lab. Some three years later, in 2367, another serious health risk required the deployment of a large quarantine chamber in the *Enterprise*'s main sickbay. In this year, young Willie Potts was infected by highly contagious and potentially lethal parasites after eating a cove palm while hiding in a forest on the planet Ogus II. After the boy was found, his illness was quickly diagnosed and he was immediately isolated aboard the ship ahead of emergency treatment at Starbase 416.

ISOLATION

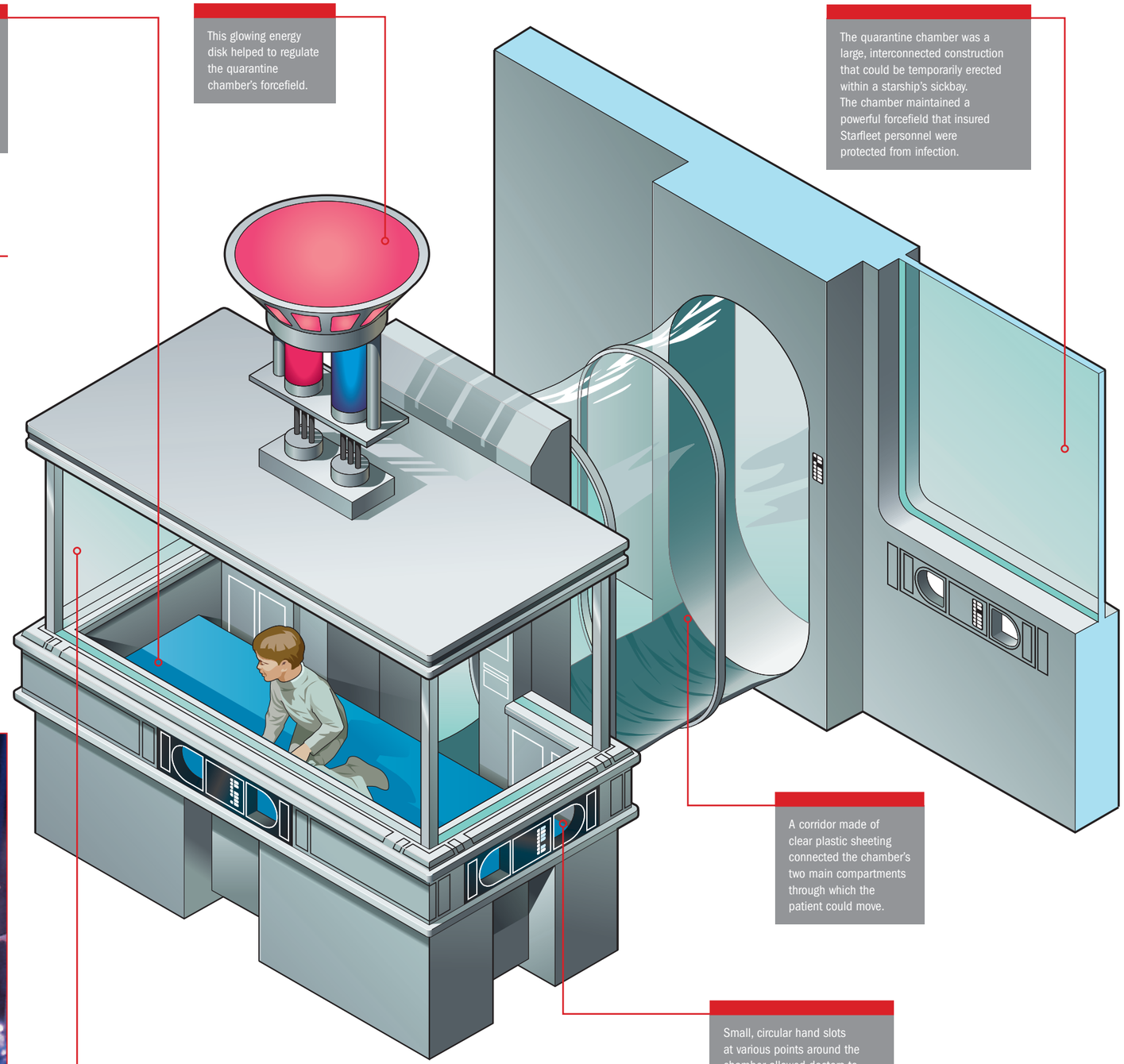
The housing served to regulate the environmental conditions experienced by the occupant, and purified the air through a filtration unit so as to prevent the infection spreading. The compartment was divided into two areas connected by a clear plastic-sheeted corridor. The front section contained a medical bed, and small slots were located to the side through which objects could be passed without compromising the sterile conditions. Physical contact with infected personnel was generally kept to a minimum, but Dr. Crusher could push her hands through these slots and dispense injections, food, medicine, or other therapeutic treatments.

The rear room contained soft furnishings and interior computer displays. On the left side there were a number of small, white cabinet boxes that contained medicines, personal effects, and recreational games to provide some entertainment for the unfortunate occupant.

Willie was successfully treated for his condition on Starbase 416, and thanks to the quarantine device his infection was successfully contained.

Patients in the quarantine chambers welcomed social interaction with those outside. Prolonged stays in the chamber could be extremely boring.

Once Willie Potts had been quarantined in the front chamber of the medical isolation device, Dr. Crusher could safely examine him through protective slits.



LONG-RANGE COMMUNICATIONS

Starfleet ships may operate in deep space, but a sophisticated communications network enabled them to keep in contact with other vessels and never be entirely isolated.

As part of their mission of exploration, Starfleet vessels regularly sent messages over enormous distances. This was made possible by the use of a series of ultra-high power subspace transceivers that were located just below the starship's hull. Vast amounts of information often had to be trafficked at great speed, and a typical Starfleet vessel was designed to receive and transmit more than 18 kiloquads of data per second.

FASTER-THAN-LIGHT

Subspace frequencies could carry electromagnetic signals at faster-than-light speeds and allowed almost instantaneous communication with distant locations. Under ideal circumstances, a subspace message had a range of 22.65 light years, so transmissions were boosted by an interstellar network of subspace relay stations once sent.

Subspace transceivers onboard ship were designed to function at both sublight and warp velocities. Starship transceivers included both a sublight signal preprocessor and a warp velocity signal preprocessor, an adapting antenna radiating element steering driver, a passive range determinator, Heisenberg and Doppler compensators, and a signal cleaning and amplifying stage. Computers automatically ensured that an incoming signal was as clear as possible, but personnel may need to make manual adjustments.

SHIP-TO-SHIP

A typical ship-to-ship transmission was initiated when one ship sent a hailing signal packet to another. The receiving ship's computers sensed, decrypted, and verified the packet's security protocols. The hailing packet then identified the calling ship and supplied the data.

A large ship with hundreds of crew members was likely to receive an ongoing barrage of official and private communiqués. All messages are automatically delivered to the proper terminus upon security clearance.

Many races and organizations other than the Federation had access to subspace technology; to accommodate them the transceiver technology on Starfleet ships could be adjusted to interact with previously unencountered protocols. When the ship's main computer analyzed an alien language, it automatically activated the universal translator.

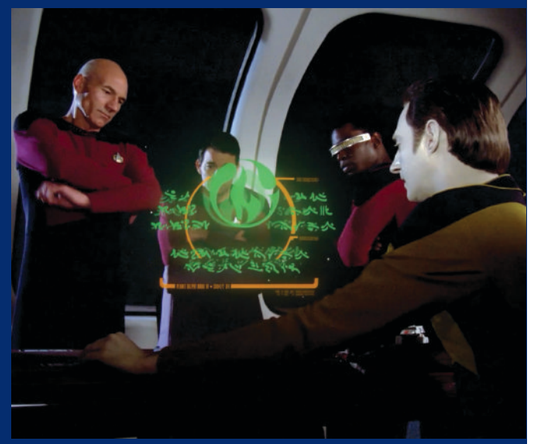
SHIP-TO-STARBASE

Ship-to-starbase communications worked in exactly the same way as between vessels. Contact with a starbase could also trigger a data dump from starship to starbase, containing details of ship operations, including data collected, logs, hardware conditions, crew evaluations, and more. All this required hundreds of subspace channels. The data stream went both ways, meaning the starship was able to receive mission orders and condensed information from other starships.

HOLOGRAPHIC SYSTEMS

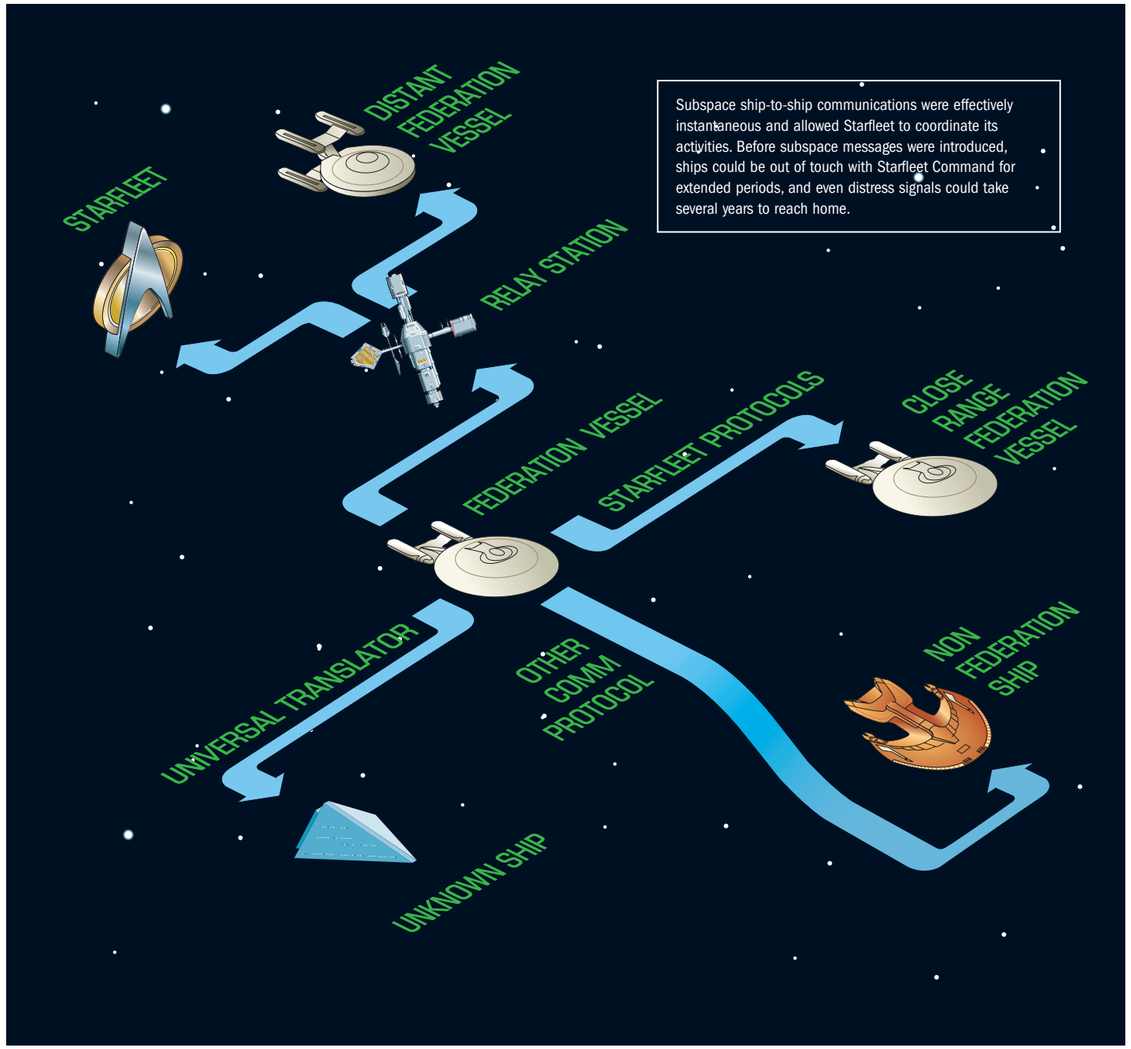
Holographic systems had been in use on Starfleet ships since the middle of the 23rd century, but were rarely used on the *Enterprise*-D unless there were specific reasons.

In the 2250s, Starfleet ships routinely used holographic systems to communicate, but on the *Enterprise,* they tended to favor the main viewer.



Holographic projectors were still used in some instances and small holographic displays were often used in briefings.

KEEPING IN TOUCH



Subspace ship-to-ship communications were effectively instantaneous and allowed Starfleet to coordinate its activities. Before subspace messages were introduced, ships could be out of touch with Starfleet Command for extended periods, and even distress signals could take several years to reach home.

SUBSPACE RELAY STATIONS

A massive – and constantly expanding – communications network provided a means for Starfleet to send and receive clear messages across Federation space.

One of the problems space explorers faced was how to keep in touch over the vast distances of space. The challenge arose because communication signals inevitably decayed over time; this caused significant amounts of information to be lost, rendering the messages useless. Much effort was devoted to devising and implementing a suitable communications network that would convey messages quickly and accurately.

Scientists found that by deploying crewed subspace relay stations at intervals of approximately 20 light years, a signal could be boosted before it started to decay. Relay stations offered the added benefit of increasing the speed of the communication to as much as 60 times faster than a starship's top warp speed.

LEAVING A TRAIL

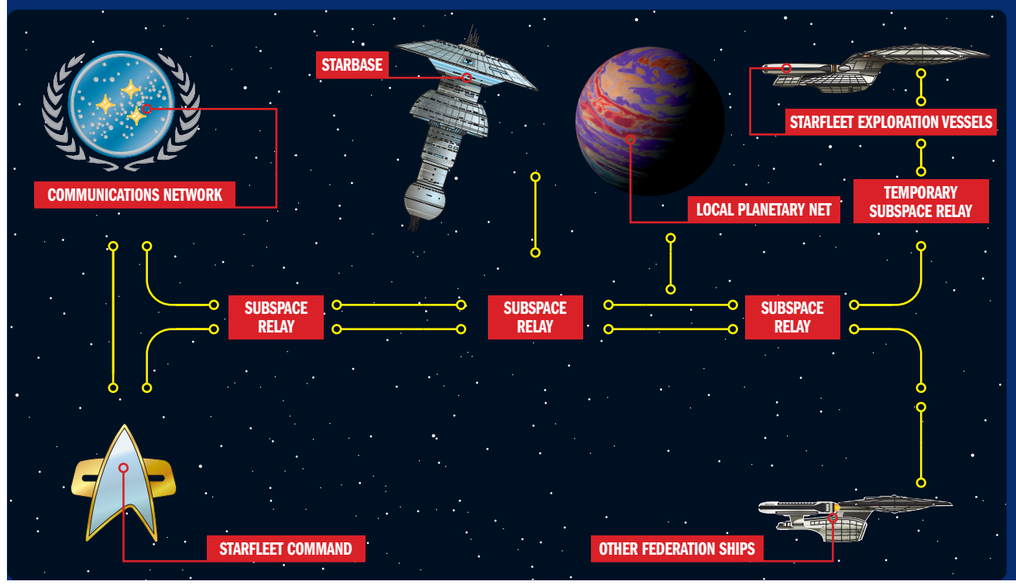
There were already thousands of relay stations located in Federation space. An additional 500 came into service each year, mostly along trade lanes and in areas of ongoing exploration.

During journeys into previously uncharted regions of space, starships would sometimes 'drop' a trail of temporary relay stations behind them as they traveled. These were often replaced by permanent stations at a later date. The *U.S.S. Enterprise* NCC-1701-D was equipped with a series of small relay beacons for this purpose.

The Starfleet network was further supplemented by the Federation's civil communication system and numerous local communication webs throughout the Galaxy.

SUBSPACE NETWORK

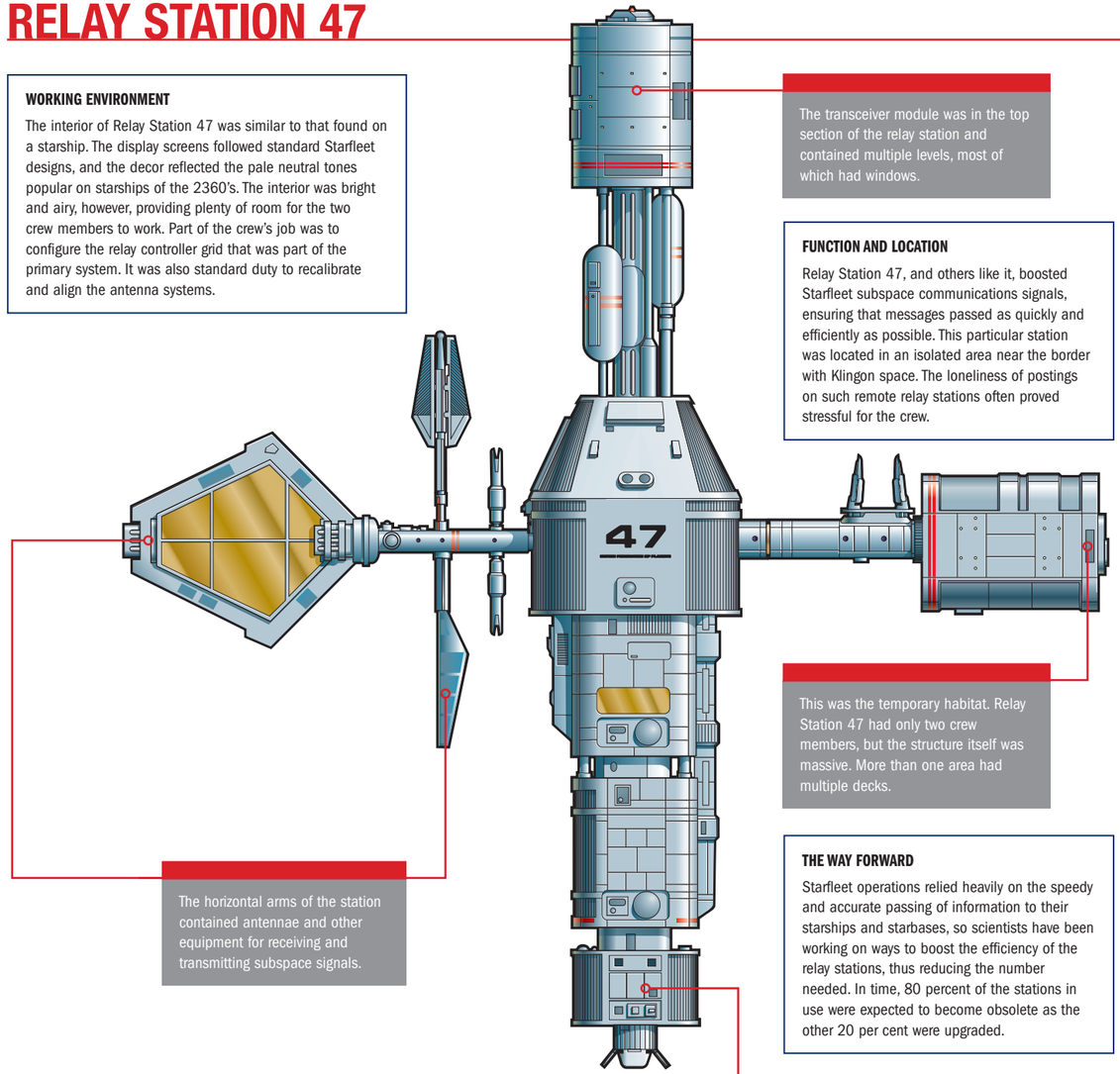
The subspace communications network linked starships with starbases, planets, and other starships, even providing exploration vessels deep in space with a direct link back to Starfleet Headquarters on Earth. Beacons dropped by distant craft were constantly expanding the network.



RELAY STATION 47

WORKING ENVIRONMENT

The interior of Relay Station 47 was similar to that found on a starship. The display screens followed standard Starfleet designs, and the decor reflected the pale neutral tones popular on starships of the 2360's. The interior was bright and airy, however, providing plenty of room for the two crew members to work. Part of the crew's job was to configure the relay controller grid that was part of the primary system. It was also standard duty to recalibrate and align the antenna systems.



The transceiver module was in the top section of the relay station and contained multiple levels, most of which had windows.

FUNCTION AND LOCATION

Relay Station 47, and others like it, boosted Starfleet subspace communications signals, ensuring that messages passed as quickly and efficiently as possible. This particular station was located in an isolated area near the border with Klingon space. The loneliness of postings on such remote relay stations often proved stressful for the crew.

This was the temporary habitat. Relay Station 47 had only two crew members, but the structure itself was massive. More than one area had multiple decks.

The horizontal arms of the station contained antennae and other equipment for receiving and transmitting subspace signals.

THE WAY FORWARD

Starfleet operations relied heavily on the speedy and accurate passing of information to their starships and starbases, so scientists have been working on ways to boost the efficiency of the relay stations, thus reducing the number needed. In time, 80 percent of the stations in use were expected to become obsolete as the other 20 per cent were upgraded.

The relay station dwarfed by the *Enterprise* as it approached for a supply drop.

The bottom of the relay station housed a fusion reactor.

Living quarters on board the relay station.

SHORT-RANGE COMMUNICATIONS

Away teams were often sent on dangerous missions, so it was vital that an efficient communications system kept them in contact with their starship.

All Starfleet vessels were equipped with a short-range communications system that was suitable for maintaining contact with away team personnel, communicating with planetside governments, and conducting shuttle approach and departure guidance.

SUBSPACE

The short-range communications systems were typically used over distances of 38,000km to 60,000km. There were two types of short-range communication: data transfer between computer systems, and personnel communications.

Short-range communications were normally conducted at faster than light speeds that were facilitated by subspace transceivers. This prevented any signal delay or distortion. Basic radio (RF) transmissions were still used when dealing with cultures that had not embraced subspace technology, and as a backup system. Some stellar and geographical phenomena prevented the efficient working of subspace systems.

TRANSCEIVER ARRAYS

A network of medium power subspace transceivers was embedded in each ship's hull, and drew power from the EPS taps. Each transceiver had separate processors for handling voice and data streams.

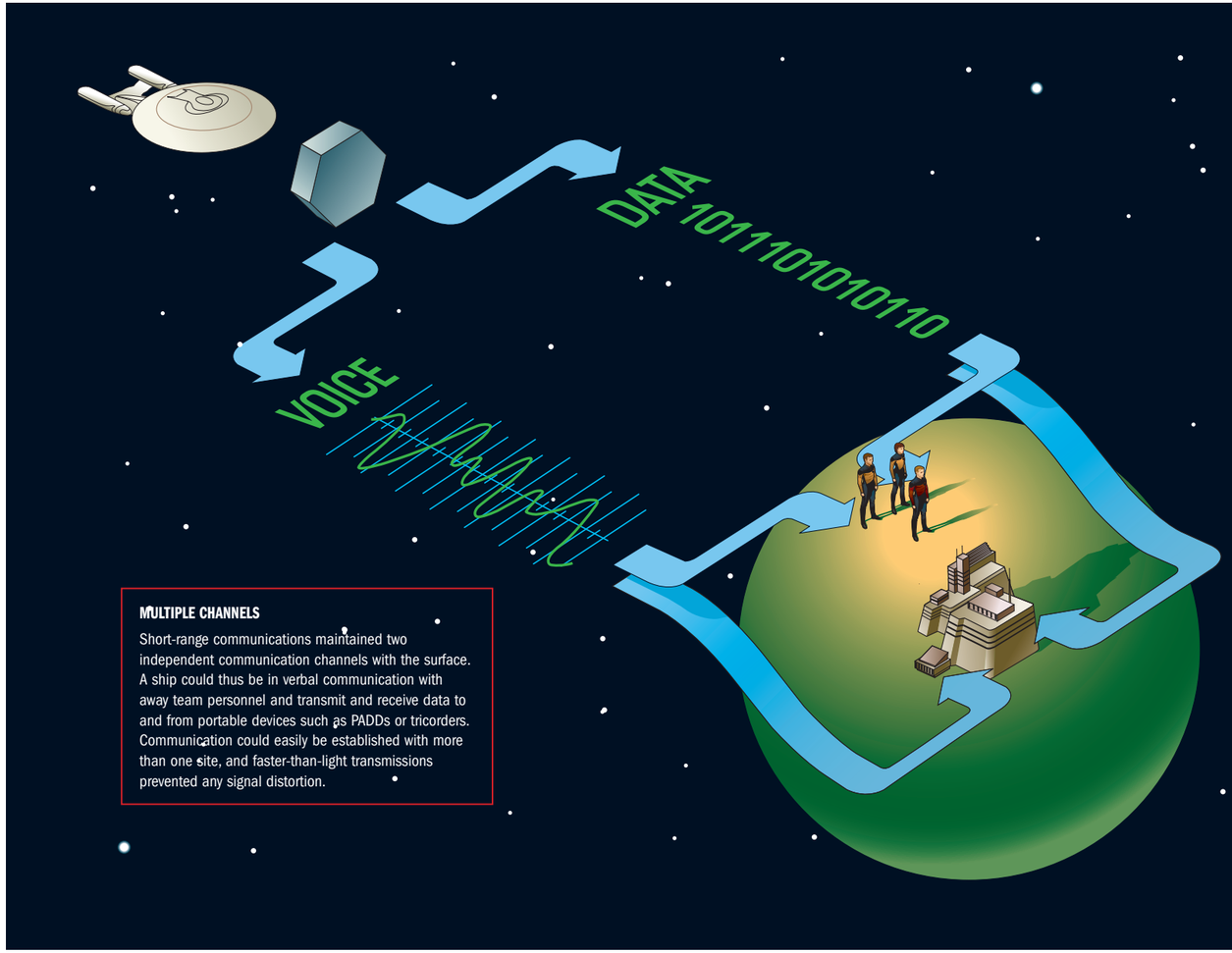
The RF system was made up of a series of triply redundant transceivers that were also partially embedded in the ship's hull. The effective range of RF signals was 5.2 AUs, although this could be boosted to 1,000 AUs.

The personal communicators used by Starfleet over the years provided the away team member with audio communication only, although the receiving ship also had access to visual communication via shipboard viewscreens. Communications between ships and official planetside bodies often provided visual links between both parties.

Starfleet ships could easily communicate with officials on the surface of the worlds they are visiting or assisting.

The short-range communications in use on Starfleet vessels allowed an away team to stay in constant, real-time communication with their starship. Com traffic aboard the *U.S.S. Enterprise* NCC-1701-D was handled by the security officer.

Modern Starfleet vessels could monitor an away team, provided that an open com channel was maintained throughout the operation. This could prove invaluable should the away team run into any difficulties.



MULTIPLE CHANNELS

Short-range communications maintained two independent communication channels with the surface. A ship could thus be in verbal communication with away team personnel and transmit and receive data to and from portable devices such as PADDs or tricorders. Communication could easily be established with more than one site, and faster-than-light transmissions prevented any signal distortion.

By the 2360s, the communicator had become a badge that was worn on the left of the chest. It was activated by tapping it with a hand.

By the 2360s, away teams communicated with their ship via combadges, leaving their hands free for other tasks.

LIFE SUPPORT

Periods of potentially hazardous exploration required sophisticated life support systems. These systems also allowed a vast range of environmental conditions to be safely recreated within the ship.

The *U.S.S. Enterprise* NCC-1701-D featured a significant number of major improvements over previous starship designs. These improvements included important changes to vital functions designed to sustain the lives of the ship's crew through the hostile conditions of space.

One of the most important systems within any starship was life support and environmental control, and the *Enterprise* featured a multiple-redundant atmospheric system designed to generate, recycle, and maintain habitable conditions within the ship.

PARALLEL SYSTEMS

The self-contained atmospheric system represented the ship's primary life support function, although there were a number of other systems that helped maintain the existence of the Starfleet crew serving aboard the ship. Primary life support was comprised of two parallel systems, each serving as a permanent back-up to the other, and including links to synthetic gravity generation through a series of deck-mounted units, the generation of breathable air, direct connection to the EPS conduits to provide constant heat and lighting, and also the water and waste distribution network.

Each of the two primary life support systems were also connected to the reserve utilities distribution network that could provide a limited supply of critical consumables such as air, power, and water, although the design of the *Galaxy*-class life support systems made the simultaneous collapse of both primary systems extremely unlikely – the bridge atmospheric support systems themselves featured seven independent safety interlocks, making total life support failure virtually impossible.

Major life support equipment facilities were located in the saucer section on decks 6, 9, and 13, while the engineering hull could be independently serviced via systems on decks 1, 21, 24, and 34. During normal flight conditions all life support facilities formed the same system, although the tactical advantage of separated flight mode required fully independent units to operate with the same redundant safety features in both sections of the vessel. Severe damage to one part of the *Enterprise* could leave the commanding officer with little option but to evacuate the entire crew to the less damaged part of the ship, although this was a worst-case scenario decision. In addition to the primary and back-up systems, contingency atmospheric supply modules were located at most corridor junctions to provide a breathable atmosphere for up to 30 minutes in a major system-wide failure and allow the crew to reach the nearby contingency shelters.

ENVIRONMENTAL EXTRAS

The *Galaxy*-class design had 52 emergency shelter areas located throughout the habitable volume of the vessel, with each shelter having a maximum capacity of 65 crew members. Assuming a minimal level of life support, these shelters could sustain their occupants for up to 36 hours, and receive priority life support from a series of dedicated protected utilities trunks so that they could remain habitable even in the event of catastrophic systems outages in other parts of the ship. In the event of the exterior atmospheric systems completely failing, the shelters also contained independent emergency breathing gas, water, food, and power supplies that could maintain life for a further 24 hours, and also contained a minimum of two emergency pressure garment environmental suits allowing movement through compromised sections of the ship. The *Galaxy*-class design was extremely resilient and could withstand a high level of damage before the loss of containment. Excepting cases of large scale explosive decompression – such as a multiple deck hull breach – even a severe atmospheric supply failure was expected to permit upward of 50 minutes for evacuation of personnel to designated shelters, and those crew working in areas where life support had been lost would make use of environmental suits to carry out repair duties.

In 2366, during a scientific mission, nanites altered the environmental systems aboard the *Enterprise* in order to create an atmosphere that was toxic to the crew.

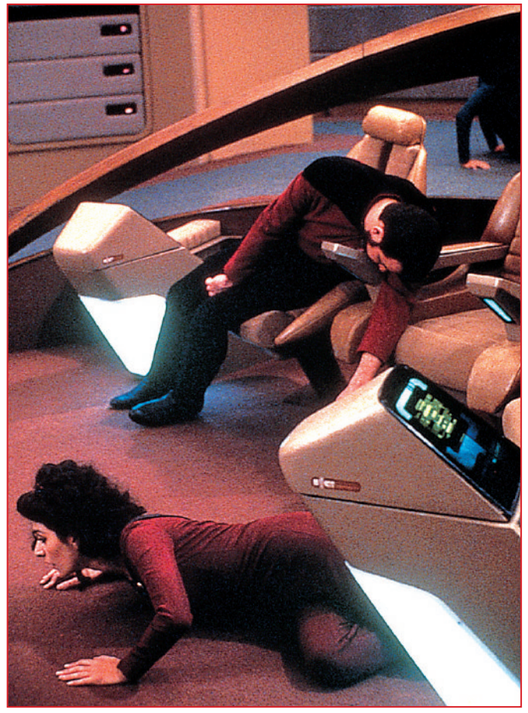
The Solanagen-based life forms that infiltrated the *Enterprise* in 2369 attempted to create an environment suitable for their own species to exist in.

QUALITY OF AIR

The atmospheric system generated and regulated a Class-M compatible oxygen-nitrogen atmosphere throughout the habitable volume of the starship, with a series of plenums built into interior bulkheads that delivered temperature and humidity controlled environmental gases from two independent primary atmospheric systems.

Operating as a contained environment, the atmospheric life support system relied on the recycling of expelled gases from the crew in order to generate breathable air and maintain environmental balance. Photosynthetic processing removed carbon dioxide from the exhaust gases vented back to the processing units via the return network, and replenished the oxygen content before passing the unfinished fresh breathing mixture to particulate filtration units. The temperature and humidity of the breathing mixture was also regulated at this point and passed on to the distribution network, linking to the reserve processors via a series of cross feeds guaranteeing the all-important redundancy of the environmental systems.

Under normal cruise mode conditions, shipboard operational rules specifed a 96-hour duty cycle for processing modules whereby the entire atmospheric processing load was automatically swapped from one primary system to the alternative primary system, although it was possible to switch partial sections of the systems. Additional control over the two primary systems was provided by the ability to reroute breathing atmosphere between individual processors, allowing a higher degree of safety through these redundant back-up swapovers.



In 2367, the reclusive Paxans employed a biochemical stasis field that breached the *Enterprise*'s environmental controls and rendered the crew unconscious when they attempted to pass through the Ngame nebula.

The reserve atmospheric system was a third back-up, providing up to half of nominal system capacity for up to 24 hours in the event of both major elements failing. Sharing the same plenum distribution system as the primaries, the reserve system operated by continual computerized system analysis which allowed any damaged plenum sections or processors to be isolated for repair. Under normal conditions the crew should notice no interruption in life support as these systems swap between each other, although localized failures were not unknown, and control of the atmospheric systems by hostiles could be used to considerable effect during boarding of a vessel.

▶ Ensign Wesley Crusher looked into the depths of the pungent Legaran pool aboard the *U.S.S. Enterprise* with wonder. He and Lieutenant Commander Geordi La Forge could only speculate why the unseen Legarans enjoyed or needed this environment.

CREATURE COMFORTS

In matters of diplomacy, a great deal of environmental adaptability was required from the *Enterprise* crew. This was evident on Stardate 43917.4. After 93 years, the protocol-adhering Legarans were prepared to ratify a treaty with the Federation, and the ship, in orbit above Legara IV, was outfitted to facilitate their dignitaries with every homeworld comfort. This included the construction of a private, purpose built pool which contained a golden-brown viscose like fluid; it could be compared to the mud baths and jacuzzis found on earth.

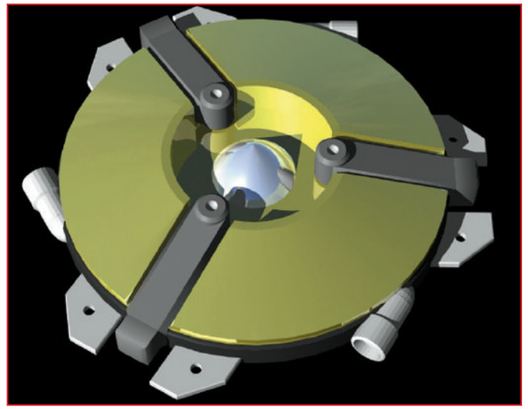
ARTIFICIAL GRAVITY

On the *U.S.S. Enterprise* NCC-1701-D, artificial gravity literally helped the crew to keep their feet on the ground. It was maintained by generators that created a field of gravitons.

It was absolutely essential for a starship like the *Galaxy*-class *U.S.S. Enterprise* NCC-1701-D to generate artificial gravity; without it, crewmembers suffered muscle wastage, their bones lost calcium, and they experienced problems with cellular growth. In fact, anyone who spent an extended period of time in zero-g had considerable difficulty functioning in a normal Class-M environment, and may never recover the muscle that they lost.

As it naturally occurs, gravity is a function of mass. The earliest physicists assumed that gravity produced a pull on objects, somewhat like magnetism, however. The 20th-century Earth physicist Albert Einstein demonstrated this was not quite true, and an object's mass actually warps space. For example, Earth distorts the space around it, creating a shallow bowl-shape. The moon and any other objects in orbit then roll around the edge of this bowl.

Notable works on the subject of artificial gravity on starships included *Synthetic Grav Field Considerations* by Dr. Leah Brahms, written prior to her key involvement as a member of the *Enterprise*-D's development team.



Individual graviton generators must be linked together in series with other generators and placed beneath the deck in order to simulate standard gravity conditions.

GENERATING GRAVITY

Mass itself is caused by something called the Higgs field, and this can be manipulated artificially. On Federation starships such as the *Enterprise*, this was accomplished by generating particles called gravitons that covered the decks with an artificial gravity field.

These graviton generators were embedded in gravity plates, which drew power from the starship's electro-plasma system (EPS). This basic technology as seen aboard the *Enterprise* had been employed in the same manner since the 22nd century, but advances in artificial gravity technology into the 24th century led to the generators installed on the *Enterprise* being much more efficient in operation.

Gravity fields could be manipulated to move heavy objects and cargo containers.

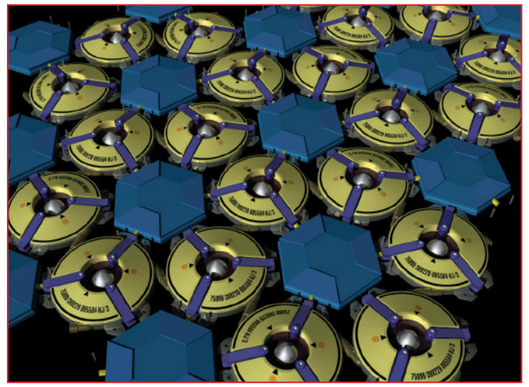
The gravity generator network deployed across the *Enterprise* was split into four distinct regions – two located in the saucer section and two in the engineering section. The network operated to establish a proper sense of 'down' at all times. The two generator networks covering the saucer section each comprised 400 generators while the networks operating in the engineering section each supported 200 individual graviton generator modules.

The individual gravity generator found aboard the *Galaxy*-class *U.S.S. Enterprise* was a cylindrical unit made of anicium titanide 454; this sealed unit's circumference was 50cm and it was 25 cm high. It was connected to the EPS by a single valve.

The unit was basically a hollow chamber that contained a superconducting stator made of thoronium arkenide that was suspended in pressurized chrylon gas. When the generator drew power from the EPS, the stator rotated. At speeds of over 125,540rpm it generated a graviton field and thus, artificial gravity. This gravity field radiated from the generator, but it decayed rapidly – it had a lifetime of only a few picoseconds – so in habitable areas layers of graviton generators were placed no more than 30m apart.

SUSPENSION

In order to function properly the stator had to stay in alignment in the center of the unit. Extreme movements could cause the stator to collide with the walls of the generator, and consequently stop rotating. These kinds of extreme forces were normally eliminated by the ship's inertial damping system; the individual gravity generators were also constructed with sinesoidal ribs that could absorb any remaining jarring motions.



Graviton generators were embedded in gravity plates that covered every deck aboard a starship such as the *U.S.S Enterprise*.

The stators were suspended from the time of manufacture, and they only needed to be synchronized by an energy pulse from the EPS every 60 minutes. If the EPS failed, the stator would continue to function for up to 240 minutes, though the strength of the gravity field would decay to approximately 0.8g.

COUNTERACTING FORCES

The network of gravity generators was connected to the Inertial Damping Field (IDF), which used gravitons to generate forcefields that counteracted the forces generated by moving at extreme speeds. In fact, the gravity plates were a part of the IDF since they conducted gravitons to it; the two systems worked in concert to minimize the effects of any sudden movements on the crew. The gravity generators were located throughout the ship, and they had to compensate for different inertial potentials. In other words, during some extreme maneuvers such as sharp turns, parts of the ship were moving at different speeds. The gravity field was designed to compensate for this, but in some cases due to the distance between the generators, it was not perfect, and as a result some crew members experienced sudden nausea. The gravity generators were linked by a series of small waveguide conduits that facilitated field bleed and therefore maintained overall gravitational stability.

EARTH STANDARD

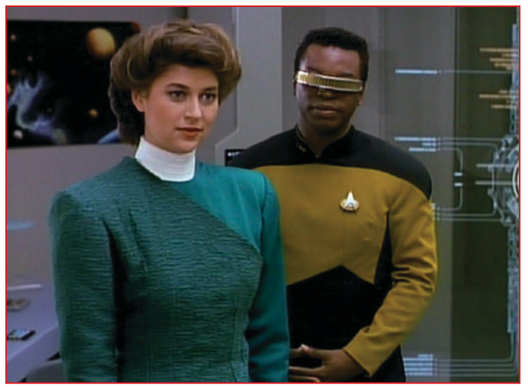
On most Starfleet vessels like the *Enterprise*, gravity was set to Earth standard (1g) throughout the habitable parts of the ship, although the gravity could be controlled locally and adjusted to suit lifeforms from different planets. The level of control was very precise, and gravity could be altered in an individual crewmember's quarters. For example, Elaysians were a Federation member race from a very low gravity planet, consequently they could only function normally in low-gravity environments. If they were serving on starships that maintained a Class-M environment they had to use exoskeletons in most of the ship, but they could at least enjoy the comfort of low gravity in their own quarters. Species such as Vulcans who were accustomed to slightly higher levels of gravity could normally function quite happily in a 1g environment without any noticeable decay in muscle or bone tissue.

The facility to control the artificial gravity was employed in other ways around the *Enterprise*. Shuttlebays were marked with warning signs indicating they were 'Variable Gravity Areas', while amongst the recreational facilities available to crewmembers was a low gravity gymnasium.

Ironically, the existence of a shipwide artificial gravity field meant that the *Enterprise*'s crew often had to generate anti-gravity forces to transport heavy or dangerous objects. This was normally done with portable devices such as anti-gravity pallets or lifters. These worked by generating a localized field of anti-gravitons that reduced the mass of the object being transported.

Gravity plating like that found on the *Enterprise* was ubiquitous on starships the 24th century and few Starfleet officers had any meaningful experience of working in zero-g. The plating could easily be fitted to any vessel or facility as long as a suitable power supply was available and made time served aboard a starship comfortable.

A gravity unit was used to float delicate medical supplies aboard the *Enterprise*-D, preventing spillage and crew infection.



Geordi La Forge with Dr. Leah Brams, one of the *Enterprise*-D's development team and author of *Synthetic Grav Field Considerations*.

TRACTOR BEAMS

The *Enterprise-D* had a number of different tractor beams that were used for anything from towing vessels, to maneuvering the ship when docking, and guiding shuttlecraft into shuttlebays.

The *U.S.S. Enterprise* NCC-1701-D was equipped with a wide range of tractor emitters that were installed at specific points across the ship's outer hull. These emitters produced a focused graviton beam that could be used to tow vessels, alter the trajectory of an approaching object, or hold it at a fixed distance from the ship.

There were a total of three primary tractor beam emitters located on the *Enterprise*, with two located fore and aft along the bottom of the engineering hull, and one positioned above the main deflector dish. The density, reach, and intensity of the tractor beams were controlled directly from the ops station on the main bridge.

The tractor beam emitter located at the rear of the *Enterprise*'s stardrive section was the primary unit for towing other vessels behind and to the side of the *Galaxy*-class ship, although the forward unit could also undertake this function.

INTERFERENCE PATTERN

The ship's tractor beams generated an interference pattern across the surface of the target object. The strength of this pattern was determined by the size and distance of the target from the tractor beam emitter, and the intensity of the beam was governed by the amount of available power. Manipulation of the focal point on the object's surface altered the pattern generated, and resulted in the target being drawn toward the ship.

The main tractor beam emitters were also frequently used to immobilize an object or to prevent a smaller vessel from escaping, so they were often targeted by enemy weapons or subjected to various amounts of damaging feedback energy.

STRUCTURAL MOUNTING

Due to the significant mechanical stress placed on the hull during tractor beam usage, the main emitters were directly mounted to primary structural members of the starship's framework. Additional structural reinforcement could be generated by routing the emitter into the ship's structural integrity field network.

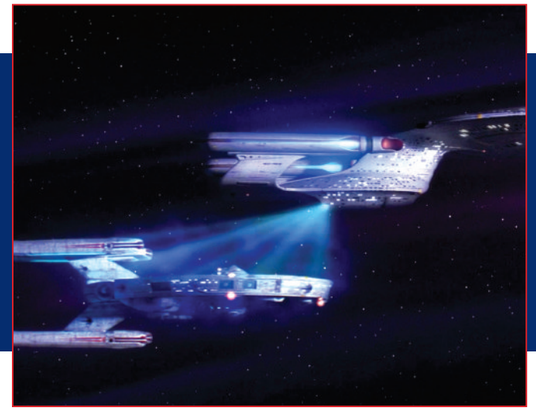
As well as the main tractor beam emitters, the *Enterprise* was equipped with secondary emitters that were used in conjunction with the Reaction Control System (RCS) and to help guide shuttlecraft into the shuttlebays.
The RCS tractor beam emitters were located fore and aft of the port and starboard sides of the saucer section, fore and aft on each side of the engineering hull's midline, and on the rear upper and lower outer surfaces of the warp nacelles. These low output tractor beam units were routinely used when the *Enterprise* was carrying out delicate precision maneuvers, such as docking at Federation starbases.

MANIPULATION OF STRENGTH

The shuttlebay emitters were located directly below the exterior entrances to the three shuttlebays. They were controlled by computer, under the direction of the flight deck officer. Additional tractor beam emitters were situated inside the shuttlebays, and could safely maneuver shuttles to within a 350-meter approach zone.

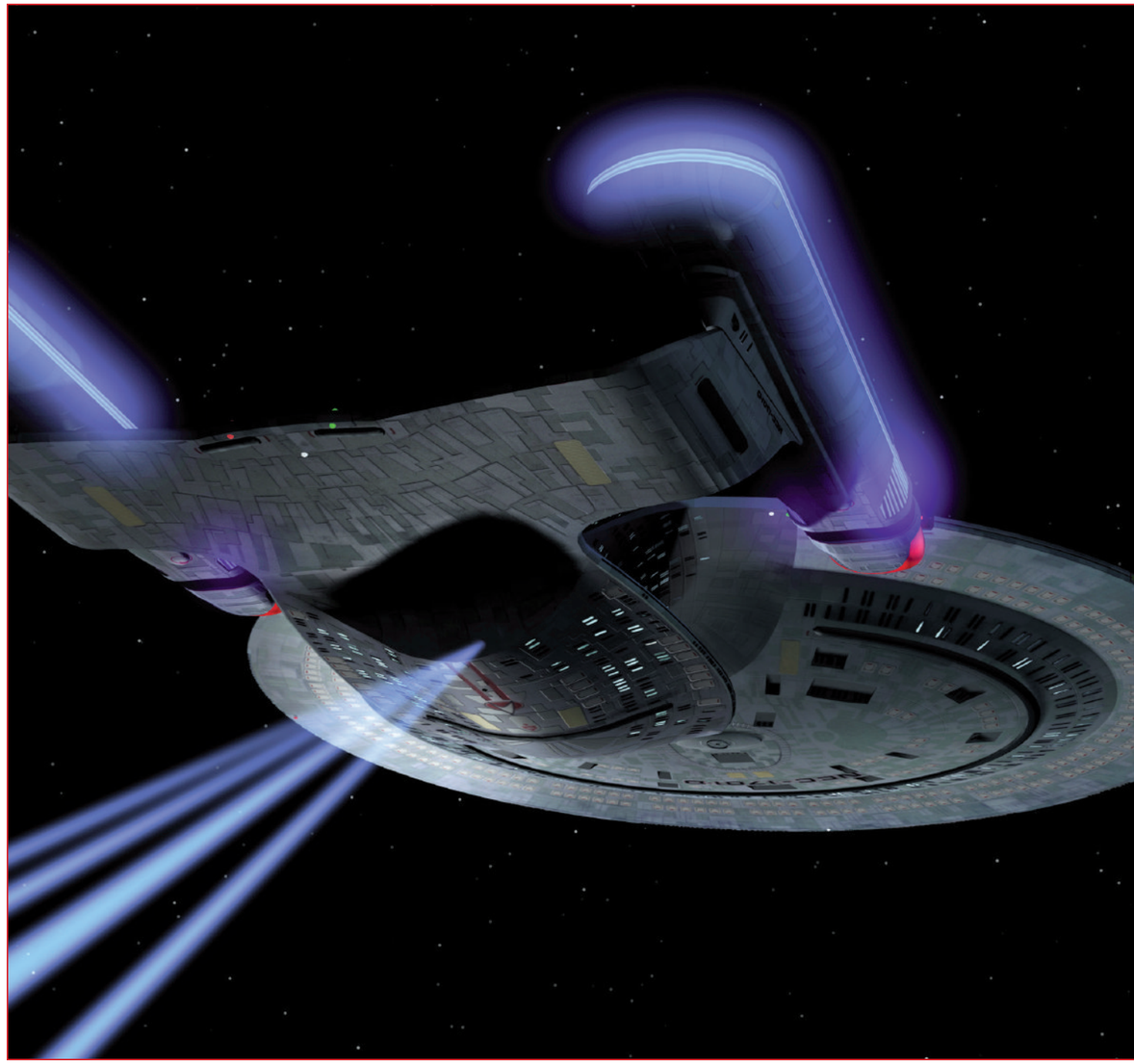
During its service, the *U.S.S. Enterprise* used its tractor beams during numerous routine operations, but there were occasions when they were used in far more exceptional ways to avoid dangerous situations and save lives.

In 2368, Lieutenant Commander Geordi La Forge enhanced the system when he developed a multiphase tractor beam with the help of Hannah Bates of Moab IV's Genome colony. Their modification work allowed the ship's warp power to be channeled into the tractor beam with massively increased efficiency, resulting in the diversion of a potentially catastrophic stellar core fragment away from the colony.

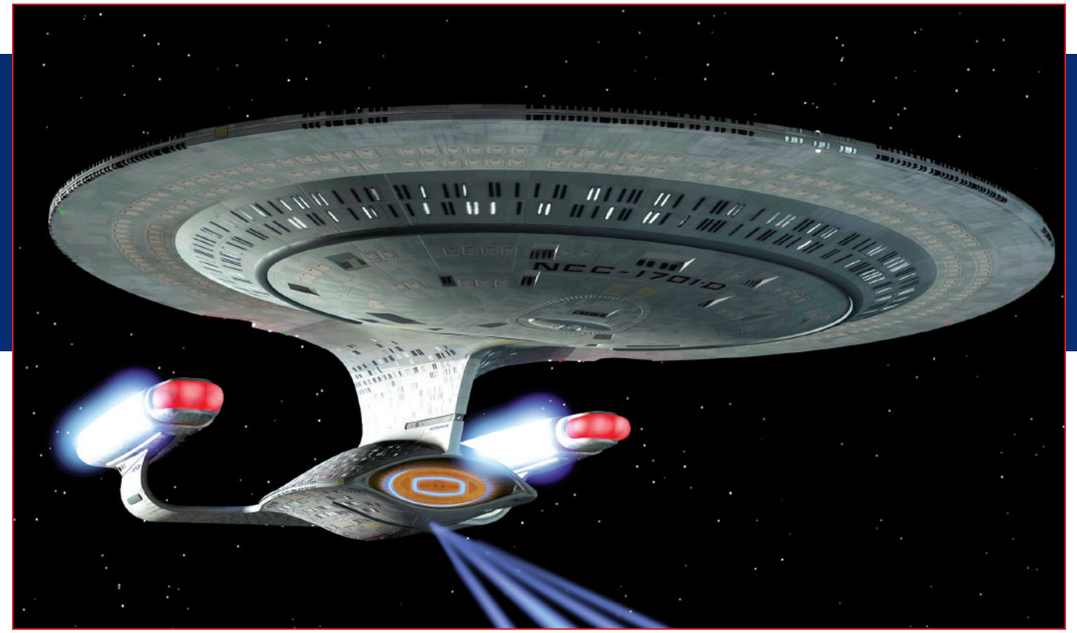


The primary use of the *Enterprise*'s tractor beam was to tow stricken vessels to a safe harbor where they could be later repaired.

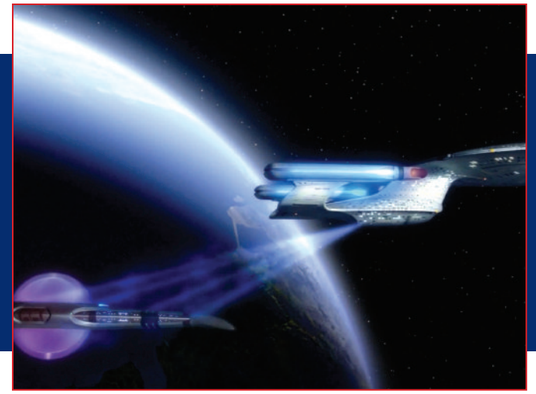
In 2368, Lieutenant Commander Geordi La Forge and Hannah Bates increased the power of the tractor beam to divert a stellar core fragment away from Moab IV.



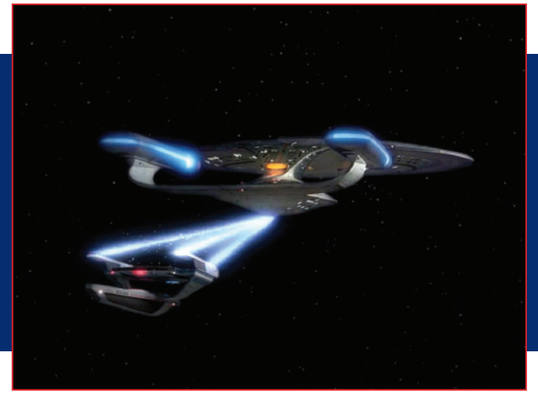
The aft tractor beam emitter aboard the *U.S.S. Enterprise* NCC-1701-D was located on the underside of the stardrive section, just forward of the warp nacelles.



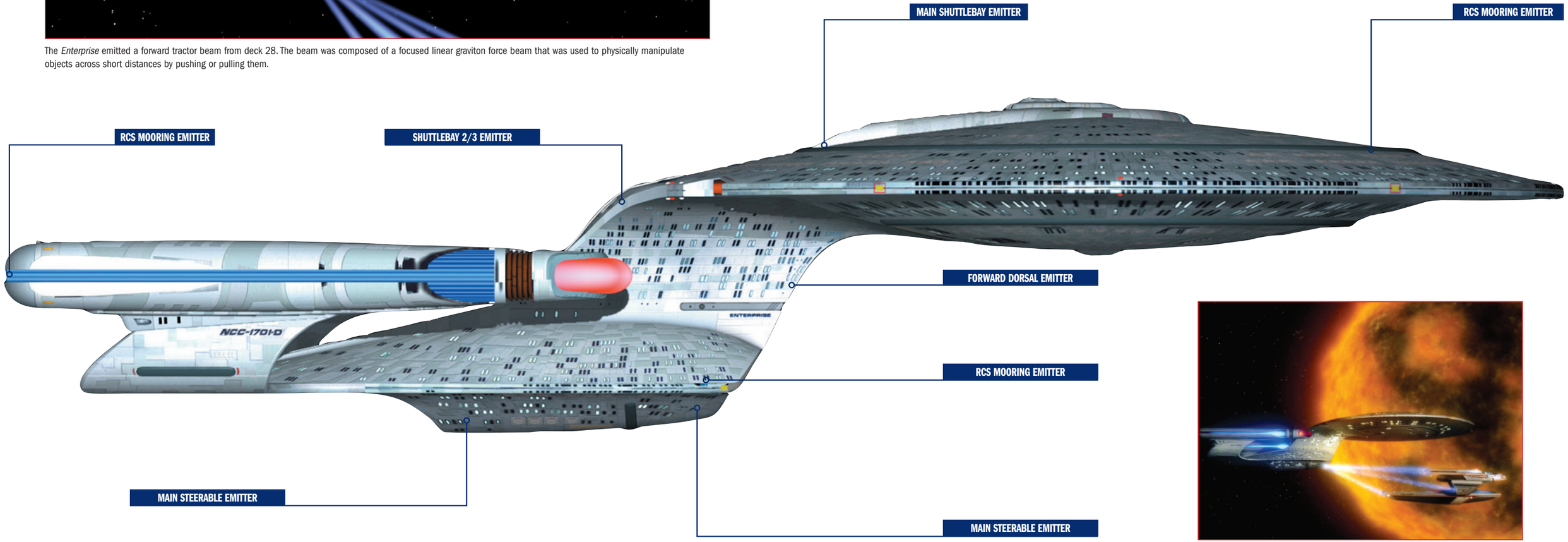
The *Enterprise* emitted a forward tractor beam from deck 28. The beam was composed of a focused linear graviton force beam that was used to physically manipulate objects across short distances by pushing or pulling them.



The tractor beam itself spreads out from the host ship so that, rather than grabbing objects at one point only, the stresses of the beam are distributed evenly across the whole of the structure. This allows for more precise maneuvering of the towed object, and minimizes the damage likely to be caused to its structural integrity.



The primary tractor beam emitter on *Galaxy*-class starships such as the *U.S.S. Enterprise* NCC-1701-D was located at the bottom of the engineering hull on deck 42. Consequently, most large objects, such as other ships, were normally positioned below and slightly behind the host ship while being towed.



The *Enterprise* pushed the *U.S.S. Tsiolkovsky* NCC-53911 into the path of exploded star material in 2364.

AWAY TEAM EQUIPMENT

The *U.S.S. Enterprise*-D away team's equipment readied them for all eventualities, including exploration, first contact, scientific research, dangerous environments, and even combat.

In the 2360s, Starfleet officers normally wore standard uniforms on away team duty. The communicator, which is built into the badge, allowed them to stay in touch with their vessel at all times. Before leaving the ship, personnel would be issued with hand phasers and tricorders which could be attached to the waist of the uniform.

Medical personnel normally carried a medical tricorder and often a medical kit, which contained vital equipment such as a hypospray and a dermal regenerator.

Other mission specialists, such as engineering staff, were issued with specialist equipment. Typically, this included an engineering kit and devices such as pattern enhancers.

1 COMMUNICATOR

The communicator badge was probably the most important piece of equipment carried by away team members. It allowed personnel to contact one another and their ship, and provided an all important signal lock for transporters.

The communicator is built into the Starfleet insignia, worn on the left side of the chest. It provides a signal which is used as a transporter lock.

3 PHASER

Personnel normally traveled lightly armed and carried type-2 hand phasers. These were issued from a locker in the transporter room, and were usually more than sufficient for dealing with any trouble.

In dangerous situations, all away team personnel carried hand phasers. Security specialists were responsible for the away team's safety.

Security and operations personnel carried a tricorder that could collect data on their surroundings and the location of any life forms or power sources.

2 TRICORDER

The standard tricorder was a powerful device that could scan the surrounding area and synthesize the data it gathered with its 4.5 kiloquads of library information. A subspace transceiver array connected the tricorder to the ship and could be used to transmit or receive data.

Away teams usually consisted of small groups; a standard team might have four members. Specialist officers might have carried additional equipment such as engineering or medical kits.

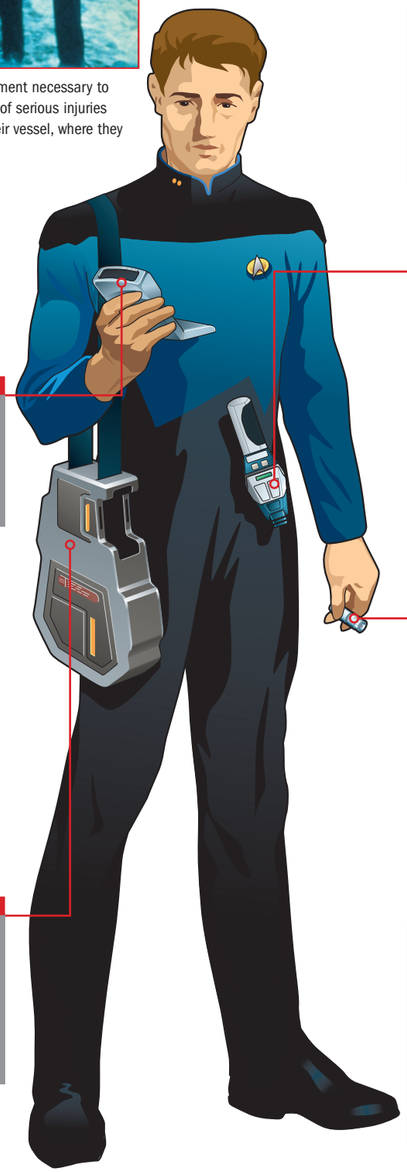
Starfleet officers always carried phasers when entering unexplored environments. The hand phaser had 16 settings, from light stun to disintegrate.

The medical kit contained all the equipment necessary to perform field medicine, but in the case of serious injuries personnel were required to return to their vessel, where they could receive a full range of treatments.

The medical tricorder was one of the most valuable pieces of equipment carried by medical personnel on away teams. It had a massive database of medical information.

4 MEDICAL TRICORDER

The medical tricorder was a customized device that was capable of analyzing any organic life form. It had a specialized database containing detailed information on thousands of medical conditions.



Even medical personnel might carry a hand phaser. The phaser was not only used as a weapon but was a valuable tool for cutting or heating.

The medical tricorder could provide invaluable analysis of new life forms. It could also be used to make a vital diagnosis if a member of an away team was injured.

The medical tricorder included a peripheral scanning device that could be used to gather data.

Medical personnel often carried a medical kit containing various devices that might be needed in an emergency. The instruments in the kit were suitable for field medicine, and were capable of treating many minor injuries.

5 UNIFORM

The standard Starfleet uniform was designed for maximum comfort. It was loose fitting and made of a tough fabric that prevented it from being easily damaged. The uniform had no obvious fastenings, but the top forms a jacket that could be removed in hot conditions.

HAND PHASERS 24TH CENTURY

The Federation was a peaceful organization, but personnel were required to carry weapons in order to defend themselves. The versatile phaser type-2 could be used to stun a human, or to blast through rock.

The type-2 phaser was an intermediate size handheld weapon. In power, it lay between the smaller hand phaser, or type-1 phaser, and the much larger phaser rifle, or type-3 phaser.

The type-2 phaser had a significantly increased power and range in comparison to the type-1 phaser, with 16 settings available – twice as many options as were available with the type-1.

By 2366, pistol phasers were a single unit almost like a 20th-century flashlight. The firing button was on the top and operated by the thumb rather than at the front of the pistol grip and operated by the forefinger, as was the case with earlier models. Close to the trigger were controls which could be used to vary beam width and intensity.

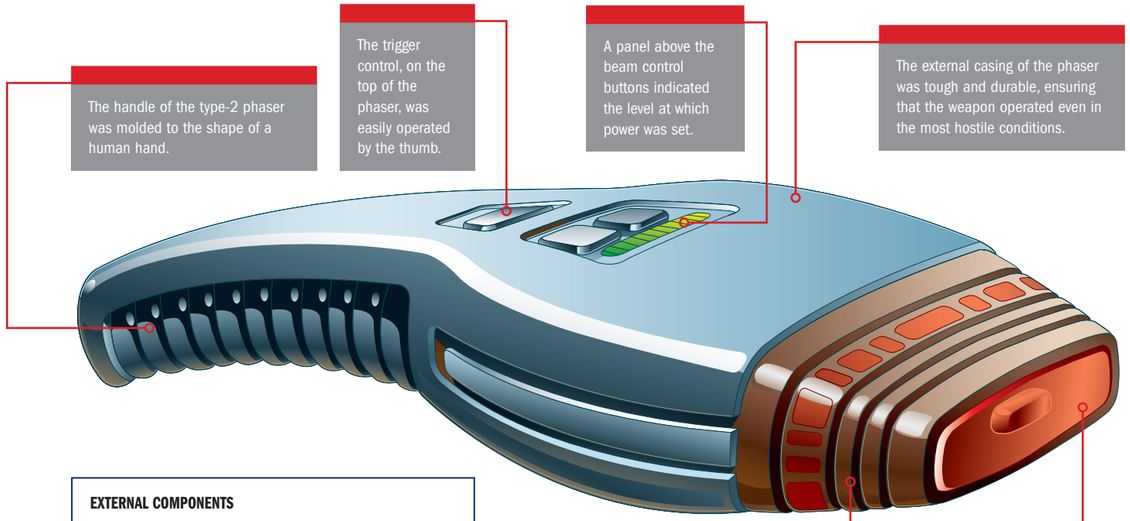
The model of type-2 phaser in use before 2366 had 16 settings, ranging from light stun to disintegrate. The lowest, or stun setting, was designed to cause temporary unconsciousness in humans for up to five minutes, while setting 16 caused major geological displacement and could even damage objects within shields. Intermediate settings could be used to drill holes, cut an object into pieces, or merely heat an object such as a rock to provide warmth.

CHARGING THE PHASER

As with the type-1 phaser, energy was stored within a sarium-krellide power cell which could be replenished when empty. Personnel on board starships could charge their phasers through the standard power taps of the electro-plasma system. Away from the ship, portable bulk sarium-krellide units were used. The power cell of the type-2 phaser measured just 10.2 x 3.0 cm and held 4.5 x 107 megajoules of energy.

Due to the potentially dangerous nature of the phasers, there were a number of safety interlocks built into the system. On board ship, a subspace transceiver array built into the phaser maintained contact with the ship's computers to restrain power levels to below those which would damage the ship – generally limiting them to heavy stun. In addition, the phaser also contained a safety interlock, a code processor which, amongst other functions, could personalize phasers for use by certain personnel only. Key-press combinations of beam width and intensity controls were used to configure the phaser's safety condition. Even when not in use, a phaser constantly trickled energy. Normally, the weapon was prevented from overloading by the safety interlocks, but this made it possible, in extreme situations, to set a phaser on overload, turning it into a makeshift bomb. If the phaser was not allowed to give off energy at a defined rate, it would sound a warning noise for a few seconds, and then explode, causing the death and destruction of everything within a radius of several meters.

This particular model of type-2 phaser was used until 2365, after which a slimmer, sleeker version came into use.

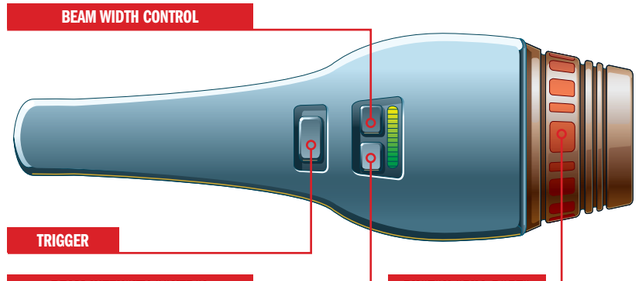


EXTERNAL COMPONENTS

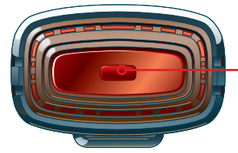
The personal type-2 phaser utilized similar external instrumentation to the type-1. The user could adjust the weapon's output, choosing from a total of 16 settings. Here we see a type-2 phaser, as used by personnel on board the *U.S.S. Enterprise* NCC-1701-D before 2366. As well as a trigger keypad, it had the usual beam width and beam intensity controls, and a power level indicator showing the level of energy being emitted.

HAND HELD DESTRUCTION

TOP VIEW



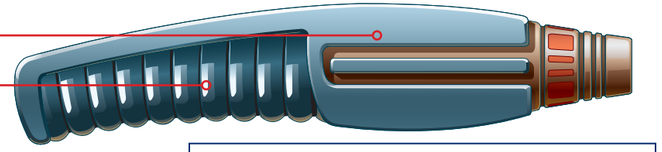
FRONT VIEW



SIDE VIEW

The sarium-krellide power cell, beam control assembly, subspace transceiver assembly, and safety interlocks were all housed in the main body area of the phaser.

The handle was designed for a comfortable and secure grip.



DESIGN AND FUNCTION

Type-2 phasers worked using a rapid nadion effect (RNE). This created energy flow from the prefire chamber to the emission interlocks.

SETTINGS FOR THE PERSONAL PHASER TYPE-2

1: LIGHT STUN
Knocks out base-type humanoids for up to five minutes.

2: MEDIUM STUN
Knocks out base-type humanoids for up to 15 minutes.

3: HEAVY STUN
Puts base-type humanoids to sleep for around one hour.

4: THERMAL EFFECTS
Causes neural damage and skin burns to base-type humanoids.

5: THERMAL EFFECTS
Causes severe burn effects to humanoid tissue.

6: DISRUPTION EFFECTS
Causes matter to disassociate and penetrates organic tissue.

7: DISRUPTION EFFECTS
Kills humanoids as disruption effects become widespread.

8: DISRUPTION EFFECTS
Cascading disruption forces vaporize humanoid organisms.

9: DISRUPTION EFFECTS
Damage to heavy alloy and ceramics over 100cm thick.

10: DISRUPTION EFFECTS
Heavy alloy and ceramic materials over 100cm thick vaporize.

11: DISRUPTION/EXPLOSIVE EFFECTS
Ultra dense alloy materials vaporize. Light geological displacement.

12: DISRUPTION/EXPLOSIVE EFFECTS
Ultra dense alloy materials vaporize. Medium geological displacement.

13: DISRUPTION/EXPLOSIVE EFFECTS
Light vibrations to shielded matter. Medium geological displacement.

14: DISRUPTION/EXPLOSIVE EFFECTS
Medium vibrations to shielded matter. Heavy geological displacement.

15: DISRUPTION/EXPLOSIVE EFFECTS
Major vibrations to shielded matter. Heavy geological displacement.

16: DISRUPTION/EXPLOSIVE EFFECTS
Shielded matter exhibits fractures. Heavy geological displacement.

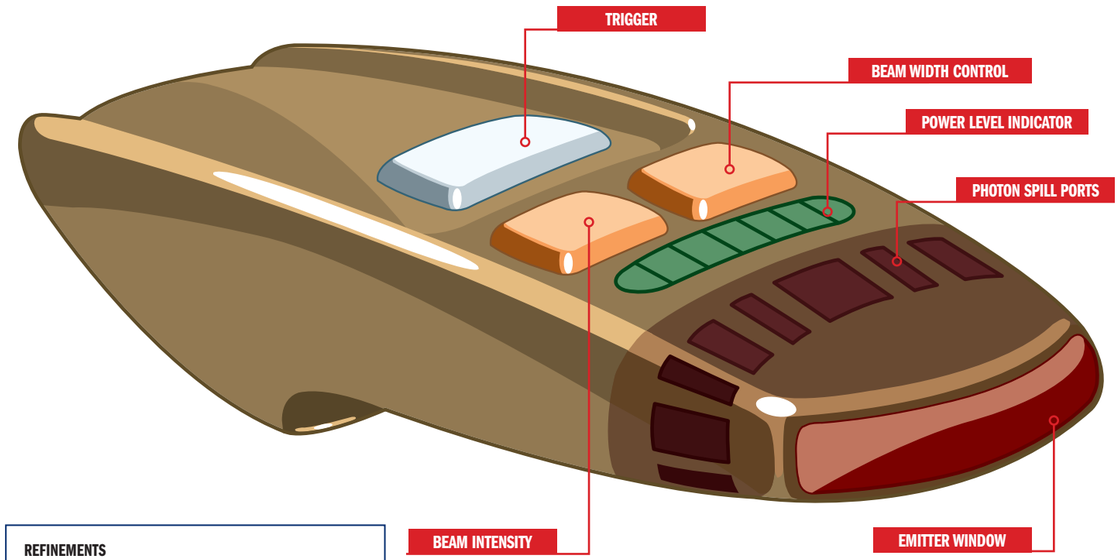
PHASER TYPE-1

The type-1 phaser was small and compact, and while not as powerful as the type-2, was still an effective weapon, containing sufficient energy to vaporize three cubic meters of tritanium.

The type-1 was the smallest personal weapon issued to personnel of the *U.S.S. Enterprise* NCC-1701-D. It worked on same principals as the larger type-2 phaser, firing rapid nadions in a pulsed protonic beam. Whereas the larger type-2 had 16 settings, from light stun to explosive disruption effects, type-1 had 8 power settings, from light stun to disruption effects with an energy discharge of 1.55 x 10^6 for 0.28 seconds; Simple Electromagnetic: Nuclear Disruption Force ratio of 1:40.

The type-1 was small enough to be discreetly carried on board the *Enterprise*-D and on away missions. All Starfleet personnel received basic training in the use of the phaser type-1, up to setting 3. Officers received advanced training and were qualified to use a full-powered 8-setting type-1.

The type-1 contained a single prefire chamber (as opposed to four in the type-2) and could be programmed to fire at intervals.



REFINEMENTS

The LiCu 521 superconducting emitter crystal in the type-1 is an elliptical solid measuring 0.5 x 1.2cm. In the type-2 the crystal is a regular trapezoid measuring 1.5 x 2.5cm.

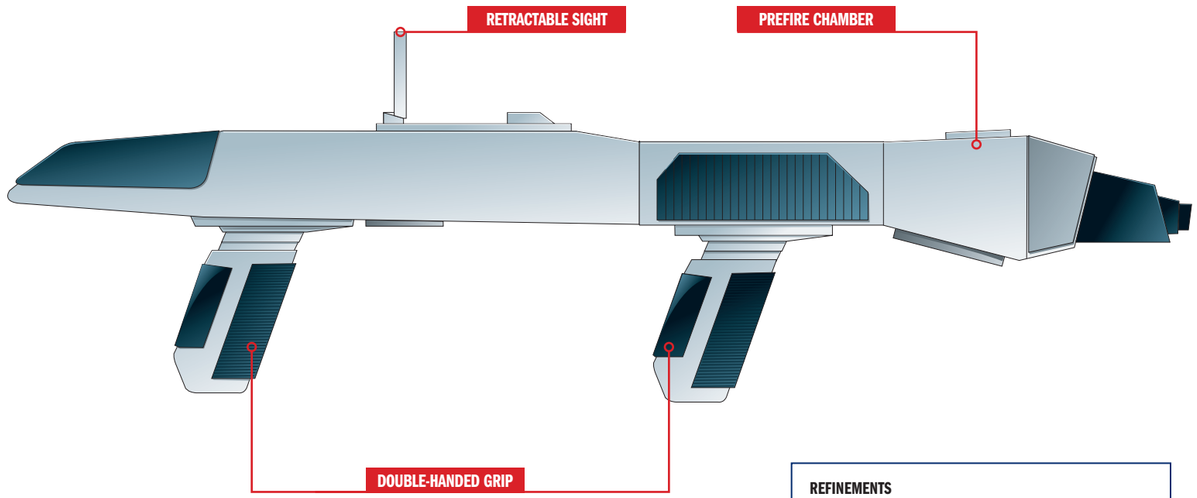
PHASER RIFLES

The type-3 phaser rifle has proved to be a devastating weapon, and as such was rarely issued to officers unless the severity of the mission warranted its use.

The phaser rifle used directed and focused energy as a weapon. Although powerful, it was rarely used because the hand phaser proved to be so effective.

The phaser rifle of the 2360s – also known as a type-3 phaser – had a square snap-up sight and was held from below by two grips. Beam width and intensity could both be controlled by the user. The energy cell was used at 0.05 megajoules per second. Common efficiency of the discharge crystal was approximately 86.6 percent. The power levels and destructive abilities of the phaser were the same as the smaller type-2 model, but the energy reserves on the rifle were 50% larger. The sight and the double larger grip made it more suitable for long-range use.

This phaser rifle was light enough to carry in one hand, and could be fired from the hip like a pistol as well as being used with a more conventional two-handed grip. By 2373, the phaser rifle had been redesigned.



REFINEMENTS

The phaser rifle in use in the 2360s was more refined and controllable than its predecessor. The rapid nadion pulse could be measured, as well as the energy flow from the prefire chamber to the emission aperture.

HAND PHASERS 2366

The handheld type-2 phaser was the first line of defense for most away team members. The design, which underwent constant change to provide the best defense, was updated in 2366.

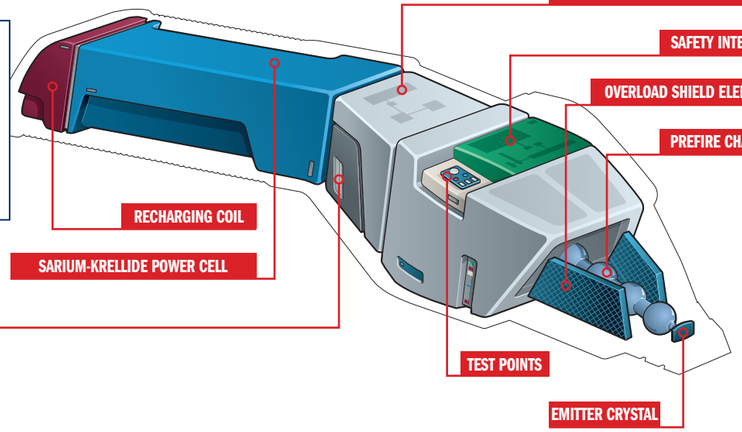
Starfleet phaser technology was constantly improving, providing better defense and better safety procedures with each new model, as well as simple design changes which were driven by fashion and ergonomics.

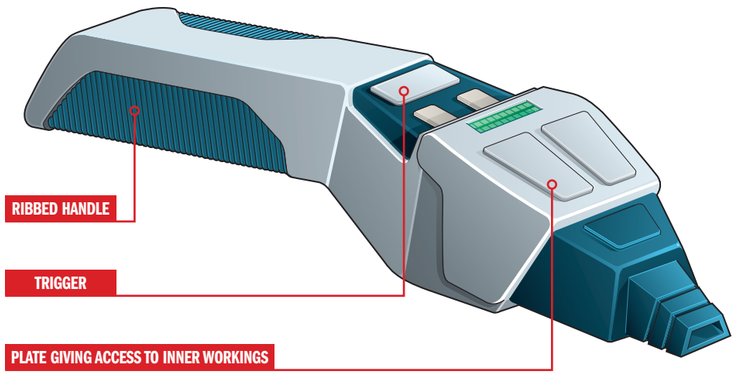
The new model type-2 phaser introduced in 2366 varied only slightly from its predecessor. The main changes were in the head section which, instead of the previous broad emitter 'mouth,' now featured a streamlined, more pointed nose. Overall, the weapon was more angled, providing a better grip and aiding accuracy. The power levels of the new-model phaser remained unchanged.

Like the previous model, this type-2 phaser was not carried by personnel as part of their standard duty equipment; it was issued to members of away team missions for the duration of that mission only, and for alert conditions aboard starships. The distribution of the phasers was overseen by the starship's security division.

INNER WORKINGS

The inner workings of the phaser were delicate but compact. The strong and durable body casing of the type-2 phaser ensured that they were covered. Access panels on the upper side and underside of the phasers protected the inside of the weapon.





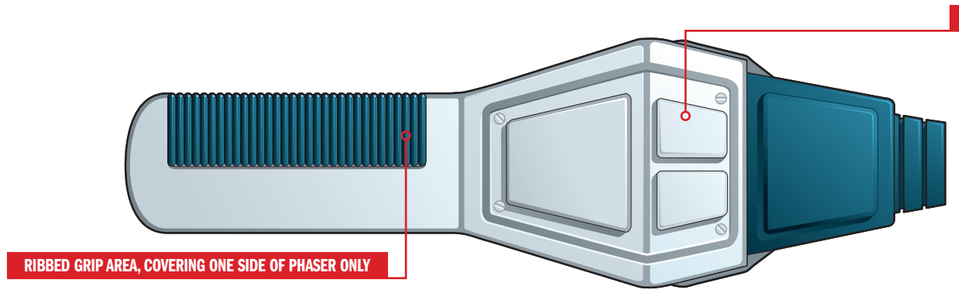
OUTER SHELL

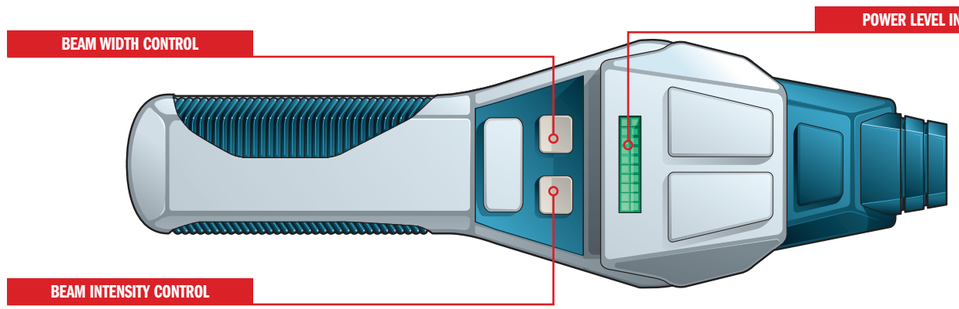
The tough outer casing of the 2366 type-2 phaser carried the control buttons. The beam width and intensity could be altered by touch, and the trigger was a thumb-operated button on the upper side of the angled head. Considering its power, the weapon was remarkably light.

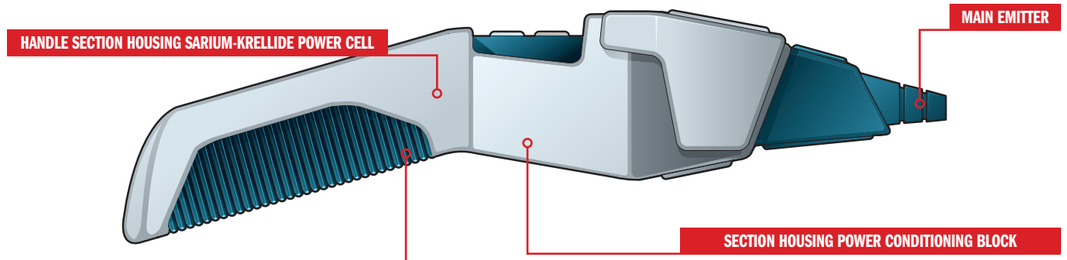
The 2366 and 2371 versions of the type-2 phaser had the same basic layout, but the design was improved.

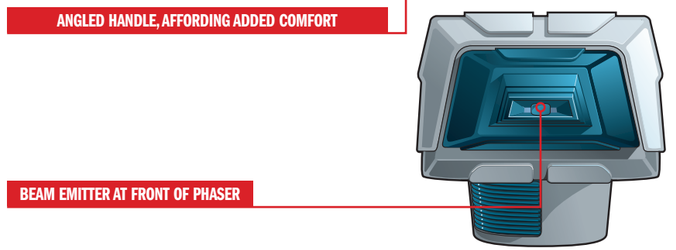
The type-2 phaser was either held, or carried at the waist. The weapon could be 'drawn' and fired at a moment's notice.

By arranging themselves in a circle facing outward, an away team ensured that they were ready to face danger, phasers in hand.









HAND PHASERS 2371

The most recent model of hand phaser was a more versatile and powerful version of the pistol phaser. This type-2 phaser could be recharged in the field and was easier to use than previous models.

The Federation type-2 phaser of 2371 was the seventh major design improvement to the pistol phaser since its introduction approximately a century ago. The 2371 phaser looked very much like its 2366 predecessor, but with a slimmer profile and greater curve to the handgrip. More important was the plethora of internal upgrades that made this model the most powerful and flexible type-2 weapon ever. Additionally, the standard phaser was issued with a holster for the first time.

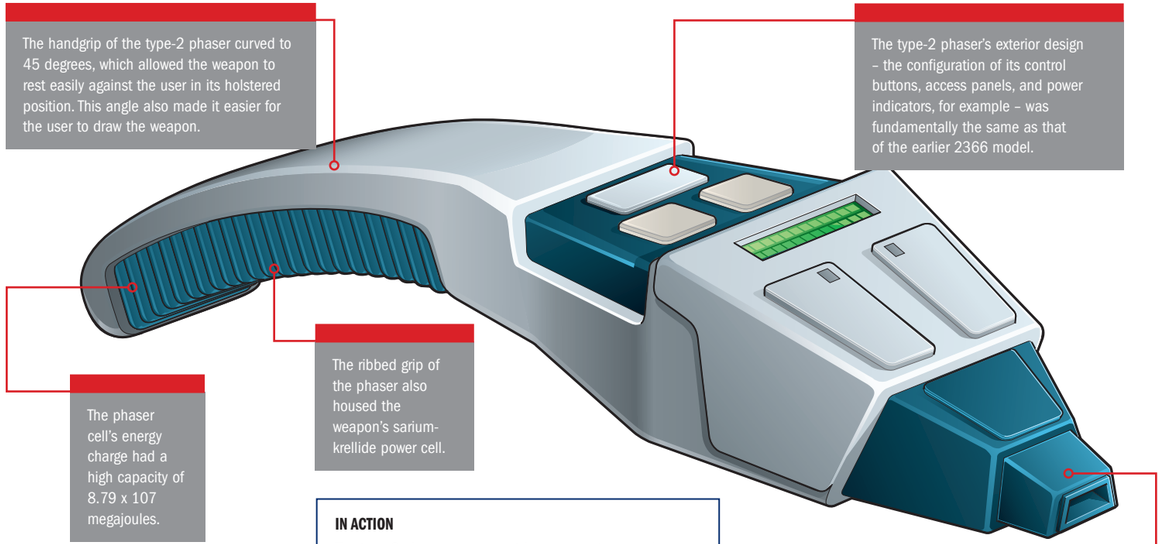
Extending the length of the handgrip and deepening its curve to 45-degrees was more than cosmetic. Personnel accuracy scores were consistently higher because the weapon was easier to aim and fire. The longer grip also housed the improved sarium-krellide power cell.

The new cell was larger than before to accommodate design upgrades. The cell's energy charge capacity was almost double at 8.79 x 107 megajoules, compared to the 4.5 x 107 megajoules on previous models. It was also redesigned so that it could be easily replaced in the handgrip. The ribbed grip area of the handle was actually a portion of the sarium-krellide power cell.

BATTERY POWER

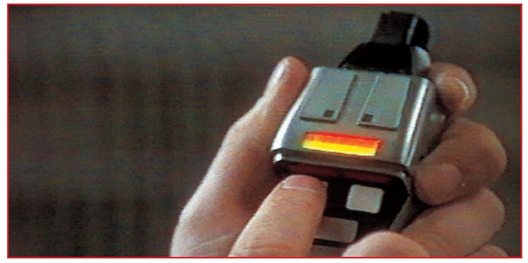
The process of opening the grip and exchanging batteries could be accomplished in the field without disturbing personalization settings or safety interlock codes, which prevented the device from overloading or discharging beyond certain intensities. In previous models, the phaser itself had to be recharged; now a spent battery could be recharged while a fresh one kept the weapon in operation.

A final advantage of the angled grip was that it rested closer to the body when holstered. From this position the user's hand did not have to twist at an odd angle to grasp the weapon, making drawing and firing quick and natural. Finally, the closer the weapon was to the body, the more difficult it was for a foe to snatch away.



IN ACTION

The type-2 phaser was a great improvement on previous models in that it could be used more easily in the field by personnel. Its advantages included easy maintenance of battery cells, a versatile curved grip, and an additional holster issued as standard equipment to all personnel.



The setting of the 2371 hand phaser was determined by the thumb buttons on top of the unit.

The 2371 phaser holster was streamlined with a black pocket in which to insert the phaser nose, and a U-shaped cradle to rest the handgrip. The new phaser holster was positioned so that the phaser was roughly horizontal, with the handle resting parallel to the waist. Right-handed individuals placed the holster on the left, and vice versa.

The phaser's exterior configuration, including control buttons, access panels, trigger, 16-level power indicator, fabrication techniques, and emitter housing were fundamentally unchanged from the 2366 model. Operations and response also did not vary a great deal.

The components driving the phaser were, however, refined to upgrade performance – a seeming impossibility given the power and energy density ceiling imposed by the laws of physics for handheld energy weapons. Starfleet scientists developed a way to extend energy buildup time in the phaser's prefire chamber before dissipation. The result was an increase in energy density and plasma pressure by 15 percent over the 2366 unit. The energy accumulation pause was not noticeable to humans, but it did create tremendous internal pressures on the optronics and energy manipulations section of the phaser. To safely contain the pressure, the lithium-copper prefire chamber was covered in a layer of hafnium tritonide fiber.

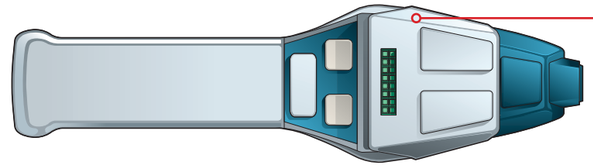
INSIDE UPGRADE

The bulk of the weapons were kept in the armory for general distribution in emergencies. All phasers had an internal system that reported the power setting level via a subspace transceiver assembly (STA) to a ship or station's main computer. This could keep the phaser from firing beyond a certain intensity; the safety system capped phaser settings at level 3. Authorized personnel could, however, override the computer setting.

The production of a more powerful type-2 phaser in 2371 was an indication that Starfleet in this period was becoming more concerned about threats from powers such as the Borg and the Dominion, and wanted to be prepared for any eventuality.

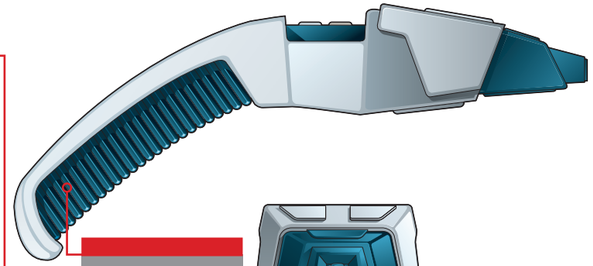
NEW AND IMPROVED

TOP VIEW



The internal components of the type-2 phaser were refined to improve performance, accuracy, and safety.

SIDE VIEW

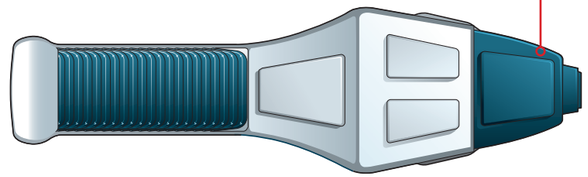


The capacity of the energy beam was increased on the type-2 phaser, without risk of overload, by extending the buildup time in the prefire chamber.

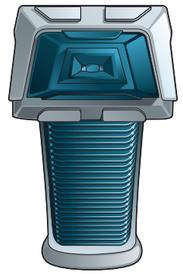
SLEEKER DESIGN

The new and improved design of the 2371 hand phaser was similar to the 2366 model, but it had a slimmer body and a longer, curved handgrip for easier usage.

BOTTOM VIEW



The lengthened, curved hand grip led to a consistent improvement in personnel accuracy scores.



FRONT VIEW

STANDARD TRICORDER

The tricorder was one of the most important pieces of equipment available to Starfleet personnel. It assessed almost any situation in seconds, while a direct link to computer banks provided instant answers.

The standard model TR-580 tricorder VII was a compact, handheld unit that collected and analyzed all manner of data, from meteorology to biology. Its ability to receive from, or share information with, space vessels and other tricorders made it indispensable during routine tasks and crises on away team missions.

The tricorder was a small two-piece device that opened and closed into a compact case. When snapped shut, it was a gray, micromilled duranium foam box; when open, the pressure sensitive, ruggedized buttons became accessible and a display screen reported incoming data. The tricorder measured 8.5 x 12 x 3cm, and weighed just 353 grams.

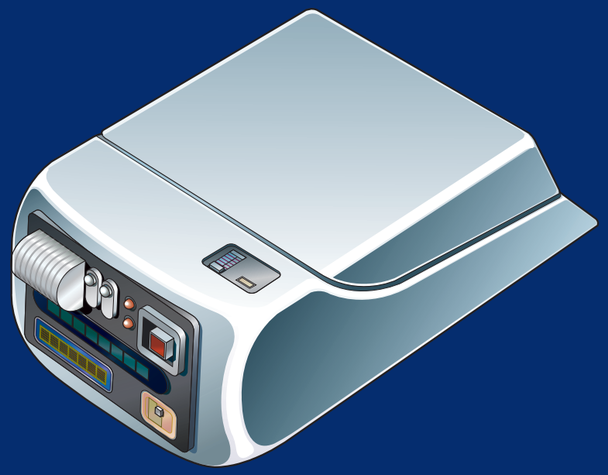
Tricorder functions were accessed via the tricorder control and display interface (CDI). The touch-sensitive operation buttons were clearly marked to provide an overview to the device's abilities.

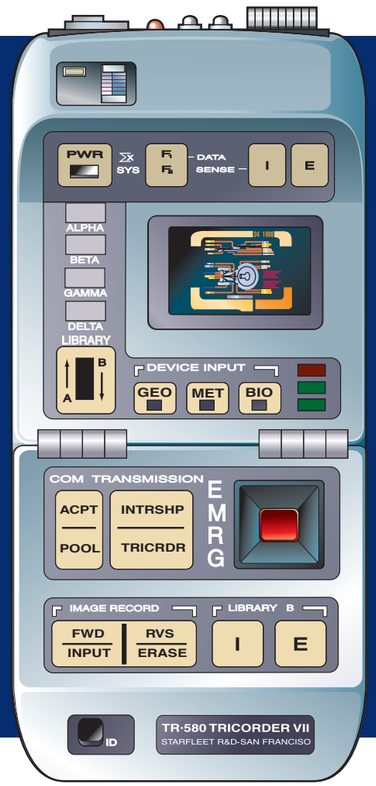
USER-FRIENDLY INTERFACE

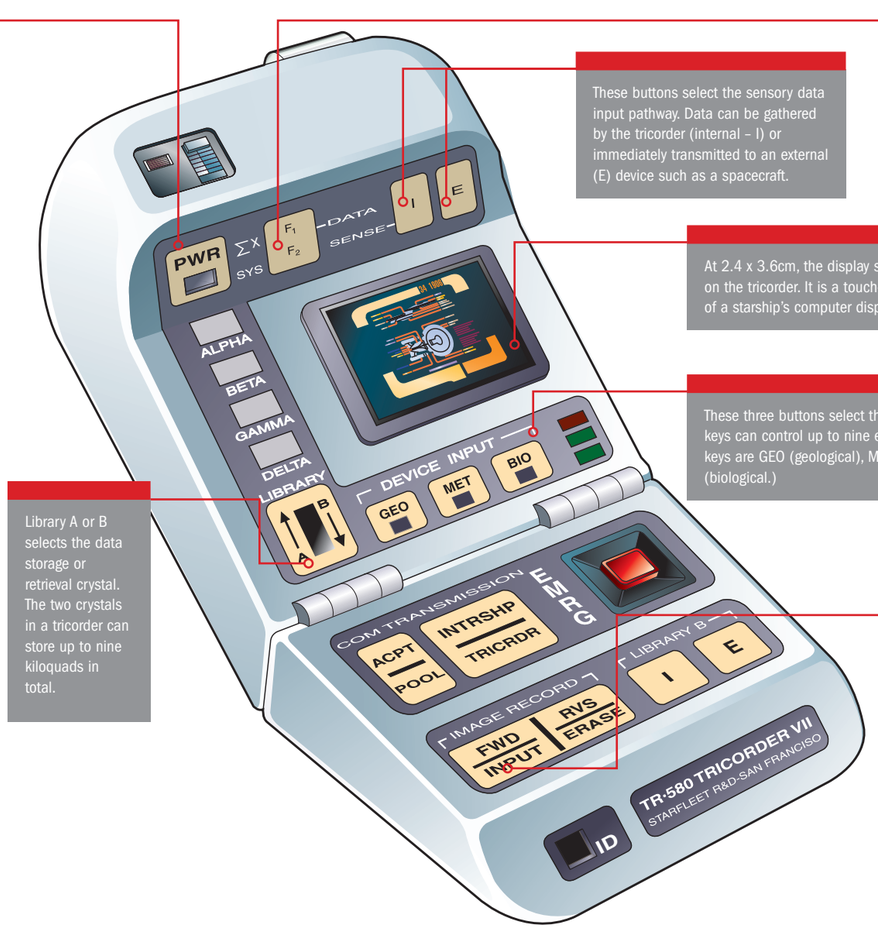
Beneath the user-friendly CDI surface lay the tricorder's internal components. These fell into five categories: sensors, processors, communications, power, and data storage. The tricorder case was implanted with 235 sensors – most embedded in the forward face – that gathered information about the user's surrounding areas to learn about the environment, life forms, terrain, subspace, and speed and direction of allies or enemy forces.

DATA BANK ACCESS

The red button on the right of the tricorder initiates an emergency raw data dump. A communications link is activated, and all the info stored in the device is transmitted, without error checking, to the orbiting starship. This operation takes just 0.875 seconds.







Power standby was a battery-saving, reduced power status. Full-power mode was restored upon contact with the tricorder command surface.

These buttons select the sensory data input pathway. Data can be gathered by the tricorder (internal – I) or immediately transmitted to an external (E) device such as a spacecraft.

Most tricorder buttons can perform more than one function. Pressing F1/F2 determines which task the button performs.

At 2.4 x 3.6cm, the display screen is the largest single area on the tricorder. It is a touch-sensitive, miniaturized version of a starship's computer display.

These three buttons select the data input type. Each of the keys can control up to nine external devices. The power-up keys are GEO (geological), MET (meteorological), and BIO (biological.)

Library A or B selects the data storage or retrieval crystal. The two crystals in a tricorder can store up to nine kiloquads in total.

The image record section controls the rate at which images are recorded and stored. The input key begins recording at 120 AVC/sec (area view changes per second); at this rate, 4.5 hours of images can be collected. Control buttons for this procedure include forward, reverse, and erase. The Library B button activates the tricorder storage area for image record data; the I (internal) and E (external) options select the image collection resource.

A smaller, detachable hand sensor generated fine, closeup detail. Tricorder sensors had limitations, however; for example, they could not see subspace and interphasic phenomena, subspace proximity detonators, or neutrino emissions. They were affected by external forces such as thoron particles.

MODIFICATIONS

Tricorder processors functioned in much the same way as computers on a starship. Subprocessors generated readings that were collected at regular intervals by a central processor that combined and analyzed data into information presented on the display screen. There were 27 separate sensor systems in the PMCS (polled main computer segments.)

Voice and data communications were handled by a built-in Subspace Transceiver Assembly (STA), a unit similar to that found in standard combadges. It had a top range of 40,000 kilometers.

Power was supplied by a single rechargeable sarium crystal power cell. In full operation, this lasted for 18 hours, but tricorders were usually not pressed into service for such long periods.

Data storage was read-write or read-only; exchangeable library chips provided data pertinent to the current mission or focus. Sensor data was stored in up to 14 nickel carbonitrium crystal wafers, providing a total of 0.73 kiloquads of storage. For long-term storage, three isolinear chips each held up to 4.5 kiloquads.

MODIFICATIONS

Resourceful users modified tricorders to perform extra-ordinary functions during emergency situations. For example, in 2367 Ensign Wesley Crusher installed the transponder element from his combadge into his tricorder to generate a signal that interrupted a forcefield sentry.

The usefulness of tricorders led their designers to create units for specific fields such as science, engineering, and medicine. These handy and widely-used units saved lives and expanded the scientific frontier.

STARFLEET UNIFORMS

Starfleet's uniform design from the 2350s to 2365 employed a color scheme and an insignia system that made it easy to identify the department and rank of all crew members.

The Starfleet uniform that first appeared during the early 2350s returned to the basic color scheme, based on red, gold, and blue, used during the 2260s. Like the uniforms of that era, the 2350s version allocated a color to each of the three main departments. Command officers were designated red, engineering and security – or operations – officers wore gold uniforms, and a blue shirt indicated the medical and science departments.

TWO DESIGNS

The standard duty uniforms of this era came in two basic unisex designs. There was an all-in-one suit with full length pants and long sleeves, and a short-sleeved tunic version worn over bare legs.

Most members of a starship crew wore the standard uniform whenever they were on duty, but there were exceptions. The uniforms worn by medical staff sometimes featured a blue jacket worn over the standard uniform, or a variant short tunic over black trousers. Crew members holding specific jobs, such as that of ship's counselor, were allowed to wear more individual outfits at the captain's discretion.

Other forms of Starfleet uniform were also changed at this time. There were two variants of admirals' uniforms: a short red tunic, and a red jacket with a black diagonal sash. Both versions featured heavy gold braiding, as did the dress uniforms, which consisted of a long tunic over black pants.

All uniforms from this period were worn with the delta symbol badge of Starfleet on the left breast. The insignia was the same for all crew members regardless of rank or department, and was used as a communicator as well as a Starfleet emblem.

SYSTEM OF RANK

A different system of rank insignia was also introduced along with the change in uniform. A series of small circular pips, each just one centimeter in diameter, combined to indicate all ranks from warrant officer to fleet admiral. Pips were either a solid gold color or black ringed by a metallic circumference. The number and arrangement of these pips provided an immediate visual reference to the rank of the wearer – an important indicator when the uniform of an enlisted crewman and a captain could otherwise be identical. Rank pips were worn on the right-hand side of the uniform collar but were not worn on the dress uniform variants until 2366.

When Starfleet changed its uniforms to predominantly black jumpsuits in 2369, and to the current black and gray jumpsuits in 2373, the rank pip system remained essentially the same. The only difference is that some pips are now silver rather than gold, and the black pips no longer have a metallic circumference. The communicator pin has also remained largely unchanged, except that the delta symbol is now silver with a gold edge and the oval background has changed to a squarer shape.

COMMAND
During this period the delta symbol badge of Starfleet was the same on all duty uniforms regardless of duty designation.

OPERATIONS
The silver Starfleet emblem was the same as, and derived from, the *U.S.S. Enterprise* NCC-1701's symbol in use during the 2260s.

SCIENCE
The Starfleet insignia was placed on a metallic golden oval and acted as a communicator that was activated by tapping it.

CAPTAIN

From the early 2350s the rank of captain was shown by four solid gold pips worn in a line on the right-hand side of the collarless duty uniform.

COMMANDER

There was no rank that wore three solid gold pips and one black one, so the next rank down, commander, wore three solid gold pips.

LIEUTENANT COMMANDER

Two solid gold pips and a black one inside a gold border indicated the rank of Lieutenant commander and was worn by crew members such as Data.

LIEUTENANT

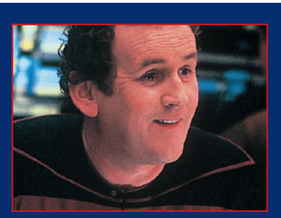
During the 2260's all ranks were denoted by gold braiding on sleeves. A lieutenant was the lowest rank to display sleeve insignia with a single gold braid. In the 2350's, the rank of lieutenant came to be represented by two solid gold pips.

LIEUTENANT JUNIOR GRADE

When an ensign was promoted to a lieutenant junior grade a single black pip was added to their gold one. This rank was new to Starfleet and was not in existence during Captain Kirk's era.

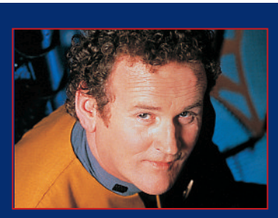
ENSIGN

An ensign was the lowest ranked officer; they wore just a single solid gold pip. As with all ranks during this period, the pip was worn on the right-hand side of the shirt between stripes of colored braiding.



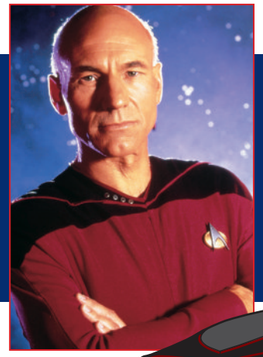
WARRANT OFFICER

The chief warrant officer was the lowest rank in this system and was denoted by a single black pip. For the first decade after the rank pips were introduced, high-ranking NCOs wore this badge.



CHIEF PETTY OFFICER

The symbol for a chief petty officer was of a different style to the rest of the insignia. It was denoted by three purple stripes and two spots on a gray background. It was worn on the 'collar.'

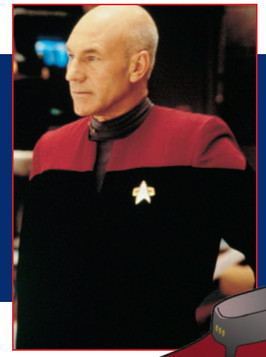


COMMAND DIVISION JUMPSUIT 2350-2365

The burgundy duty uniform denoted the command division, and was worn by crew members such as Captain Picard and Commander Riker. This was an all-in-one suit with full length pants and long sleeves. The design was worn by both male and female officers.

COMMAND DIVISION JUMPSUIT 2366-2372

Starfleet's redesigned duty uniform for the command division featured a high collar, with pips worn on the right hand side. The redesign was looser on the leg and on the torso and tapered at the waist. The Starfleet communicator was worn on the left of the chest.



COMMAND DIVISION VARIANT JUMPSUIT 2370s

In the 2370s some officers wore a variant duty uniform that was standard issue on Starbases. It comprised a black jumpsuit with red shoulder styling. Pips were fixed to the grey roll neck worn beneath the jumpsuit, which had a close-matching V at the front.

COMMAND DIVISION DRESS EARLY 2360s

The standard duty uniform of this era was also available as a short-sleeved dress that was worn over bare legs with knee-high boots. As with the more common all-in-one version, it followed the standard color theme, combining black with the departmental color.

SKANT
EARLY 2360s

In the early 2360s some male personnel wore a 'skant' – a short-sleeved tunic that was an alternative to the jumpsuit. Like the female equivalent, it was worn over bare legs but men favored black calf-high boots. The skant was phased out towards the end of 2365.

OPERATIONS JUMPSUIT
2366-2372

The operations division comprised engineers, security and tactical, and some service specializations such as communications and navigation. From 2366 they wore high-collar gold and black duty uniforms with gold trim.

SCIENCE JUMPSUIT
2366-2372

The blue version of the standard duty uniform was worn by members of the science division, which included medical, astrophysics, cybernetics and ship's counselors. The modification introduced in 2366 maintained the same color but modified the cut of the uniform.

UTILITY JUMPSUIT
2350-2365

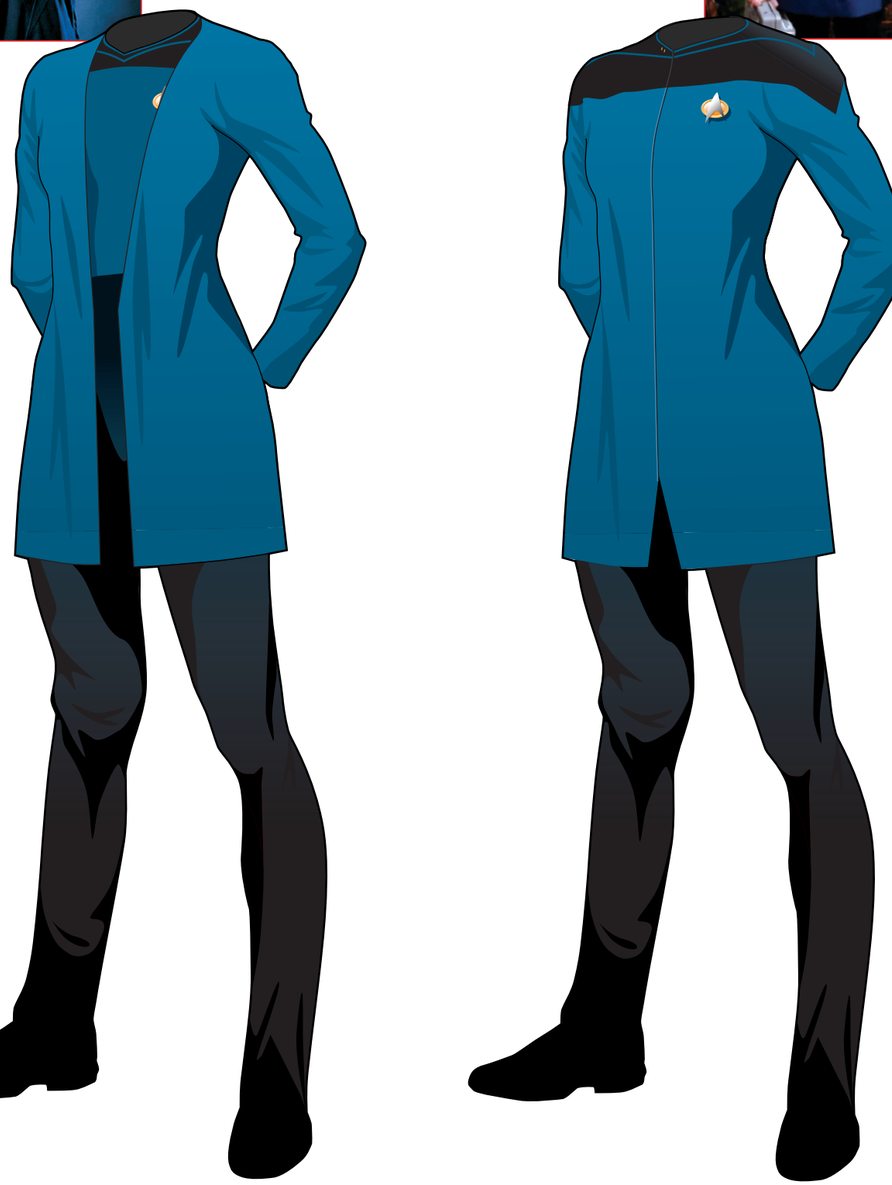
Technicians wore duty coveralls. These all-in-one jumpsuits were worn with a black undershirt which could be seen beneath the collar. The rest of the uniform was tan-colored, with no other details except for a tapered section around the waist.

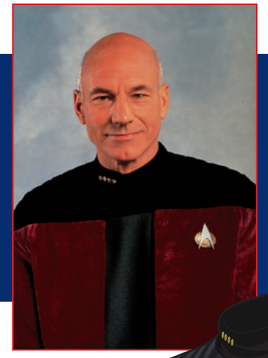
MEDICAL LAB COAT

The medical and science staff wore blue standard duty uniforms, but some medical staff such as the Chief Medical Officer also wore a plain blue lab coat over the standard uniform. The same style of coat was worn throughout the 2360s.

MEDICAL TUNIC EARLY 2360s

Medical staff also had a variant uniform design where the top half of the standard uniform was replaced with a coat that fastened down the front. There were variant designs including plain, pockets and a waistband, or front slit. It was favored by Dr. Katherine Pulaski.



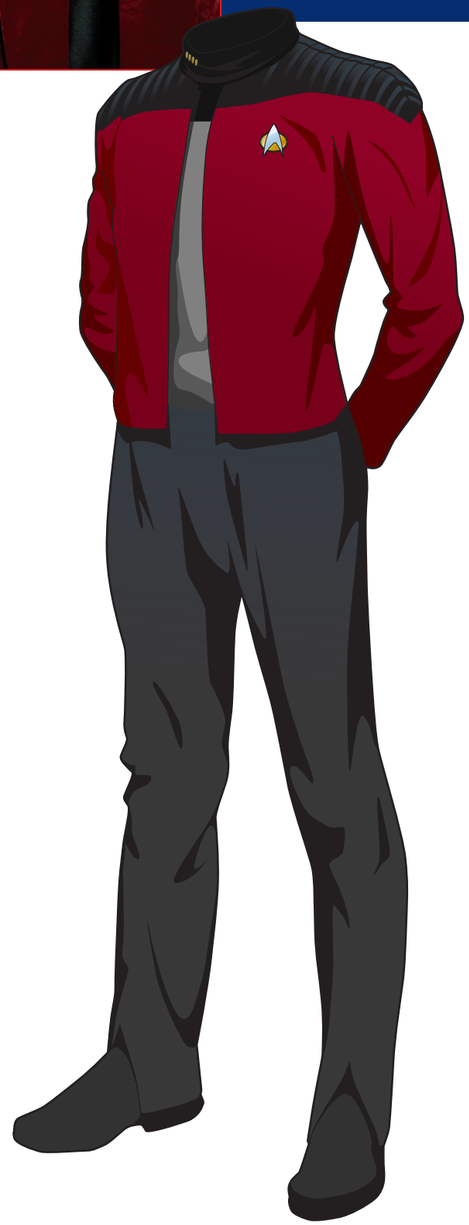


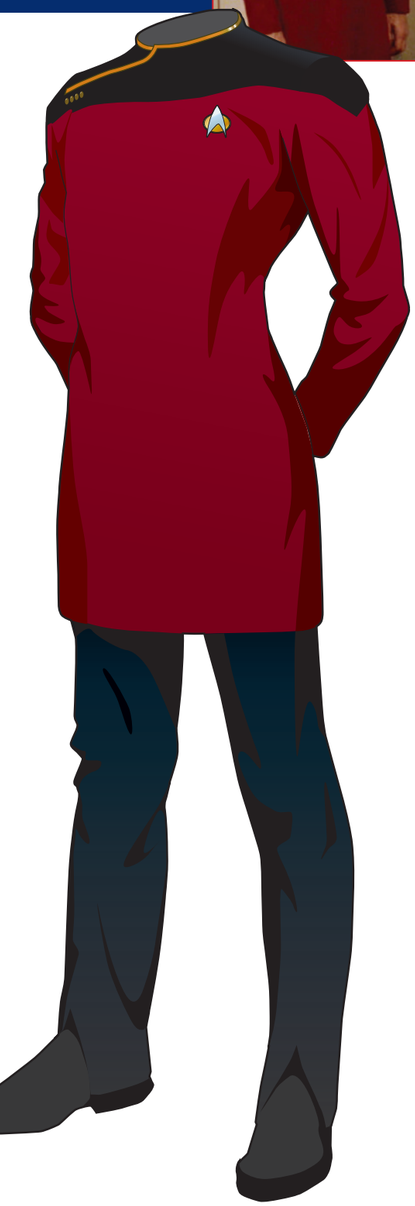
CAPTAIN'S VARIANT UNIFORM 2368

Starfleet offered commanding officers several variant uniforms that distinguished them from the rest of the crew. This version comprised black trousers, a two-tone black and gray roll neck and a red and black jacket with ribbed shoulders.

DRESS UNIFORM

The dress uniforms featured a coat or jacket, in the divisional color, with gold brocade running from the neck to the right shoulder, where the rank pips were positioned. Before 2368 the jacket was knee length, but after this point it was made shorter and finished mid-thigh.





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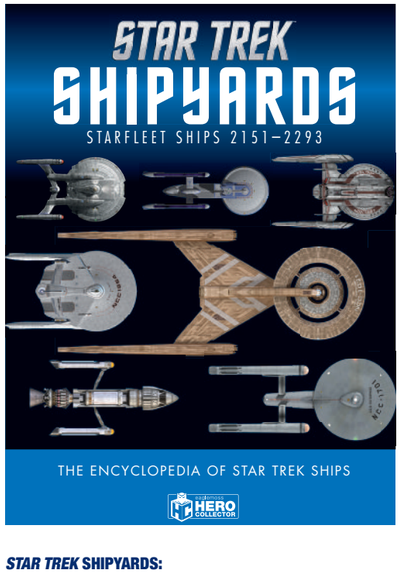

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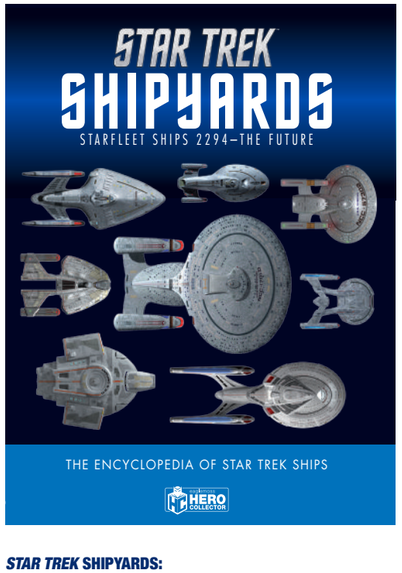
This in-depth reference book, written by Ben Robinson, Marcus Riley, and Matt McAllister profiles Starfleet ships from the birth of the Federation to the launch of the *U.S.S. Enterprise* NCC-1701-B and the death of Captain Kirk. It also includes a chapter on Earth's pre-Federation vessels, including Zefram Cochrane's ship the *Phoenix*, which made mankind's first faster-than-light journey. Plus all of the Starfleet ships from the first season of *STAR TREK: DISCOVERY* and the original *STAR TREK* TV series. The book is richly illustrated with CG artwork using the original VFX models created for the *STAR TREK* TV shows and movies.



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This volume features small transports, fighters, multi-mission explorers and time traveling ships from the distant future. Each ship is illustrated with CG artwork, including original VFX models made for the TV show, alongside a technical overview and operational history. Chapters include size charts, showing the ships to scale. An appendix of class listings is featured at the back of the book.

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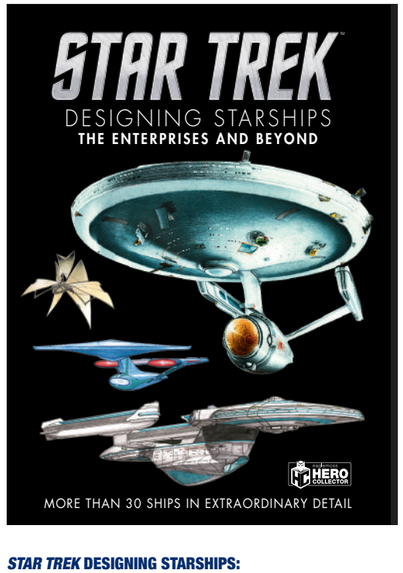

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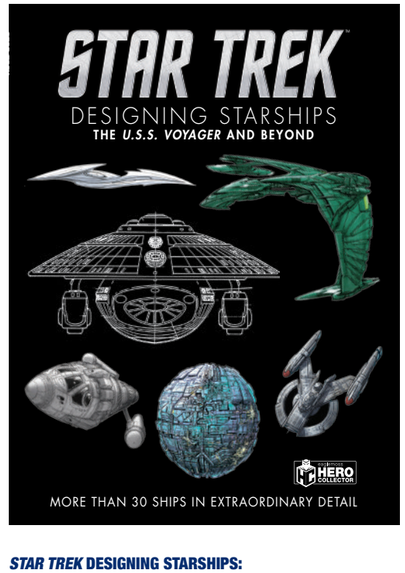

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