Scout Operating Umbrella Technology

SYSTEM SPECIFICATION

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1. System Overview

This specification defines SCOUT (Scout Class Operating Umbrella Technology), the integrated operating system of the Scout Class starship. SCOUT is not a single device but the umbrella under which the vessel's crew interfaces, supervisory intelligence, computing core, networks, and operational applications are unified into one coherent system. It is the means by which the crew perceives, commands, and collaborates with the ship.

SCOUT is composed of the following principal subsystems, each specified in this document:

- **Crew interfaces.** The means by which crew interact with the system: the touchscreen consoles, the public audio interface, and the personal audio link (earbuds). The relationship between these is defined in the Crew Interaction Tiers overview.
- **Supervisory intelligence (the AI).** The distributed ship intelligence that monitors, advises, coordinates, and operates alongside the crew across every station.
- **Computing core.** The triple-redundant, all-classical computing architecture with a hardened survival core that executes navigation, warp-field, AI inference, and ship-management workloads.
- **Networks.** The hardened, domain-isolated command-and-control network connecting all of the above.
- **Applications.** The operational software the crew uses to run the ship, from propulsion control to life support to the astronomical suite (Section 10).

Anything the crew can do by touch at a console, they can do by voice through the AI, and the AI continuously supports the operator through monitoring, recommendation, and delegated autonomy. Every console aboard the vessel is physically identical; all role differentiation is implemented in software.

1.1 Design Philosophy

Scout Class vessels operate with minimal crews on extended independent deployments. SCOUT therefore follows four governing principles:

- **Role-agnostic hardware.** Any crew member can operate any station in any role. Hardware never constrains crew assignment; a casualty at one station never eliminates a capability.
- **Configuration follows the operator.** Crew profiles, saved layouts, key assignments, and the personal audio link travel with the individual's credential, not with any physical console.

- **Always within reach.** Through the personal audio link, every crew member maintains continuous contact with SCOUT anywhere aboard the vessel, not only when seated at an authenticated console.
- **Graceful degradation.** Loss of any single console, interface, network domain, or computing core is absorbed by reconfiguring or failing over to the remaining resources. Multiple independent command paths exist for every critical function.

2. SCOUT Interfaces

The crew interacts with SCOUT through three complementary interfaces. They are tiered by reach and authority: the personal audio link is always present, the public audio interface is available in any compartment, and the console provides full authenticated command authority. A crew member moves fluidly between them through a single working session.

2.1 Crew Interaction Tiers

Tier	Interface	Availability	Authority
Personal	Personal audio link (earbuds) Section 6	Always, anywhere aboard, while worn	Continuous private dialogue, advisories, coaching; voice commands within the wearer's credential
Public	Public audio interface (compartment microphones and speakers)	Any compartment with audio coverage	Voice interaction and alerts; sensitive actions still require authentication
Station	Touchscreen console — Sections 3–5	At any console, once authenticated	Full command authority for the active role, including guarded actions

The three tiers share one identity and one conversation. A crew member wearing an earbud is already in contact with SCOUT; when they sit at a console and authenticate, the same conversation continues with the console's full authority added. When they walk away, the dialogue follows them back to the earbud. Authentication governs authority, not contact: the personal link is always connected, but commands that change ship state are validated against the wearer's credential exactly as they are at a console.

3. Scout Class Console System

SCOUT Console family, drawn to relative scale. All four classes share identical functionality; only physical size and mounting differ.

The Scout Class console system is designed to provide a **unified, role-adaptive interface** that allows crew members to interact with all ship systems regardless of their physical location or assigned duty. Every console—regardless of form factor—connects to the same underlying command, control, and data architecture, ensuring that propulsion, navigation, life support, sensors, and mission systems can be monitored and controlled through a consistent interface model.

The primary purpose of the console system is to:

- **Enable clear role-based operation** (helm, navigation, science, engineering, communications, command)
- **Provide situational awareness** appropriate to each crew position
- **Support safe execution of critical actions** through layered controls and authorization
- **Maintain operational continuity** under both normal and degraded conditions
- **Allow distributed control** of ship systems without requiring crew to remain at a single location

At the center of this system is S.C.O.U.T., which manages data flow, system status, and interface presentation across all console types. This ensures that every console presents

the right information at the right level of detail for the user's role, while still allowing cross-functional access when required.

Purpose of Console Classes

The Scout Class uses four distinct console classes not for technological necessity, but for operational efficiency, spatial constraints, and mission realism. Each type represents a different balance between capability, footprint, accessibility, and durability.

Functional Scaling

Not every task requires a full command station.

- Class I consoles provide full-system authority and immersion for mission-critical roles.
- Smaller consoles provide just enough interface for their intended function without unnecessary complexity.

Spatial Optimization

The ship has limited usable volume, especially in high-traffic or utility areas.

- Large, curved consoles are reserved for the bridge and key operational spaces.
- Compact and wall-mounted systems allow functionality to exist throughout the ship without consuming valuable space.

Operational Distribution

A single-point control model is a liability.

- Systems must remain accessible even if parts of the ship are isolated or damaged.
- Multiple console types allow distributed access to critical systems, supporting damage control and redundancy.

Mobility and Flexibility

Crew members are not always at fixed stations.

- Portable interfaces (Class IV) ensure that diagnostics, control, and communication are available anywhere on the ship.
- This is especially important for maintenance, emergency response, and mission adaptability.

Environmental Suitability

Different areas of the ship impose different physical demands.

- Bridge consoles prioritize ergonomics and visibility
- Wall panels prioritize durability and rapid access
- Portable devices prioritize resilience and portability

Each console class is therefore tailored to its operating environment while maintaining interface consistency.

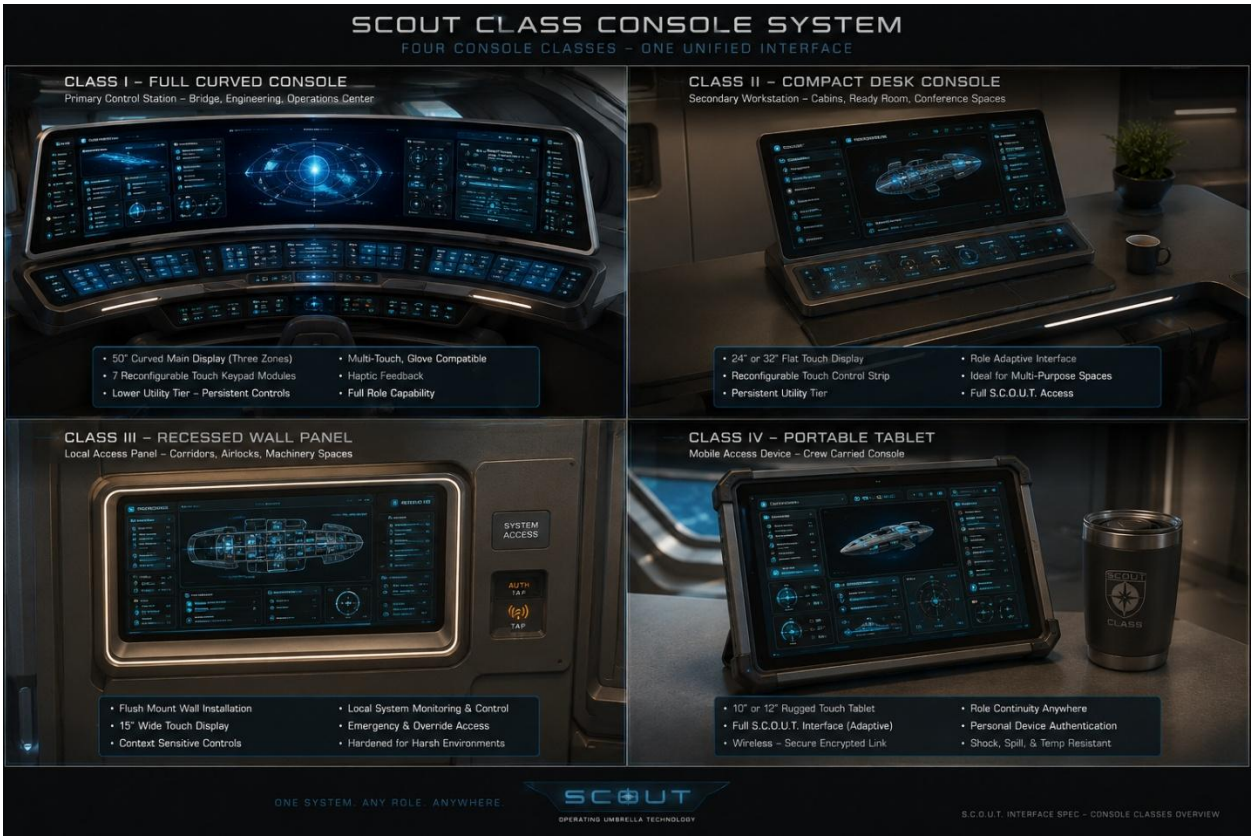
Training and Usability

A unified interface across all console types reduces training complexity.

- A crew member trained on one console can operate any other with minimal adjustment
- Differences are physical, not conceptual

This supports the design goal of a ship that can be operated by a small, cross-trained crew, including inexperienced participants in the Starship Adventures environment.

3.1 Console Classes



SCOUT Console Classes

Hierarchy

- Class I = **Command Authority**
- Class II = **Operational Support**
- Class III = **Local Control**
- Class IV = **Mobile Access**

Consistency Principle

All classes share:

- Unified UI paradigm
- Role-based interface switching
- Same backend system (S.C.O.U.T.)

Design Strength

This is a **clean, scalable HMI architecture**:

- No redundant system logic
- Only form factor changes

- Supports both realism and simulation operations

3.2 Console Class Descriptions

Class I — Primary Control Station

Role

Primary mission-critical workstation used for:

- Helm (flight control)
- Navigation
- Science operations
- Tactical / situational awareness
- Engineering command interfaces

Physical Configuration

- Wraparound seated console
- Three-tier interaction system:
  - Upper panoramic display
  - Mid control surface (touch + physical)
  - Lower persistent control strip

Dimensions (per station)

- Width (arc length): 2.2 – 2.6 m (≈ 7.2 – 8.5 ft)
- Depth: 1.2 – 1.4 m (≈ 4 – 4.6 ft)
- Height (deck to top of display): 1.5 – 1.7 m (≈ 5 – 5.6 ft)
- Seated console height: 0.75 m (≈ 29.5 in)
- Display width (flattened equivalent): ~1.5 m (≈ 50 in)
- Display curvature radius: 1.2 – 1.6 m

Display System

- Triple-zone curved OLED / micro-LED
- Resolution equivalent: **8K wide panoramic**
- Eye-tracking + adaptive UI zones

Controls

- 6–8 modular touch panels
- Haptic feedback surfaces
- Guarded physical switches (critical functions)
- Dual redundant input layers

Use Case Fit

- Requires full immersion and situational awareness
- Anchors the bridge layout (your 4 forward stations + captain support)

Class II — Compact Desk Console

Role

Multi-purpose station for:

- Planning
- Data analysis
- Crew operations
- Mission prep

Physical Configuration

- Desk-mounted unit
- Single forward display + control strip
- Designed for seated or standing use

Dimensions

- Width: 0.9 – 1.2 m (≈ 3 – 4 ft)
- Depth: 0.6 – 0.75 m (≈ 2 – 2.5 ft)
- Height (desk): 0.75 m standard
- Display size: 24” – 32”

Display System

- Flat or slight curve
- 4K resolution
- Multi-window interface

Controls

- Touch primary interface
- Configurable control strip
- Minimal physical inputs

Use Case Fit

- Flexible, non-critical operations
- High deployment density across ship

Class III — Recessed Wall Panel

Role

Localized system control for:

- Airlocks
- Environmental systems
- Power routing
- Maintenance access

Physical Configuration

- Flush-mounted into bulkhead
- Hardened enclosure
- Minimal protrusion

Dimensions

- Display width: 0.35 – 0.45 m (≈ 14 – 18 in)
- Height: 0.25 – 0.35 m (≈ 10 – 14 in)
- Total panel footprint: ~0.5 x 0.4 m
- Depth (behind wall): 0.1 – 0.2 m

Display System

- Ruggedized touch display
- Glove-compatible
- High contrast / emergency readable

Controls

- Touch interface
- Authentication pad (RFID / biometric)
- Emergency override button (physical)

Use Case Fit

- Distributed ship-wide
- Supports damage control architecture

Class IV — Portable Tablet

Role

Mobile access to:

- Ship systems
- Diagnostics
- Communications
- Mission data

Physical Configuration

- Rugged handheld device

- Dockable / wearable compatible

Dimensions

- Screen size: 10” – 12”
- Width: 0.25 – 0.30 m (≈ 10 – 12 in)
- Height: 0.18 – 0.22 m (≈ 7 – 9 in)
- Thickness: 20 – 35 mm

Display System

- High-brightness touchscreen
- Adaptive UI scaling

Controls

- Touch + gesture
- Limited physical buttons (power, emergency)
- Voice interface via S.C.O.U.T.

Use Case Fit

- Maintenance crews
- Emergency response
- Redundant control pathway

3.3 Common Console Provisions

- Brightness, contrast, UI scale, theme (3 presets), and screen layout (single / split / quad) adjustable per operator via Display Controls.
- Numeric shortcut block (1–9, 0, CLEAR, ENTER) plus four programmable USER keys (A–D) in every configuration.
- All consoles network over redundant fiber rings with the ship AI core; any console may assume any station's function.

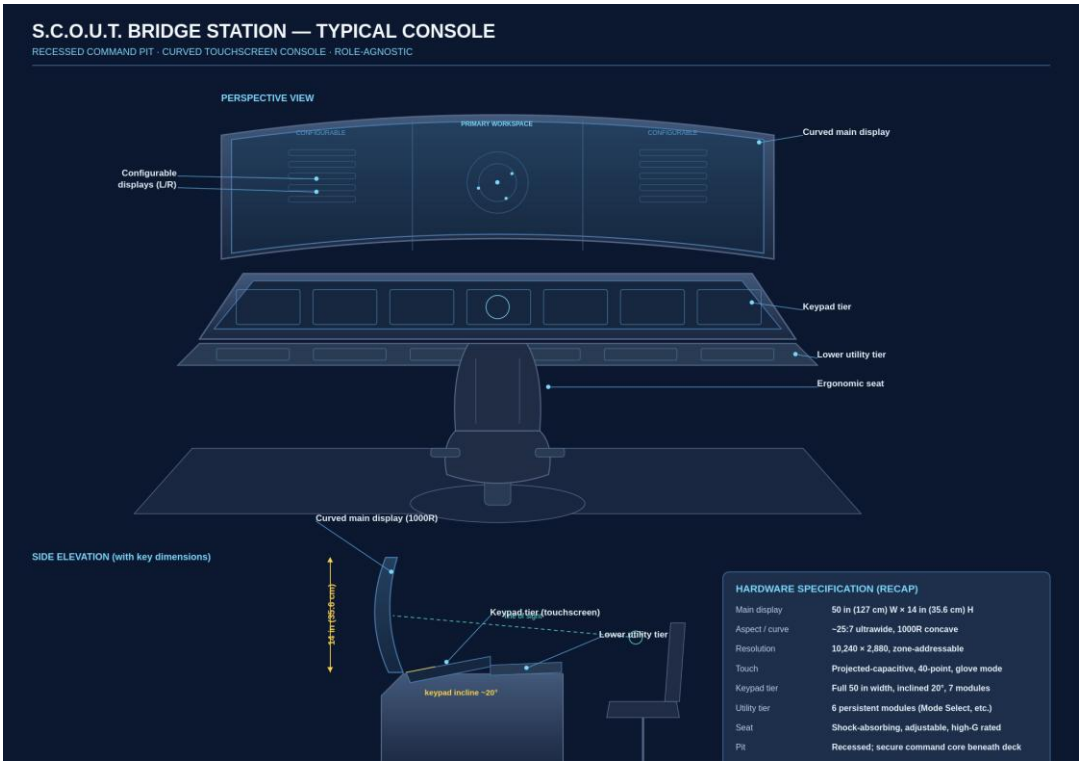


Figure 10. S.C.O.U.T. bridge station — typical console. Perspective view and dimensioned side elevation of a single crew station matching the hardware specification.

3.4 Keypad Tier

Parameter	Specification
Form factor	Full-width touchscreen surface matching the 50 in main display width, inclined 20° from horizontal
Dimensions (active area)	50 in (127 cm) wide × 6 in (15.2 cm) tall nominal
Module slots	Seven reconfigurable module regions: Display Controls, View & Layout, Data Filters, Navigation/Cursor Control, Data & Interaction, Shortcut Keys, System Interaction
Haptics	Per-key localized haptic actuators; programmable intensity 0–100%; escalating-profile support for guarded actions

Parameter	Specification
Key rendering	Touch targets resize and reposition per role configuration; minimum target 18 mm; guarded actions rendered with confirmation borders

3.5 Lower Utility Tier

A secondary full-width touch surface below the keypad tier carries the six persistent utility modules: Mode Select, Display Assignment, Alerts & Notifications, Communications, Power & Priority, and Haptic Feedback. These modules remain present in every role configuration, although individual roles may mirror, elevate, or partially lock their functions as defined in Section 5.

4. SCOUT GUI

The primary SCOUT Graphical User Interface is comprised of four configurable zones plus a Quick Info Strip. Along with the keypad tier this provides a well-balanced architecture: it gives the crewmember focus (one center), context (two flanks), and status (the strip), each with distinct purpose.

Each zone has a purpose, default character, and what the operator-facing affordances are. Each role section then naturally specializes these. All zones are present in every role configuration; what changes between roles is what populates them, not what they are. The zones are arranged horizontally across the operator's field of view in the order the eye naturally moves during focused work — peripheral context on the flanks, primary focus in the center, and persistent reference data along the bottom.

Zone	Position	Functional identity
Left Configurable Display	Left third	**Context.** State, status, and reference data the operator must keep in peripheral awareness but does not need to act on continuously. The role's situation indicators: what the ship is doing, what the environment is, what the systems report.
Primary Workspace	Center half	**Focus.** The operator's active task surface and decision space: where work is done, where input is consumed, and where the outcome of an action becomes

		immediately visible. Anything requiring sustained attention or fine motor input lives here.
Right Configurable Display	Right third	**Detail.** Drilled-down or supporting information specific to the current selection or task: detail panes, alternative views, secondary sensor feeds, history, and cross-references — the role's supporting evidence.
Quick Info Strip	Full width, bottom	**Persistent status.** A continuous strip of five to seven role-critical metrics the operator never wants to lose. Designed for glance-reading; values change continuously and are color-coded by threshold.

4.1 Design rules common to all zones.

- **Widget containers.** Each zone is a widget container. The widget library (Star Map, Flight Data, Sensor Feed, Comm Status, Target List, System Status, and mission-loadable extensions) can populate any zone in any combination; role configurations are the named defaults.
- **Center holds input.** The center zone is the only zone that accepts sustained input (drag, pan, plot, multi-touch). The flank zones accept selection and dismissal but not extended interaction, preventing an operator from drifting into a peripheral zone and losing focal awareness.
- **Strip is read-only.** The Quick Info Strip is read-only. Touching a value on the strip jumps the relevant detail to the Right Configurable Display.
- **Roles survive reallocation.** Any zone may be promoted to fill the whole screen (single layout) or shared three ways (split or quad) via Display Controls, but the roles of context / focus / detail / persistent status are preserved regardless of physical allocation.
- **Command linking.** During heightened readiness the command station may force-push a designated overlay (most commonly the DSA situational picture) to a chosen zone of every linked console; the affected zone displays a LINKED — COMMAND banner so the operator knows the content is not their own.

Why this allocation. The arrangement reflects how a trained operator's attention moves during continuous-watch work: a constant low-bandwidth check of context on the periphery, deep engagement at center, and reference-pulling to the side when a question arises. Information that requires commitment — committing a course, designating a contact, executing a maneuver — always lives in the center; the flank zones never offer a one-touch path to a guarded action.

4.2 Layout Overview

The S.C.O.U.T. layout is divided into display zones or widget containers. The widget library (Star Map, Flight Data, Sensor Feed, Comm Status, Target List, System Status, and mission-loadable extensions) can populate any zone in any combination. The Layout & Widget Manager on the left display provides drag-and-drop arrangement; EDIT LAYOUT, SAVE LAYOUT, and LOAD LAYOUT functions on the keypad tier manage the operator's personal layout library.

SCOUT Console Layout

The SCOUT Graphical User Interface Template shows the labeled zone map of the SCOUT main display, color-coded by each zone's functional identity:

- **Left Configurable Display → CONTEXT** (sky blue) situation indicators and reference data held in peripheral awareness
- **Primary Workspace → FOCUS** (green) the active task surface, shown with a representative plot, labeled as the only zone that accepts sustained input
- **Right Configurable Display → DETAIL** (violet) drill-down and supporting evidence for the current selection
- **Quick Info Strip → PERSISTENT STATUS** (amber) the full-width, read-only metric strip along the bottom, with sample glance-read values

4.2 Mode Select and Role Profiles

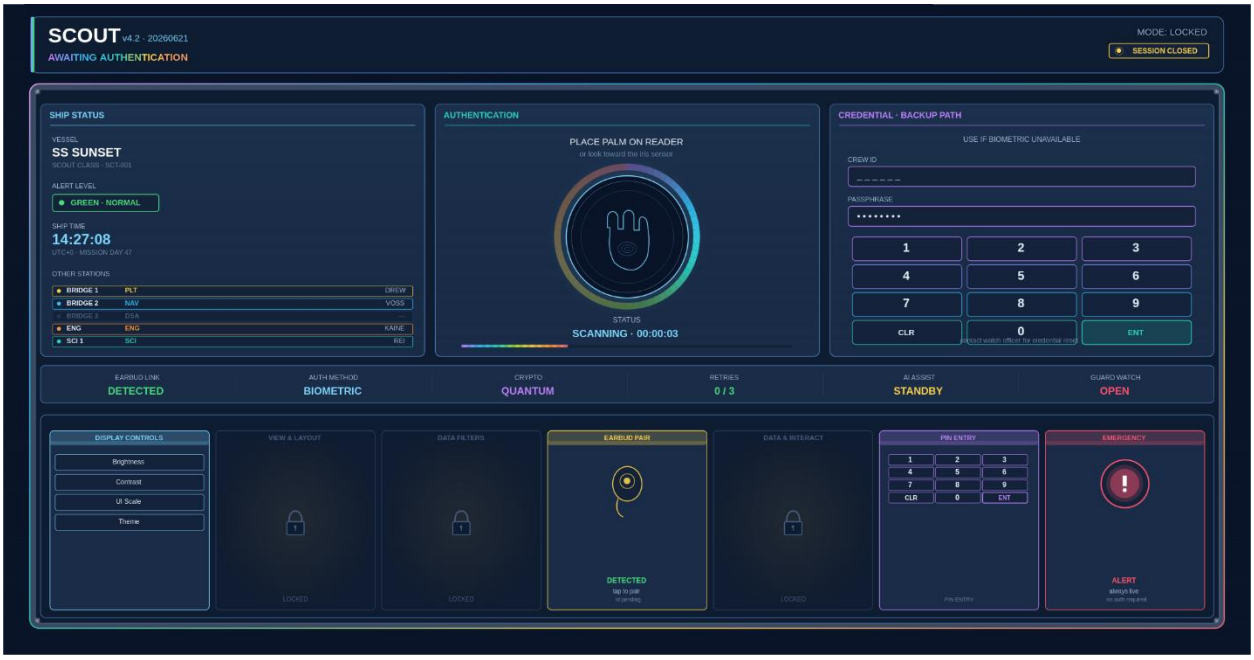
The Mode Select module switches the entire console — all three display zones, the Quick Info Strip, every keypad module, and the alert profile — between role configurations in a single action. A role configuration is a named bundle of:

- Display zone assignments and default widget layouts,
- Keypad module mappings and key target geometry,
- Shortcut key (1–9, 0) and USER key (A–D) bindings,
- Alert level defaults and lockout rules,
- Control authority grants (which ship systems the console may command),
- Haptic and audio cue profiles.

Role switching completes in under one second. The outgoing role's state is checkpointed so a crew member returning to a role resumes exactly where they left off.

4.3 Credentials and Control Authority

Control authority is granted by the intersection of the operator's credential and the active role. Selecting a role exposes that role's controls, which then validate the operator's authorization before any action takes effect. Guarded actions (all-stop, coordinated evasion, load shed, reactor SCRAM, section vent, distress transmission) use two-stage confirmation with role-specific haptic profiles.



An inactive console displays the *Awaiting Authentication* screen and is in a LOCK LAYOUT waiting for a crewmember to login. The full console is visible (top displays + keypad tier), so

it matches other active consoles. Controls requiring authorization are inactive and dimmed. Biometrics is the primary path for credential entry, but backup authorization options are available including a widget for earbud pairing if a crew member is wearing one or entering a crewmember PIN code. The *Awaiting Authentication* screen freezes the current arrangement against accidental touch input. Certain role configurations engage layout lock automatically under defined conditions (see role sections).

4.4 AI Interface Coupling

Every function available through the console surface is also addressable through the SCOUT AI interface, and the two pathways remain continuously synchronized. The AI is treated as a co-operator at every station rather than a separate utility. Its full capabilities — voice command, autonomous monitoring, layout and action recommendation, role-specific delegation, and reduced-crew operations — are specified in Section 9.

4.5 Multi-Console Linking

The Display Assignment module assigns content to the left/center/right zones and links consoles to mirror or extend one another. Linked consoles behave as one logical surface: a DSA operator can push the situational picture to the Pilot's right zone; the Science station can extend its analysis workspace across an adjacent unoccupied console. Link state is indicated on the Quick Info Strip of every participating console.

4.6 Roles, Functions, and Permission Tiers

SCOUT separates two independent concepts that together define what any crew member may do at a console. A functional role determines which screens and tools the console loads — the job a person performs. A permission tier determines the level of authority that person carries — what they are allowed to do to the ship and to the system. Every authenticated user is the combination of one functional role and one permission tier. This two-axis model lets the ship describe arrangements such as “a pilot who may also stand a command watch” without inventing new roles: that person simply holds the Pilot function at the First Officer tier.

4.6.1 Permission Tiers

Permission tiers form a strict ladder of authority. Each tier includes every capability of the tiers below it and adds one or more distinct authorities of its own. Tier is carried by the user’s credential and travels with them to any console.

Tier	Typical holder	Distinct authority added
Administrator	System keeper	Creates and edits roles, screens, and functions; manages all user accounts and passwords; configures network domains, software, and audit logging. The only tier that can change what the system itself is.
Command	Captain	Authorizes guarded ship actions (warp initiation, lockdown, section venting); adds and removes users; assigns roles to crew; may override or assume any station.
Executive	First Officer	Stands command watch in the captain's absence; limited user management (password resets, assignment of existing roles); may assume Command authority when designated.
Senior Operator	Watch supervisor	Supervises a station; authorizes routine (non-guarded) operations; may mentor or override a junior operator at the same station.
Operator	Certified bridge crew	Operates the station or stations they are certified for. The standard operational tier.
Support	Galley, hospitality, medical	Operates their specialized function screen but no ship-operational systems. Sits above General laterally to the operator track.
General	Any crew or guest	Basic and personal functionality only: ship time, personal information, crew messaging, and guest-facing screens. No operational access.

4.6.2 Functional Roles

Functional roles determine the console's loaded workspace. They fall into three groups.

- **Operational roles.** Pilot (PLT), Navigator (NAV), Defensive & Situational Awareness (DSA), Engineering (ENG), Communications (COM), Science (SCI), Command (CMD), and Executive Officer (XO). These load ship-system workspaces and require Operator tier or higher.

- **Support roles.** Steward, Chef, and Medical. These load specialized non-operational workspaces (hospitality, galley, and medical respectively) and operate at the Support tier.
- **Basic role.** General / Crew. A minimal personal workspace available to any crew member or guest at the General tier.

Role	Group	Workspace focus
Command (CMD)	Operational	Whole-ship and mission oversight: all-station status, authority and authorization controls, overlay push to other consoles. Identity color: white / silver.
Executive Officer (XO)	Operational	Crew and watch supervision: watch bill, crew readiness, task assignment, standing orders. The First Officer's active-supervision view. Identity color: gold.
Steward	Support	Guest services: cabin assignments, guest manifest, per-cabin environmental preferences, activity scheduling. Identity color: rose.
Chef	Support	Galley operations: stores and inventory, meal scheduling, per-crew dietary records, consumables and potable-water budgeting. Identity color: warm amber.
Medical	Support	Medical bay: patient records, triage, medical inventory, environmental and life-support coordination for the infirmary. Identity color: medical green-cyan.
General / Crew	Basic	Personal information, ship time, crew messaging, and guest-facing content only. Identity color: neutral slate.

4.6.3 Combining Function and Tier

Because function and tier are independent, a single functional role can be held at different authority levels, and a single tier can apply to many functions. Representative combinations:

- **Captain.** Command function at Command tier.
- **First Officer.** Executive Officer function (when actively supervising) or any operational function, always at Executive tier; authority follows the credential to whichever console is used.
- **Senior pilot standing third watch.** Pilot function at Senior Operator tier.
- **Ship's cook.** Chef function at Support tier.
- **Guest.** General function at General tier.

4.6.4 The Administrator Layer

Administrator is treated as a distinct system layer rather than a bridge role. It is not a station on the bridge; it is accessed from the Exploration Operations Center or from a designated engineering maintenance console, and it requires the highest authentication tier (optionally dual-authorization, requiring two qualified credentials presented together). Where operational roles consume the system, the Administrator defines it: creating and editing roles, screens, and functions; managing all user accounts and credentials; configuring the seven isolated network domains; applying software updates; and reviewing audit logs.

To reinforce that it operates at a different layer, the Administrator interface deliberately departs from the holographic operational aesthetic. It is utilitarian and information-dense — monospaced text, log views, and form controls rather than spatial displays — signaling that the user is configuring the system rather than flying the ship. Command tier inherits a limited subset of administrative capability (adding and removing users and assigning existing roles) so that the captain is never dependent on the Administrator for routine crew changes; but the creation of new roles, screens, and functions remains exclusive to the Administrator layer.

5. Standard Role Configurations

This section specifies the standard role configurations. Each subsection defines the default display zone allocation, the keypad tier remapping, shortcut and USER key bindings, and operational notes particular to the role. All defaults may be customized per operator within the limits of the role's control-authority profile; defaults restore via LOAD LAYOUT → ROLE DEFAULT.

A consolidated cross-role comparison is provided in Appendix A.

5.1 ADM — Administrator

Administrators Console

The Administrator (ADM) function represents the highest level of non-physical authority within the SCOUT operating environment. It provides comprehensive control over user access, system configuration, software deployment, security policy enforcement, and audit oversight across all shipboard systems.

The ADM role is not part of normal mission operations. Instead, it governs the integrity, security, and continuity of the ship's command-and-control infrastructure. All administrative actions are logged, permission-gated, and—where required—subject to multi-party authorization.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	System modules and configuration domains
Primary Workspace (Center)	Active management workspace (users, roles, functions)
Right Configurable Display	Detail and audit pane for the selected entity: account history, permission inheritance, change diffs, and the live audit-log trail of the action in progress.
Quick Info Strip	Configurable

The Administrator console is structured for clarity, auditability, and precision: This layout supports:

- Simultaneous configuration and monitoring
- Immediate feedback on administrative actions
- Rapid intervention capability

Core Responsibilities

Identity and Access Management (IAM)

The Administrator defines and controls who can access what systems, at what level, and under what conditions.

Capabilities include:

- Create, modify, and revoke user accounts
- Assign roles and functional designations (e.g., Helm, Engineering, Medical)
- Define permission tiers (Command, Executive, Operator, Support, Guest)
- Configure multi-role assignments (e.g., Pilot + Navigator-qualified)
- Manage authentication methods:
    - Biometric
    - PIN / credential
    - Dual-auth pairing (watch standing authorization)

Role and Permission Architecture

The ADM function maintains the hierarchical control model of the ship.

- Define and modify:
  - Roles (functional responsibilities)
  - Permission tiers (authority levels)
  - Access scopes (system domains)
- Enforce least-privilege access principles
- Support temporary privilege elevation for mission-specific needs

System Configuration Management

Administrators control the structure and behavior of the S.C.O.U.T. interface environment.

- Create and manage:
  - UI screens
  - Functional modules
  - Console configurations
- Assign interfaces to:
  - Console classes (I–IV)
  - Specific crew roles
- Ensure interface consistency across all devices

Software and Update Control

The ADM role governs all software lifecycle activity onboard.

- Deploy system updates
- Validate and publish new interface modules
- Control versioning across:
  - Bridge systems
  - Distributed consoles
  - Mobile devices
- Ensure no unauthorized code execution

Network and Domain Control

Administrators define the logical segmentation of ship systems.

- Manage network domains:
  - Command systems
  - Engineering systems
  - Guest/isolated networks
- Control inter-domain communication rules

- Isolate compromised systems when required

Audit and Logging Oversight

All actions within S.C.O.U.T. are continuously monitored and recorded.

- Real-time audit log monitoring
- Review:
  - User actions
  - System changes
  - Security events
- Maintain tamper-resistant logs
- Support forensic analysis and mission replay

Security Enforcement and Compliance

The ADM function enforces ship-wide security protocols.

- Require dual-authentication (dual-auth) for:
  - Critical system changes
  - Role escalations
  - Root-level operations
- Enforce:
  - Authentication policies
  - Credential rotation
  - Access revocation
- Detect and respond to:
  - Unauthorized access attempts
  - Credential anomalies
  - System drift

Emergency Control Authority

In contingency scenarios, the Administrator can intervene to preserve system integrity.

- Disable compromised accounts
- Lock or isolate system domains
- Force system-wide configuration rollback
- Enable degraded but safe operating modes
- Override automation under controlled conditions

Authorization Model

Tier Structure

- **ROOT (Administrator)** - Full system authority

- **Command** - Mission authority
- **Executive** - Senior operational authority
- **Operator** - Standard system operation
- **Support** - Limited subsystem access
- **General / Guest** - Restricted access

Dual-Authorization Requirement

Critical actions require:

- Two authorized users **or**
- One administrator + one qualified officer

This ensures: No single individual can unilaterally alter mission-critical systems

Operational Constraints

- Administrator actions are:
  - Logged
  - Traceable
  - Reversible where possible
- The ADM function cannot bypass physical interlocks
- Critical system changes may require:
  - Time delay
  - Secondary confirmation
  - System state validation

Summary

The SCOUT Administrator function exists to ensure that:

The ship remains secure, consistent, and controllable—regardless of crew composition, mission conditions, or system state.

It is not a command role; it is a governance role, responsible for:

- Maintaining trust in the system
- Enforcing operational boundaries
- Ensuring that control is always deliberate, authorized, and auditable

5.2 PLT — Pilot Configuration

Pilot Console

The Pilot (PLT) function—commonly referred to as Helm—is responsible for the direct physical control of the spacecraft. It translates approved navigation solutions into real-time thrust, orientation, and motion adjustments, ensuring the vessel follows its intended trajectory.

Where Navigation defines *where to go*, the Pilot system determines *how the ship actually moves* to get there.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	Flight Data widget stack: attitude indicator, velocity vector, thrust profile, fuel/reaction-mass state, inertial damper status, and structural load monitor.
Primary Workspace (Center)	Helm plot: forward navigational sphere with projected flight path, conn orders queue, collision-avoidance envelope, and docking/landing guidance overlay when within terminal approach parameters.

Display Zone	Default Configuration
Right Configurable Display	Sensor Feed (forward view) with situational overlay showing contacts within the maneuvering envelope; switchable to aft/ventral camera clusters for docking operations.
Quick Info Strip	Speed, heading, altitude/orbital radius, ETA to active waypoint, and inertial damper load percentage.

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Navigation / Cursor Control	Remapped as a fly-by-wire vernier pad: directional pad provides translation pulses (RCS); ZOOM IN/OUT become throttle increment/decrement; ORBIT and FOLLOW engage autopilot sub-modes.
Data & Interaction	SELECT TARGET locks navigational reference; TRACK/LOCK slaves the helm plot to a contact; ADD WAYPOINT inserts an immediate course node pending Navigator confirmation.
Data Filters	Filters contacts by collision risk, transponder class, and time-to-closest-approach.
View & Layout	Presets: Cruise, Maneuvering, Docking, Atmospheric Entry, Emergency.
System Interaction	POWER MGMT shortcut requests thrust priority from Engineering; DIAGNOSTICS limited to propulsion and attitude-control subsystems.

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Autopilot modes: Hold Attitude, Hold Course, Station-Keep
4–6	Thrust presets: 25% / 50% / Full Military
7–9	RCS modes: Fine, Standard, Coarse
USER A	All-stop (double-press confirmation)
USER B	Evasive maneuver execute (vector proposed by DSA console)
USER C	Docking mode toggle
USER D	Hand off helm to AI voice interface (verbal confirmation required)

Core Responsibilities

Attitude Control and Orientation

The Pilot maintains precise control of the ship's orientation in three-dimensional space.

- Controls:
  - Pitch, yaw, and roll
- Maintains:
  - Target heading alignment
  - Stable orientation during maneuvers
- Uses:
  - RCS thrusters for fine control
  - Main engines for vector alignment (if applicable)

Thrust and Velocity Management

The Pilot system regulates all propulsion outputs.

- Controls:
  - Main engine thrust levels
  - RCS impulse firing
- Maintains:
  - Target velocity profiles
  - Smooth acceleration/deceleration curves

- Ensures:
    - No structural or inertial overload

Maneuver Execution

The Pilot executes trajectory instructions received from Navigation.

- Performs:
    - Course corrections
    - Waypoint intercepts
    - Orbital insertions (if applicable)
- Aligns ship to:
    - Required burn vectors
- Executes:
    - Timed burns and impulse adjustments

Flight Stability and Load Management

The system continuously monitors the physical condition of the ship during movement.

- Tracks:
    - Structural load (e.g., 0.3 G equivalent)
    - Inertial stress
- Applies:
    - Dampening and smoothing algorithms
- Prevents:
    - Excessive strain on hull or internal systems

Autopilot and Assisted Flight Modes

The Pilot console supports both manual and automated control.

- Autopilot modes:
    - Hold course
    - Hold speed
    - Route follow (NAV-driven)
- Pilot can:
    - Override at any time
    - Blend manual inputs with automation

Real-Time Flight Monitoring

The Pilot system provides continuous feedback on ship motion.

- Displays:
    - Speed (e.g., 1,256 m/s)
    - Heading

    - Altitude / relative position
- Indicates:
    - “On Course” vs deviation
- Updates instantly with control inputs

Forward Sensor Integration

Pilot integrates direct forward sensor data for maneuvering.

- Provides:
    - Immediate spatial awareness ahead of the ship
- Supports:
    - Visual confirmation of alignment
    - Short-range hazard avoidance

RCS Vector Control

Fine maneuvering is handled through Reaction Control System (RCS) inputs.

- Enables:
    - Precision alignment
    - Station-keeping
    - Docking maneuvers
- Controlled via:
    - Vector input interface (shown in console)

Authorization and Operational Role

Authority Level

Operator / Specialist Tier (Pilot)

- Executes command directives and NAV solutions

Control Scope

The Pilot function directly controls:

Propulsion systems (thrust output)

RCS thrusters

Ship orientation

Operational Constraints

The Pilot system does not determine:

- Destination or route (NAV responsibility)
- Threat prioritization (DSA responsibility)
- Engineering limits beyond safety enforcement

However, it:

- Enforces physical constraints
- Can reject unsafe maneuver commands
- Maintains ship integrity under all conditions

Operational Role in the System

The Pilot function serves as the ship's motion execution authority.

- Haptic Level defaults to 90% in Pilot mode; tactile confirmation substitutes for visual confirmation during maneuvers.
- Layout lock engages automatically when vessel acceleration exceeds 2G to prevent unintended widget rearrangement.
- The all-stop key (USER A) is rendered with a 30% larger touch target than standard keys in this mode.

It converts:

- Planned trajectory → Physical movement
- Desired vector → Actual thrust

Design Intent

The Pilot function exists because:

- Physical control must be decoupled from planning
- Real-time maneuvering requires continuous human or AI input
- Ship safety depends on dynamic adjustment to conditions

Summary

The Pilot (Helm) function is responsible for making the ship move—accurately, smoothly, and safely. It:

- Executes navigation plans
- Controls propulsion and orientation
- Maintains stability and structural integrity

In the S.C.O.U.T. system, if Navigation chooses the path, the Pilot ensures the ship actually follows it.

5.3 NAV — Navigator

Navigator Console

The Navigation (NAV) function is responsible for the planning, validation, and execution of all ship trajectories, including waypoint routing, transit optimization, and positional awareness. It serves as the ship's spatial intelligence and motion-planning system, translating mission objectives into precise movement through space.

NAV operates as the authoritative source of "where the ship is going and how it gets there", working in tight coordination with Helm, DSA, and Science.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	Star Map widget at sector scale with plotted route, gravity-well boundaries, hazard corridors, and fuel-optimal transfer windows.
Primary Workspace (Center)	Primary plot: active course with waypoint chain (e.g., Waypoint Alpha), object-selected detail pane showing distance, bearing, and ETA; deviation-from-plan indicator; burn schedule timeline.

Display Zone	Default Configuration
Right Configurable Display	Ephemeris and survey data: celestial body catalog, drift-correction log, and jump/transit solution validator.
Quick Info Strip	Current waypoint, cross-track error, next burn countdown, total route ETA, and navigational sensor confidence.

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Navigation / Cursor Control	Standard chart-manipulation mapping: pan/zoom across the star map, ORBIT rotates the 3D plot, FOLLOW centers on the vessel's projected position.
Data & Interaction	ADD WAYPOINT is the primary action and is elevated in size; OPEN DETAILS retrieves full ephemeris records; SHOW ON MAP cross-references catalog entries to the plot.
Data Filters	Time Filter scrubs the plot forward/backward to preview orbital mechanics; Tag Filter isolates charted vs. uncharted objects.
View & Layout	Presets: System Plot, Sector Chart, Transit Solution, Survey Overlay.
System Interaction	ROUTING module fully unlocked: course library, transfer calculators, and arrival-window planning.

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Chart scales: Orbital / System / Sector
4–6	Solution types: Fuel-Optimal / Time-Optimal / Stealth Transit
7–9	Plot overlays: Hazards / Traffic / Survey Grid
USER A	Commit course to helm (requires Pilot acknowledgment)
USER B	Plot return-to-base solution
USER C	Mark current position (survey log entry)
USER D	Request AI course verification

Core Responsibilities

Trajectory Planning and Waypoint Management

The Navigation system defines and manages all movement paths.

Capabilities include:

- Create and edit waypoint sequences (e.g., WP1 → WP2 → WP3)
- Define:
  - Primary routes
  - Alternate routes
- Validate path feasibility based on:
  - Ship performance limits
  - Environmental constraints
- Manage waypoint progression and sequencing

This ensures structured and predictable movement through space.

Transit Plot Execution (Primary Workspace)

The central NAV interface is the Transit Plot, the only zone accepting sustained operator input.

- Displays:
  - Current ship position

    - Active waypoint
    - Planned trajectory vector
- Allows:
    - Real-time adjustment of course
    - Fine-tuning of intercept geometry
- Provides spatial reference using radial distance rings

This is the core control surface for navigation decisions.

Positional Awareness and State Tracking

NAV continuously tracks the ship's movement state.

- Monitor:
    - Velocity (e.g., 1,256 m/s)
    - Heading (e.g., 124.3°)
    - Relative position in space
- Maintain high-confidence sensor fusion for position accuracy

Timing and Transit Metrics

The Navigation system calculates mission-critical timing data.

- Track:
    - Estimated time to waypoint (ETA)
    - Next waypoint identification (e.g., WP2)
    - Cross-track error (XTE)
    - Transit duration
- Provide predictive updates as conditions change

This ensures precise timing and alignment with mission objectives.

Hazard Integration and Route Safety

NAV integrates hazard data from DSA and Science.

- Evaluate:
    - Proximity to hazards
    - Collision risk along trajectory
- Adjust routes to:
    - Avoid debris fields
    - Maintain safe clearance
- Incorporate dynamic updates during transit

Delta-V and Transfer Calculations

The system calculates required maneuver energy.

- Compute:

    - Transfer solution Δv (delta-v)
    - Burn timing and efficiency
- Optimize for:
    - Fuel efficiency
    - Time constraints
- Support multiple solution comparisons

Ephemeris and Reference Data

NAV maintains celestial and positional reference datasets.

- Track:
    - Object motion
    - Orbital mechanics data
- Use ephemeris data for:
    - Accurate trajectory prediction
    - Long-duration navigation planning

Route Comparison and Optimization

The system supports multiple route evaluation.

- Compare:
    - Primary vs alternate routes
- Evaluate trade-offs:
    - Time vs fuel
    - Risk vs efficiency
- Allow operator selection of optimal path

Authorization and Operational Role

Authority Level

Operator / Specialist Tier (Navigator)

- Works under Command direction

Control Scope

NAV defines:

- Where the ship should go
- How it should get there

Helm executes:

- The physical maneuvering

Operational Constraints

The NAV function cannot directly control:

- Thrusters or propulsion systems
- Power distribution
- Defensive systems

However, it:

- Provides flight solutions to Helm
- Recommends maneuver adjustments
- Drives mission path decisions

Operational Role in the System

The Navigation function serves as the ship's path-finding and motion-planning authority.

- Course commits are dual-key: the Navigator's USER A transmits the solution, and the Pilot console must acknowledge before the helm plot updates.
- The Time Filter scrub function is unique to NAV mode and renders predicted positions up to 72 hours ahead.

It ensures:

- Accurate trajectory execution
- Efficient resource usage
- Safe passage through space

Design Intent

The NAV function exists because:

- Movement in space is non-intuitive and precision-dependent
- Trajectory planning requires continuous recalculation
- Spatial awareness must be separated from physical control

Summary

The Navigation function transforms mission intent into precise spatial execution. It is responsible for:

- Planning instead of executing
- Calculating instead of controlling
- Guiding instead of moving

Together with S.C.O.U.T., it ensures that the ship does not just move—it arrives exactly where it intends, when it intends, and safely.

5.4 DSA — Defensive & Situational Awareness

Defensive & Situational Awareness Console

The Scout Class carries no offensive weapons. The DSA configuration provides the situational awareness an exploration vessel requires to keep itself safe: contact detection and identification, hazard and debris tracking, threat assessment, evasive-maneuver coordination with the helm, and non-weapon defensive countermeasures. Where an armed vessel would prosecute a contact, the Scout Class characterizes it and, if necessary, avoids it. Display logic is assessment-oriented: every contact is classified and assigned a hazard envelope, but the console offers no engagement controls.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	Contact List widget: prioritized queue of tracked contacts and charted hazards with IFF/transponder status, classification, closest approach distance, and closure rate.
Primary Workspace (Center)	Situational sphere: 360° awareness plot centered on own ship showing contacts, charted hazard arcs (debris fields, radiation zones, gravitational anomalies), and the recommended evasive vector when a hazard envelope is breached.

Display Zone	Default Configuration
Right Configurable Display	Sensor Feed for identification: passive visual feeds, emission analysis, and spectral signatures used to characterize unknown contacts without active illumination where stealth is preferred.
Quick Info Strip	Tracks held, nearest-contact range, closure rate, evasion-readiness state, and countermeasure (ECM) status.

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Navigation / Cursor Control	Cursor slews the sensor reticle across the situational sphere; ZOOM controls sensor magnification on the designated contact; FOCUS commits passive sensors to identification of the selected track.
Data & Interaction	SELECT and TRACK/LOCK designate and maintain a fix on a contact; ID CONTACT runs the classification routine; BROADCAST shares the characterized contact picture to all linked consoles.
Data Filters	Filters by contact state (unknown/charted/friendly), hazard type, and closure rate. RESET FILTERS restores the full situational picture and is guarded against accidental press.
View & Layout	Presets: Situational Overview, Hazard Watch, Evasion, Damage Control Support.
Defensive Systems	Non-weapon countermeasures only: decoy deployment, electronic counter-measures (ECM), and sensor-dazzle for breaking a hostile track. No offensive controls are present in standard fit.

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Sensor posture: Passive Wide / Active Scan / Silent (emissions-controlled)
4–6	Countermeasures: Decoys / ECM / Sensor Dazzle
7–9	Hazard response: Mark Hazard / Plot Avoidance / Alert Helm
USER A	Initiate coordinated evasive maneuver (handshakes with Pilot console)
USER B	Recall all active countermeasures
USER C	Cycle next contact in priority queue
USER D	Broadcast contact picture to all linked consoles

Core Responsibilities

Contact Detection and Tracking

The DSA function maintains a live contact list of all relevant objects in proximity.

Capabilities include:

- Detect and track:
  - Vessels
  - Debris fields
  - Natural hazards (asteroids, radiation zones)
  - Unknown contacts
- Maintain contact attributes:
  - Distance
  - Bearing
  - Velocity (implied/derived)
- Track total active contacts (e.g., 6 tracked objects)

This provides continuous spatial awareness of the surrounding environment.

Situational Sphere Visualization

The system renders a 3D-relative proximity model (displayed as a 2D projection).

- Displays:
  - Ship at center reference
  - Contacts as relative positions
  - Distance rings for scale
- Highlights:
  - Hazard arcs (e.g., debris bearing 318°)
  - Closest approach metrics (e.g., −1.2 min to intercept)

This allows operators to quickly interpret spatial relationships and risk vectors.

Hazard Identification and Classification

The DSA system evaluates environmental risks.

- Identify hazards such as:
  - Debris fields
  - Collision trajectories
  - Radiation zones
  - Unknown objects
- Classify severity:
  - Monitor
  - Caution
  - Immediate risk
- Provide predictive warnings:
  - Time-to-impact
  - Closest approach distance

Sensor Integration and Emissions Monitoring

The system integrates with ship sensors and emission controls.

- Track sensor outputs relevant to threats
- Monitor ship emissions profile:
  - Active sensor signature
  - Detectability by external systems
- Provide stealth-awareness indicators

Defensive Readiness Status

DSA tracks the readiness of defensive systems.

- Status indicators include:
  - Evasion readiness (e.g., READY)

    - ECM (electronic countermeasures) status (e.g., STBY)
- Provide system availability without direct control

Data Filtering and Contact Prioritization

Operators can refine the situational picture.

- Filter by:
    - Threat level
    - Contact type
    - Distance range
- Prioritize high-risk contacts
- Reduce clutter in dense environments

Sensor Slew and Target Focus

The system allows directional focus on specific contacts.

- Slew sensor focus toward:
    - Selected target
    - Hazard region
- Maintain tracking lock
- Improve resolution on priority objects

Tactical Data Interaction

The DSA function provides tools for interacting with tracked data.

- Actions include:
    - Track (lock onto contact)
    - Mark (flag for attention)
    - Classify (assign type)
    - Broadcast (share data with other systems)

Authorization and Operational Role

Authority Level

- **Operator / Tactical Support Tier**

Role in Decision Chain

DSA does not execute actions—it informs them.

It provides input to:

- **Helm** → maneuvering decisions
- **Command** → tactical choices
- **Engineering** → system readiness

- **Communications** → contact identification

Operational Constraints

The DSA function cannot directly control:

- Ship movement
- Weapons or countermeasure deployment
- Power allocation

However, it can:

- Trigger alerts
- Recommend evasive actions
- Elevate threat levels

Operational Role in the System

The Scout Class mounts no offensive weapons; the DSA role provides assessment and avoidance, not engagement. The console exposes no firing controls, weapon groups, or master-arm function in standard configuration.

Evasive maneuvers (USER A) are a coordinated two-console action: DSA recommends the vector and the Pilot console executes it, mirroring the Navigator's course-commit handshake.

The DSA function serves as the ship’s immediate awareness and threat interpretation layer. It ensures:

- The ship understands its surroundings in real time
- Risks are identified before they become critical
- Command decisions are based on accurate spatial data

Design Intent

The DSA function exists because:

- Navigation alone does not account for dynamic hazards
- Raw sensor data must be interpreted in context of risk
- Tactical awareness must be continuous and predictive

Summary

The Defensive & Situational Awareness function transforms environmental data into **real-**time operational safety intelligence. It is responsible for:

- Monitoring instead of acting
- Interpreting instead of controlling
- Predicting instead of reacting

Together with S.C.O.U.T., it ensures that the ship is never surprised—always aware, always prepared, and always one step ahead of danger.

5.5 ENG — Engineering

Engineering Console.

The Engineering (ENG) function is responsible for the operation, monitoring, and control of all shipboard mechanical, electrical, and life-support systems. It serves as the ship's primary technical authority, ensuring that propulsion, power generation, structural integrity, and environmental systems remain stable and within operational limits.

ENG is a mission-critical role with direct system authority, capable of influencing or controlling nearly every physical subsystem aboard the vessel.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	System Status widget expanded to full diagnostic depth: Propulsion, Power, Shields, Life Support, Sensors, Comms, and Navigation, each drillable to component level with color-coded thresholds.
Primary Workspace (Center)	Interactive ship schematic (the cutaway hull view): power distribution grid, coolant loops, atmosphere zones, and damage-control sections. Touch any compartment to isolate, reroute, or dispatch repair tasking.

Display Zone	Default Configuration
Right Configurable Display	Trend telemetry: reactor output curves, thermal load history, consumables projection, and predictive failure analysis from the AI maintenance model.
Quick Info Strip	Reactor output %, available power margin, hull integrity, life support reserve hours, and active fault count.

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Navigation / Cursor Control	Navigates the schematic: pan/zoom across decks, ORBIT rotates the 3D hull model, SELECT isolates a subsystem branch.
Data & Interaction	TRACK/LOCK pins a component's live telemetry to the Quick Info Strip; ADD WAYPOINT repurposed as ADD WORK ORDER for the maintenance queue.
Data Filters	Filters schematic by subsystem (power/thermal/atmosphere/structural) and by fault severity.
View & Layout	Presets: Power Grid, Damage Control, Cruise Monitoring, Reactor Detail.
System Interaction	POWER MGMT and DIAGNOSTICS fully unlocked, including load-shed planning and component-level test routines.

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Power priority profiles: Combat / Cruise / Silent Running
4–6	Subsystem isolation: Propulsion / Shields / Life Support
7–9	Damage control: Seal Section / Vent Section / Dispatch Team
USER A	Execute load shed (per the Power & Priority module plan)
USER B	Reactor SCRAM (two-stage with physical-pressure haptic confirmation)
USER C	Acknowledge/silence current fault alarm
USER D	Request AI diagnostic narration of active fault tree

Core Responsibilities

System Status Monitoring

The Engineering function provides a continuous overview of all major ship systems. Tracked systems include:

- Propulsion
- Reactor / Power Core
- Life Support
- Communications infrastructure (hardware layer)
- Navigation support systems
- Structural integrity (hull)

Each system is monitored via:

- Health percentage indicators
- Fault detection flags
- Performance thresholds

This provides real-time operational awareness of ship condition.

Power Generation and Distribution

ENG manages the ship's energy lifecycle.

- Monitor reactor output (e.g., 98%)

- Allocate power across systems:
  - Propulsion
  - Sensors
  - Life support
  - Auxiliary systems
- Balance load to prevent overload or instability
- Respond to fluctuations or faults

This ensures stable and efficient energy utilization across all operations.

Propulsion and Drive Systems

The Engineering function oversees propulsion systems at the mechanical level.

- Monitor propulsion health and output
- Manage thrust availability and readiness
- Coordinate with Helm for:
  - Maneuver execution
  - Performance limits
- Detect propulsion anomalies

Life Support Systems Control

ENG maintains environmental survivability.

- Monitor:
  - Atmosphere composition
  - Pressure
  - Temperature regulation
- Ensure system redundancy and stability
- Respond to:
  - Leaks
  - Contamination
  - System degradation

Structural Integrity and Hull Monitoring

The system tracks the physical condition of the vessel.

- Monitor hull integrity (e.g., 100%)
- Detect:
  - Microfractures
  - Stress loads
  - Damage zones
- Provide input to damage control operations

Ship Schematic and System Mapping

The Engineering console includes a real-time schematic view.

- Visual representation of:
  - Ship layout
  - System nodes
  - Active components
- Identify:
  - Fault locations
  - Power flow
  - System interdependencies

This supports rapid fault localization and response.

Trend Analysis and Telemetry

ENG provides predictive insight through telemetry trends.

- Monitor system performance over time
- Identify:
  - Degradation patterns
  - Efficiency drops
  - Instability trends
- Example:
  - “Reactor nominal — 0 faults”

This enables preventative maintenance and early intervention.

Damage Control Operations

The Engineering function manages system recovery and containment.

- Actions include:
  - Isolate damaged systems
  - Depressurize compartments (if required)
  - Contain system failures
  - Initiate repair protocols
- Coordinate with:
  - Command
  - Medical (if casualties)
  - Steward (guest safety)

Diagnostics and System Debugging

The ENG console supports technical troubleshooting.

- Run diagnostics on:

    - Sensors
    - Reactor systems
    - Distribution networks
- Use sensor debug tools for calibration
- Identify root causes of anomalies

Operational Notes

- The Power & Priority module (LOW/NOM/HIGH and LOAD SHED) is mirrored into the keypad tier in ENG mode so that power decisions never require reaching to the lower tier during a casualty.
- Reactor SCRAM uses an escalating haptic profile: the key vibrates with increasing intensity through the press-and-hold to provide unambiguous tactile feedback that a protective action is being commanded.
- Section vent commands (key 8) are inhibited unless the target compartment registers zero life signs or a command override is entered.

Authorization and Operational Role

Authority Level

Operator / Senior Operator Tier

- May escalate to **Command-level authority** during critical failures

Direct Control Authority

Unlike most roles, ENG can:

- Directly control system states
- Modify power distribution
- Isolate or shut down subsystems

Operational Constraints

While highly authoritative, ENG:

- Must coordinate with Command for major system changes
- Cannot override command decisions without emergency justification
- Operates within safety interlocks and system protections

Operational Role in the System

The Engineering function serves as the physical control layer of the vessel

It ensures:

- Systems remain operational
- Failures are contained
- Performance remains within safe limits

Design Intent

The ENG function exists because:

- Complex systems require centralized technical control
- Failures must be addressed immediately and precisely
- Power, propulsion, and life support are interdependent systems

Summary

The Engineering function transforms the ship from a structure into a functioning, survivable machine. It is responsible for:

- Maintaining systems instead of using them
- Stabilizing operations instead of directing them
- Ensuring survivability instead of mission intent

Together with S.C.O.U.T., it ensures that the ship continues to function—no matter the stress, damage, or demands placed upon it.

5.6 COM — Communications Configuration

Communications Screen.

The Communications (COM) function is responsible for the transmission, reception, routing, and interpretation of all external and internal signals. It operates as the ship's primary interface to other vessels, stations, fleets, and unknown contacts, managing both structured communications and raw signal intelligence.

COM is a mission-critical role, bridging command intent with external entities while ensuring secure, reliable, and context-aware data exchange.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	**Channel Matrix** → multi-channel control and status
Primary Workspace (Center)	**Spectrum Waterfall** → real-time signal visualization
Right Configurable Display	**Directory & Protocol** → contact management and connection state

Display Zone	Default Configuration
Quick Info Strip	• Active channel (e.g., Fleet CMD) • Signal strength (e.g., 98%) • Encryption state (e.g., CMD Cipher) • Unread messages • Last contact time • Guard watch status

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Data Filters	channel, encryption, origin, time
Spectrum Tune	frequency selection and tuning
Data & Interaction	hail, track, history, dictate
Data Filters	Filters traffic by channel, encryption class, origin, and time range; TAG FILTER isolates flagged or intercepted traffic.
Signal Routing	antenna, relay, bandwidth, broadcast
Shortcuts/User Keys	rapid command input

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Channel presets: Fleet Command / Local Traffic / Emergency Guard
4–6	Encryption modes: Clear / Standard / Command Cipher

Key	Assigned Function
7–9	Transmission modes: Voice / Data Burst / Tight-Beam Laser
USER A	Transmit distress signal (two-stage confirmation)
USER B	Open shipwide intercom (all-call)
USER C	Toggle AI live translation on active channel
USER D	Begin/end traffic recording and logging

- The lower-tier Communications module (channel, volume, squelch, PTT, mute) remains active and mirrors the keypad state, providing redundant physical-style sliders for fine audio control.
- Emergency Guard channels are monitored continuously regardless of mode; distress traffic generates a CRIT alert on every console shipwide.

Core Responsibilities

Channel Management and Control

The Communications system maintains a structured **channel matrix** for all signal pathways.

Capabilities include:

- Monitor and control multiple channels simultaneously:
  - Command (Fleet CMD)
  - Tactical (TAC 1 / TAC 2)
  - Routine (A/B)
  - Science / Data
  - Diplomatic
  - Engineering (internal relay)
  - Encrypted channels
  - Emergency Guard (121.5)
  - First Contact (unknown signals)
- Set channel states:
  - Active
  - Standby
  - Open
  - Monitor
  - Watch

This enables parallel communication streams without signal conflict.

Signal Detection and Spectrum Analysis

The COM function provides continuous monitoring of the electromagnetic spectrum.

- Real-time spectrum waterfall visualization
- Detection across bands:
  - LF, VHF, UHF, X-band, etc.
- Identify:
  - Signal strength
  - Frequency patterns
  - Anomalies or unknown transmissions
- Support signal classification and prioritization

This allows early identification of contacts, interference, or threats.

Contact Directory and Protocol Handling

The system maintains a structured directory of known entities and communication protocols.

- Track and manage:
  - Fleet command nodes
  - Wing units
  - Relay stations
  - Science outposts
  - Diplomatic channels
- Maintain connection states:
  - Linked
  - Standby
  - Monitor
  - Watch
- Automatically apply appropriate communication protocols

Encryption and Security Management

Secure communication is a primary function of COM.

- Manage encryption states:
  - Standard
  - Command cipher
  - Secure channels
- Switch between encrypted and open transmission
- Validate signal integrity
- Detect spoofing or unauthorized signals

Signal Routing and Relay Control

The COM system directs how signals move through the network.

- Route signals via:
  - Primary antennas
  - Relay stations (e.g., Relay K-9)
- Control bandwidth allocation
- Execute:
  - Direct transmission
  - Relay forwarding
  - Broadcast (All-Call)

This ensures efficient and reliable communication across distance and interference.

Data Interaction and Messaging

The COM role manages actual communication exchanges.

- Actions include:
  - Hail (initiate contact)
  - Track (maintain lock on signal)
  - History (review past transmissions)
  - Dictate (compose outgoing messages)
- Maintain unread message tracking
- Monitor last contact timestamps

AI-Assisted Translation and First Contact

The system supports communication with unknown or non-standard entities.

- AI translation layer:
  - Linguistic parsing
  - Confidence scoring (e.g., 71%)
- Identify:
  - Unknown vessels
  - Non-standard protocols
- Enable First Contact mode with controlled risk

Emergency Communications

The COM function is central to emergency signaling.

- Monitor guard frequency (121.5)
- Issue distress signals
- Maintain emergency channel priority

- Support ship-wide alert communication

Authorization and Operational Role

Authority Level

Typically, **Operator / Specialist Tier**

Can escalate during:

- Tactical operations
- First contact scenarios
- Emergency situations

Operational Constraints

The COM function cannot directly control:

- Navigation or propulsion systems
- Weapons systems (if present)
- Core ship operations

However, it can:

- Provide targeting and situational data
- Relay command instructions
- Influence mission decisions through information flow

Operational Role in the System

The Communications function serves as:

The ship's voice, ears, and signal intelligence layer

It ensures:

- Continuous awareness of external environment
- Reliable command communication
- Secure data exchange

Design Intent

The COM function exists because:

- Information is as critical as propulsion or power
- Communication must be multi-threaded, secure, and adaptive
- Unknown signals require interpretation, not just reception

Summary

The Communications function transforms raw signals into actionable information and controlled interaction.

It is responsible for:

- Managing connectivity instead of systems
- Interpreting signals instead of generating them
- Enabling coordination instead of execution

Together with S.C.O.U.T., it ensures that: The ship is never isolated; always connected, aware, and capable of being heard.

5.7 SCI — Science Configuration

Science Console.

The Science (SCI) function is responsible for the acquisition, processing, analysis, and interpretation of all sensor-derived data. It serves as the ship's primary discovery and research system, transforming raw environmental inputs into actionable scientific and navigational intelligence.

SCI operates at the intersection of exploration, hazard detection, and mission insight, supporting both planned survey operations and real-time anomaly investigation.

Interface Characteristics

The Science console is designed for data density, clarity, and analytical workflow:

Display Zone	Default Configuration
Left Configurable Display	**Sensor Allocation** → distribution of sensor resources
Primary Workspace (Center)	**Analysis Workspace** → real-time data visualization and anomaly detection

Display Zone	Default Configuration
Right Configurable Display	**Survey Catalog** → logged discoveries and storage metrics
Quick Info Strip	• Active sensors (e.g., 4 active) • Scan completion progress • Anomaly confidence level • Storage utilization (e.g., 71%)

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Data Filters	refine incoming data
Sensor Pointing	SELECT TARGET queues an object for deep scan; OPEN DETAILS retrieves catalog and database records; ADD WAYPOINT requests a survey waypoint via the Navigator's queue.
Data Interaction	Filters survey data by category (stellar/planetary/biological/artificial), tags, and time range — the deepest filter set of any role.
Sensor Debug	calibration and diagnostics
Shortcuts/User Keys	rapid access

Shortcut and User Key Assignments

Key	Assigned Function
1–3	Scan modes: Passive Wide / Active Focused / Deep Penetrating
4–6	Sensor priority: EM Spectrum / Gravimetric / Biosign

Key	Assigned Function
7–9	Catalog actions: Classify / Flag Anomaly / Append to Report
USER A	Commit deep-scan (high power draw; requests Engineering allocation)
USER B	Snapshot all active sensor feeds to the survey log
USER C	Compare current readings against database (AI match)
USER D	Push findings to Primary Workspace of all linked consoles

Core Responsibilities

Sensor Allocation and Control

The Science function dynamically manages all sensor resources.

Capabilities include:

- Allocate sensor bandwidth across domains:
  - EM Spectrum
  - Gravimetric
  - Spectrographic
  - Biological
  - Quantum/Exotic (if applicable)
- Adjust scan priorities based on mission phase
- Manage active scan queues and targeting
- Balance resolution vs coverage

This enables optimized sensor utilization under limited power and processing constraints.

Data Acquisition and Scanning

SCI governs all scanning operations.

- Initiate targeted scans (e.g., object, region, anomaly)
- Conduct passive and active sweeps
- Track scan progress and completion
- Maintain scan history and repeatability

This ensures systematic and repeatable data collection.

Analysis and Interpretation Workspace

The Science console provides a dedicated analysis environment.

- Visualize signal patterns and datasets
- Identify:
  - Trends
  - Deviations
  - Anomalies
- Apply automated and manual analysis tools
- Generate probability-based assessments (e.g., *"87% probable new anomaly"*)

This supports rapid interpretation of complex data in real time.

Anomaly Detection and Classification

SCI is responsible for identifying unknown or unusual phenomena.

- Detect anomalies across all sensor domains
- Classify:
  - Natural phenomena
  - Artificial signals
  - Unknown signatures
- Assign confidence levels
- Flag for further investigation or escalation

This provides early warning and discovery capability.

Survey and Catalog Management

The system maintains a structured database of all findings.

- Log discoveries:
  - Stellar objects
  - Planets
  - Anomalies
  - Signals
- Maintain survey catalog:
  - Total scans completed
  - Objects logged
  - Storage utilization
- Track remaining data capacity

This ensures persistent scientific recordkeeping across missions.

Data Filtering and Processing

SCI allows refinement of incoming data streams.

- Apply filters by:
  - Spectrum type
  - Phenomenon category
  - Time range
- Reduce noise and isolate relevant signals
- Enhance signal clarity for analysis

Sensor Pointing and Targeting

The Science system can direct sensor focus.

- Select scan targets
- Adjust sensor orientation (virtual or physical arrays)
- Track moving or transient objects
- Maintain lock for continuous observation

Data Interaction and Reporting

SCI enables interaction with collected data.

- Actions include:
  - Collect (capture dataset)
  - Analyze (process findings)
  - Classify (assign category)
  - Archive (store results)
- Generate reports for:
  - Command
  - Navigation
  - Engineering
  - Communications (if signal-related)

Authorization and Operational Role

Authority Level

- Typically, **Operator / Specialist Tier**

Escalation Role

SCI can trigger:

- Alerts to Command (unknown anomaly)
- Input to Navigation (trajectory hazards)
- Input to Communications (signal identification)

Operational Constraints

The SCI function cannot directly control:

- Ship movement or propulsion
- Tactical systems
- External communications

However, it directly influences:

- Navigation decisions
- Mission objectives
- Threat assessment

Operational Role in the System

The Science function serves as the ship's perception and understanding layer

It ensures:

- The environment is continuously analyzed
- Unknowns are identified and interpreted
- Data becomes knowledge

Design Intent

The SCI function exists because:

- Exploration requires structured observation and interpretation
- Raw sensor data is useless without context and classification
- Unknown phenomena require probabilistic reasoning and escalation

Summary

The Science function transforms sensor input into mission intelligence.

It is responsible for:

- Observing instead of acting
- Interpreting instead of executing
- Discovering instead of controlling

Together with S.C.O.U.T., it ensures that the ship does not merely travel through space; it understands it.

5.8 MED — Medical

Medical Console.

The Medical (MED) function is responsible for the monitoring, diagnosis, treatment, and stabilization of all crew and guests aboard the vessel. It operates as a semi-autonomous clinical system, integrating real-time biometric data, medical records, and inventory management to ensure rapid and effective response to health-related events.

Unlike hospitality or administrative roles, MED has conditional authority escalation, allowing it to override certain operational constraints when life safety is at risk.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	**Patient Board** → patient status, bed assignments, triage
Primary Workspace (Center)	**Vitals Monitor** → real-time biometric display and waveform
Right Configurable Display	**Medical Inventory** → supply readiness and status

Display Zone	Default Configuration
Quick Info Strip	• Patients count • Triage queue • Beds available • Oxygen reserves • Blood units • Patient status (e.g., stable)

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Patients	admit, chart, discharge, triage
Vitals	monitor, trend, alarm set, record
Inventory	stock, dispense, reorder, seal
Comms	bridge, crew messaging, emergency channel

Shortcut and User Key Assignments

Key	Assigned Function
1–3	
4–6	
7–9	
USER A	
USER B	
USER C	

Key	Assigned Function
USER D	

Core Responsibilities

Patient Management and Tracking

The Medical function maintains continuous oversight of all patients.

Capabilities include:

- Admit and discharge patients
- Maintain real-time patient board
- Track:
  - Current patients
  - Triage queue
  - Bed assignments
  - Isolation status
- Record incident history (e.g., last incident reference)

This provides a clear operational view of medical load and readiness.

Triage and Prioritization

The MED system supports structured triage protocols.

- Classify patients based on severity
- Prioritize treatment order
- Assign:
  - Observation
  - Active treatment
  - Isolation
- Dynamically update triage queue

This ensures efficient allocation of limited medical resources during both routine and emergency conditions.

Vital Signs Monitoring

The system provides continuous biometric monitoring.

- Real-time tracking:
  - Heart rate (BPM)
  - Oxygen saturation (SpO_2)
  - Body temperature

- Trend analysis and historical data
- Configurable alert thresholds
- Automated anomaly detection

This enables early detection of medical issues before escalation.

Clinical Record Management

The MED function maintains complete medical records.

- Chart patient data
- Record:
  - Symptoms
  - Treatments
  - Outcomes
- Maintain longitudinal health records
- Sync with system-wide identity profiles

This ensures continuity of care across the mission timeline.

Medical Inventory Control

The system tracks all medical supplies and readiness.

- Monitor inventory levels:
  - Pharmaceuticals
  - Trauma kits
  - Blood/plasma units
  - Oxygen reserves
- Control actions:
  - Dispense
  - Reorder
  - Seal/unseal critical kits
- Flag shortages or reorder requirements

This ensures clinical capability is always aligned with demand.

Emergency Medical Response

The MED role is central during onboard emergencies.

- Respond to:
  - Injury
  - Illness
  - Environmental exposure
- Coordinate with:
  - Bridge (ship status, maneuvering constraints)

  - Engineering (environmental hazards)
  - Steward (guest coordination)
- Trigger emergency protocols

Communications and Coordination

Medical operations require cross-functional coordination.

- Communicate with:
  - Bridge (critical alerts)
  - Crew (medical advisories)
  - Emergency channels (priority override)
- Maintain clear escalation pathways

Authorization and Escalation

Authority Level

- Typically **Support / Specialist Tier**
- Gains **conditional elevated authority** during:
  - Medical emergencies
  - Life-threatening conditions

Emergency Overrides

When authorized:

- Can issue priority alerts to bridge
- Can request:
  - Course deviation
  - Environmental adjustments
- Can trigger ship-wide medical alerts

Operational Constraints

The MED function cannot directly control:

- Propulsion systems
- Navigation systems
- Reactor or power systems

However, it can:

- Recommend or request changes
- Escalate to command authority
- Trigger emergency protocols that influence ship behavior indirectly

Operational Role in the System

The Medical function serves as:

The life-safety authority within the S.C.O.U.T. ecosystem

It ensures:

- Continuous health monitoring
- Rapid response to medical events
- Preservation of crew and guest wellbeing

Design Intent

The MED function exists because:

- Human health is a mission-critical dependency
- Medical response must be fast, structured, and data-driven
- Clinical operations must be independent yet integrated

Summary

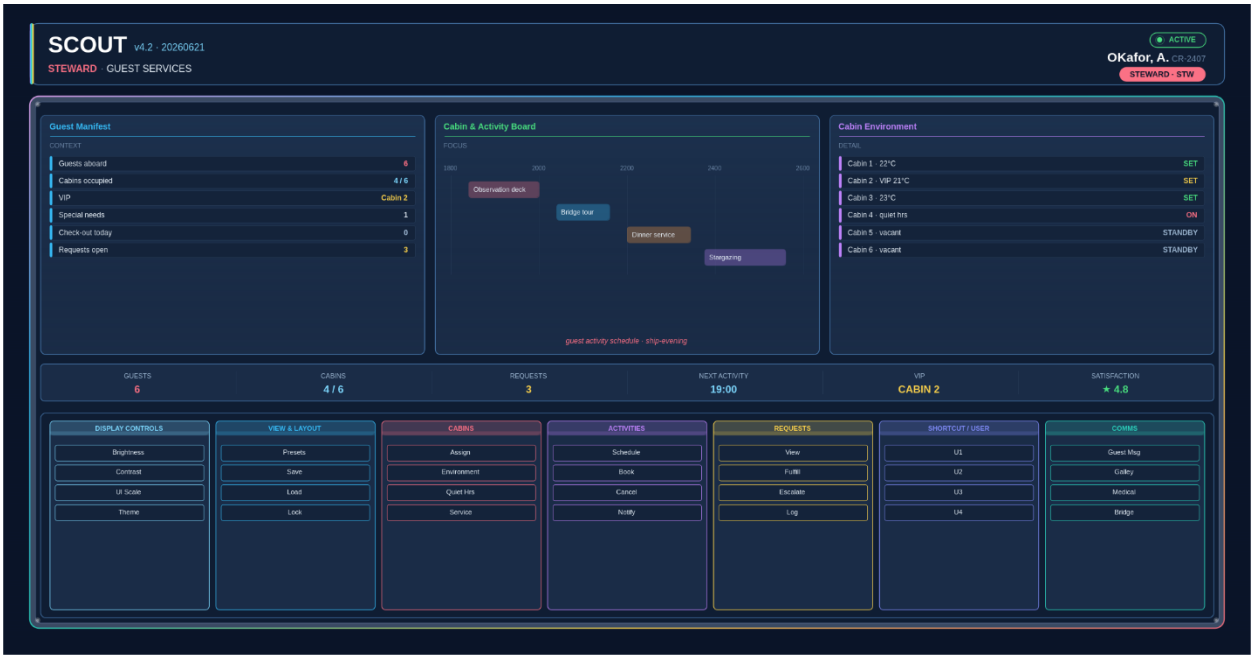
The Medical function transforms the ship into a self-contained clinical environment, capable of sustaining human life under isolated conditions.

It is responsible for:

- Monitoring health continuously
- Managing care actively
- Responding to emergencies decisively

Together with S.C.O.U.T., it ensures that no mission proceeds without the continuous safeguarding of the people aboard.

5.9 STW — Steward



Steward's Console.

The Chief Steward (STW) function is responsible for the end-to-end management of guest experience aboard the vessel, including accommodations, scheduling, service coordination, and satisfaction monitoring. It operates as the primary interface between crew operations and guest-facing services, ensuring that all non-mission-critical human factors are executed smoothly and consistently.

While not part of command or engineering authority, the STW role is operationally critical to mission continuity in a guest-based environment, maintaining structure, timing, and comfort throughout the voyage.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	**Guest Manifest** → occupancy, VIPs, special needs
Primary Workspace (Center)	**Cabin & Activity Board** → timeline-based scheduling

Display Zone	Default Configuration
Right Configurable Display	**Cabin Environment** → per-cabin environmental controls
Quick Info Strip	• Guests onboard • Cabins occupied • Active requests • Next scheduled activity • VIP tracking • Satisfaction rating

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Cabins	assign, configure, manage environment
Activities	schedule, book, notify
Requests	track, fulfill, escalate
Comms	coordinate with ship departments
Display/UI controls	local console customization

Shortcut and User Key Assignments

Key	Assigned Function
1–3	
4–6	
7–9	

Key	Assigned Function
USER A	
USER B	
USER C	
USER D	

Core Responsibilities

Guest Manifest Management

The Chief Steward maintains full visibility and control over all embarked guests.

Capabilities include:

- Track total guests onboard
- Monitor cabin occupancy and assignments
- Identify VIP guests and special designations
- Flag special needs or accommodations
- Track arrivals, departures, and status changes

This provides a real-time operational snapshot of all guest-related variables.

Cabin Assignment and Control

The STW function governs all aspects of guest accommodations.

- Assign and reassign cabins
- Monitor occupancy levels
- Configure cabin status:
  - Occupied
  - Vacant
  - Standby
- Manage guest-specific configurations

This ensures efficient use of limited cabin resources and supports dynamic reassignment if needed.

Cabin Environment Management

The Chief Steward controls environmental settings at the cabin level.

- Adjust:

    - Temperature
    - Lighting presets
    - Quiet hours enforcement
- Apply VIP or special condition overrides
- Monitor cabin readiness and comfort levels

This provides personalized environmental control without exposing core life-support systems.

Activity and Schedule Coordination

The STW role manages all guest-facing activities.

- Create and maintain activity schedules
- Coordinate events:
    - Tours
    - Observation sessions
    - Dining service
    - Recreational activities
- Balance timing against ship operations
- Track upcoming activities and participation

This ensures a structured, continuous guest experience aligned with mission flow.

Request and Service Management

The Chief Steward acts as the central hub for all guest service requests.

- Receive and categorize requests
- Actions:
    - Fulfill
    - Escalate
    - Log
- Route requests to:
    - Galley
    - Medical
    - Engineering (non-critical)
    - Bridge (if necessary)

This creates a controlled service pipeline with accountability and traceability.

Communications Coordination

The STW function manages guest-related communications.

- Send messages to guests
- Coordinate with:

  - Galley (meal service)
  - Medical (guest care)
  - Bridge (schedule coordination)
- Maintain communication clarity without overloading command channels

Satisfaction Monitoring

The system tracks guest satisfaction as a measurable operational metric.

- Monitor satisfaction scores (e.g., 4.8 rating)
- Identify trends or issues
- Trigger corrective actions when thresholds drop

This introduces a quantitative feedback loop into hospitality operations.

Authorization and Limitations

Authority Level

- Typically **Support Tier**
- May include limited elevated permissions for:
  - Guest safety
  - Emergency coordination

Restrictions

The STW function cannot directly control:

- Propulsion systems
- Reactor or power distribution
- Navigation systems
- Core life-support infrastructure

However, it can:

- Request actions from authorized roles
- Escalate issues through proper channels

Operational Role in the System

The Chief Steward serves as: The operational bridge between human experience and ship systems. It ensures that:

- Guests remain informed, comfortable, and engaged
- Crew resources are efficiently coordinated
- Non-critical operations do not interfere with mission-critical functions

Design Intent

The STW function exists because:

- Guest operations require constant coordination but not full system authority
- Hospitality tasks must be centralized but separated from command systems
- The experience must feel intentional, structured, and responsive

Summary

The Chief Steward function transforms the ship from a purely technical system into a livable, experiential environment.

It is responsible for:

- Managing people instead of machinery
- Coordinating experience instead of execution
- Maintaining flow instead of control

Together with S.C.O.U.T., it ensures that the mission runs smoothly—and the people onboard experience it as seamless, organized, and immersive.

5.10 CHF — Chef

Chef's Console.

The Chef (CHF) function is responsible for the planning, preparation, and delivery of all food services aboard the vessel, including inventory management, dietary compliance, and meal scheduling. It operates as a logistics-driven support system with direct impact on crew health, morale, and mission sustainability.

While not a command role, the CHF function is a critical resource management node, balancing consumption, supply longevity, and dietary constraints in a closed environment. The Chef console is optimized for resource visibility and operational timing.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	**Stores & Inventory** → supply levels and depletion rates
Primary Workspace (Center)	**Meal Schedule** → timeline and preparation state

Display Zone	Default Configuration
Right Configurable Display	**Dietary & Allergens** → constraints and special cases
Quick Info Strip	• Covers (total meals) • Next mealtime • Produce level • Water allocation • Days of stores remaining • Allergen count

Control Modules

- **Inventory** → count, order, receive, waste
- **Menu** → plan, schedule, substitute, post
- **Dietary** → profiles, allergens, flags, review
- **Comms** → steward, medical, crew messaging, bridge

Keypad Tier Configuration

Keypad Module	Role-Specific Function
Inventory	count, order, receive, waste
Menu	plan, schedule, substitute, post
Dietary	profiles, allergens, flags, review
Comms	steward, medical, crew messaging, bridge

Shortcut and User Key Assignments

Key	Assigned Function
1–3	
4–6	

Key	Assigned Function
7–9	
USER A	
USER B	
USER C	
USER D	

Core Responsibilities

Food Inventory and Stores Management

The Chef maintains full control over all consumable resources.

Capabilities include:

- Monitor inventory levels:
  - Dry stores
  - Refrigerated goods
  - Frozen reserves
  - Fresh produce
  - Potable water allocation (galley share)
- Track:
  - Percentage remaining by category
  - Estimated days of supply remaining (e.g., 41 days)
- Manage inventory actions:
  - Count
  - Order (if resupply available)
  - Receive
  - Waste tracking

This ensures sustainable consumption and early detection of supply risks.

Meal Planning and Scheduling

The CHF function structures all food service operations.

- Plan daily meal cycles:
  - Breakfast
  - Lunch

    - Dinner
    - Late mess
- Track meal states:
    - Served
    - Preparation (PREP)
    - Queued
- Align meal timing with:
    - Crew duty cycles
    - Guest activity schedules (via Steward)

This provides predictable operational rhythm and resource allocation.

Dietary and Allergen Management

The Chef enforces all dietary requirements and restrictions.

- Track dietary categories:
    - Vegetarian
    - Gluten-free
    - Religious (e.g., Halal)
    - Medical restrictions
- Monitor allergen risks (e.g., nut allergy)
- Flag and manage special requests
- Assign dietary profiles to individuals or cabins

This ensures safe and compliant food service in a mixed-crew/guest environment.

Menu Engineering and Adaptation

The CHF role dynamically manages menu composition.

- Plan menus based on:
    - Inventory availability
    - Nutritional requirements
    - Guest preferences (VIP overrides)
- Modify menus via:
    - Substitution logic
    - Ingredient reallocation
- Post and communicate finalized menus

This enables flexibility under constrained supply conditions.

Nutritional Oversight

The system ensures adequate nutritional intake across all personnel.

- Balance:
  - Calories
  - Macronutrients
  - Hydration
- Coordinate with Medical for:
  - Special dietary prescriptions
  - Recovery diets
- Adjust menus based on:
  - Activity level
  - Mission phase

Service Load Management

The Chef tracks and manages meal demand.

- Monitor total meal count (covers, e.g., 24)
- Adjust preparation scale accordingly
- Anticipate peak demand periods
- Coordinate with Steward for:
  - Guest scheduling
  - Special events

Waste and Efficiency Control

Closed-system operation requires strict waste management.

- Track food waste
- Optimize ingredient utilization
- Reduce spoilage risk
- Balance freshness vs longevity

This supports long-duration mission sustainability.

Communications and Coordination

The CHF function interfaces with multiple departments.

- **Steward** → guest schedules, VIP needs
- **Medical** → dietary restrictions, recovery meals
- **Bridge** → schedule adjustments during mission events
- **Crew** → general meal notifications

Authorization and Limitations

Authority Level

- **Support Tier (Specialist)**

Restrictions

The CHF function cannot directly control:

- Life support systems
- Environmental systems (except indirectly via requests)
- Command or navigation systems

However, it can:

- Influence operational tempo via scheduling
- Request resource adjustments
- Escalate supply risks

Operational Role in the System

The Chef serves as: The sustainment and morale engine of the vessel It ensures:

- Continuous nourishment
- Efficient use of consumables
- Compliance with health and safety constraints

Design Intent

The CHF function exists because:

- Food is a finite, mission-critical resource
- Nutrition directly impacts performance and health
- Guest experience depends heavily on meal quality and consistency

Summary

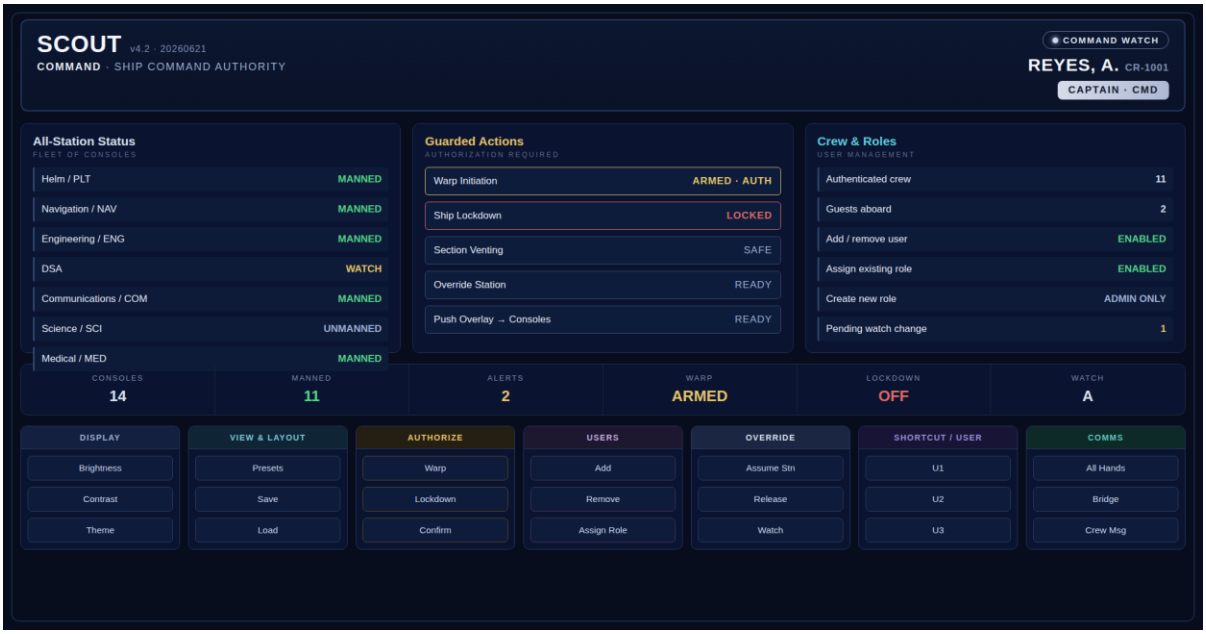
The Chef function transforms raw supplies into a managed life-support subsystem for nutrition.

It is responsible for:

- Managing consumption instead of production
- Sustaining people instead of systems
- Balancing quality, safety, and scarcity

Together with S.C.O.U.T., it ensures that the ship remains fed, efficient, and operational—no matter how long the mission endures.

5.11 CMD-T — Command Tier (Captain)[1]



Command Tier Console (Captain)

The Command (CMD-T) tier is the highest level of operational authority aboard the vessel. It is held by the Captain and represents command of the ship itself — as distinct from the Administrator layer, which governs the system. Where the Administrator defines what the system is, Command directs what the ship does.

A console authenticated at Command tier gains whole-ship oversight and the authority to authorize guarded actions, manage the crew roster, and project a working view onto any other console. Command tier inherits every capability of the tiers below it and adds the distinct command authorities described below.

Interface Characteristics

Display Zone	Default Configuration

[1] *Permission-Tier Configurations.* The configurations defined before 5.11 CMD-T define the functional roles a console can load (the job a crew member performs). The three configurations that follow define the permission tiers from Section 4.6.1 — the authority a credential carries, independent of function. Because the two axes are independent, any functional role above may be held at any of these tiers; the tier governs what the operator may do to the ship and to the system, while the role governs which workspace is presented. Command, Officer, and General are documented here as standard configurations because each presents a distinctive console arrangement that is not tied to a single bridge station.

Left Configurable Display	All-station status across the console fleet: which stations are manned, on watch, or unmanned, with alert state per station.
Primary Workspace (Center)	Guarded-action authorization and command controls: warp initiation, lockdown, section venting, station override, and overlay push.
Right Configurable Display	Crew and roles: authenticated crew and guests, add/remove user, assign existing role, and pending watch changes.
Quick Info Strip	Configurable — defaults to consoles, manned count, alerts, warp state, lockdown state, and active watch.

Core Capabilities

Whole-Ship Operation

A Command-tier credential may operate any station in any role. The Captain is never confined to a single workspace; the console can assume the helm, navigation, engineering, or any other operational view as the situation requires.

- Operate any station in any functional role
- Assume or release any station on the bridge
- Override a junior operator at any station when required

User Management

Command tier carries the limited subset of administrative capability that keeps the Captain independent of the Administrator for routine crew changes.

- Add and remove users
- Assign which already-existing roles a crew member may hold
- Assign multi-role qualifications from the existing role set

Command tier **cannot** create new roles, screens, or functions. The creation of new system constructs remains exclusive to the Administrator layer (Section 4.6.4).

Guarded-Action Authorization

Command tier is the authority that arms and authorizes guarded ship actions — those gated behind a secondary authorization step.

- Authorize warp initiation
- Authorize ship lockdown
- Authorize section venting and other guarded actions

- Provide one half of a dual-authorization pairing

Overlay Push

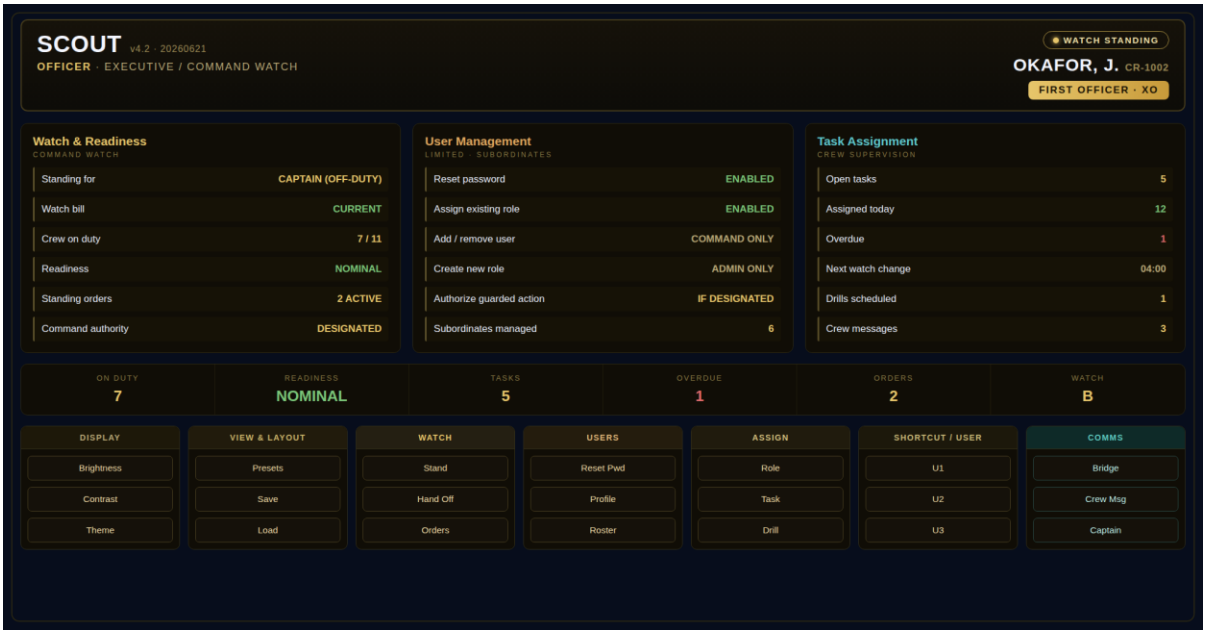
The Captain can project a view or annotation onto any other console, directing the crew's attention or sharing a working layout across stations.

- Push an overlay or working view to one or more consoles
- Recall or clear a pushed overlay

Authority Boundary

Command tier sits directly below Administrator on the authority ladder. It is a command authority, not a system-configuration authority: it directs the ship and its crew but cannot alter the definition of the system. The boundary is deliberate — it ensures that operational command and system governance remain separate, so that no single credential both commands the ship and redefines the system that runs it.

5.12 OFF-T — Officer Tier (Executive)



Officer Tier Console (First Officer / Senior Staff)

The Officer (OFF-T) tier is the senior operational authority below Command. It is held by the First Officer and senior staff and corresponds to the First Officer tier of Section 4.6.1. Its defining purpose is continuity of command: an Officer-tier credential can stand a command watch when the Captain is off-duty, carrying delegated command authority for the duration of that watch.

Like Command, an Officer-tier credential may operate any station in any role. Beyond station operation, it adds watch-standing and a limited band of user management appropriate to a senior officer supervising subordinates.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	Watch and readiness: who the watch is being stood for, watch bill currency, crew on duty, readiness state, and active standing orders.
Primary Workspace (Center)	Limited user management: subordinate password resets, assignment of existing roles, and the elevated controls available only when designated for command watch.
Right Configurable Display	Task assignment and crew supervision: open and assigned tasks, overdue items, next watch change, and scheduled drills.

Quick Info Strip	Configurable — defaults to crew on duty, readiness, open tasks, overdue count, standing orders, and active watch.

Core Capabilities

Station Operation

Officer tier operates any station in any functional role, exactly as Command does, so that a senior officer can take any position the watch requires.

- Operate any station in any functional role
- Supervise and, where qualified, override a junior operator at the same station

Command Watch

The central purpose of the tier: standing command in the Captain's absence.

- Stand a command watch when the Captain is off-duty
- Assume designated Command authority for the duration of the watch
- Maintain the watch bill and issue standing orders for the watch
- Hand off the watch to a relieving officer

When designated for command watch, an Officer-tier credential may exercise the guarded-action authorizations of Command tier for that watch. Absent that designation, those authorizations remain with Command.

Limited User Management

Officer tier carries a narrower band of user management than Command — scoped to subordinates and to roles that already exist.

- Reset a subordinate's password
- Assign already-existing roles to subordinates
- Review subordinate profiles and watch assignments

Officer tier cannot add or remove users — that authority belongs to Command — and cannot create new roles, screens, or functions, which remain exclusive to the Administrator layer.

Crew Supervision

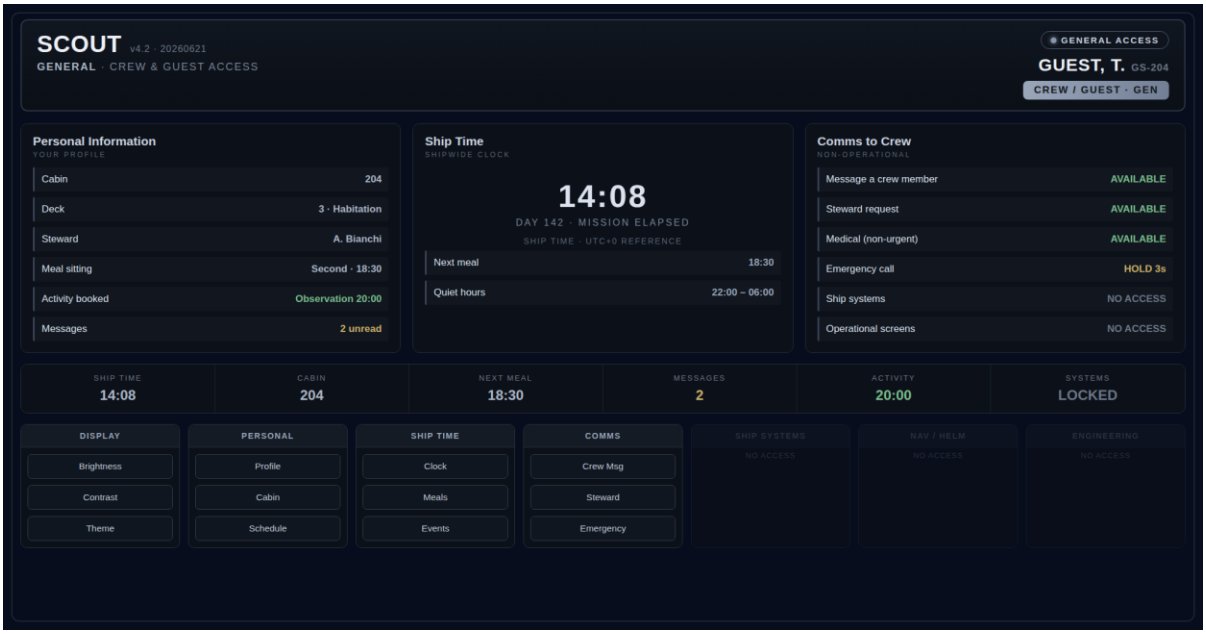
The Officer console is the First Officer's active-supervision view, oriented toward crew readiness and task flow.

- Assign and track crew tasks
- Monitor crew readiness and overdue items
- Schedule and run drills

Authority Boundary

Officer tier sits between Command and Senior Operator on the authority ladder. It holds full station operation and senior supervisory authority, and it can assume Command authority **only** when designated to stand a command watch. Its user management is limited to subordinates and existing roles; it never adds or removes users, and never alters the system's definition.

5.13 GEN-T — General Tier (Crew / Guest)



General Tier Console (Crew / Guest)

The General (GEN-T) tier is the baseline authority available to any crew member or guest. It corresponds to the General tier of Section 4.6.1 and provides basic, personal, and non-operational functionality only. A General-tier credential cannot operate ship systems under any circumstances; the operational keypad columns are present but inert, shown as no-access.

General tier exists so that anyone aboard — including guests and untrained participants — can use a console for personal and social functions without any risk to ship operation. It is the floor of the authority ladder: it adds no operational authority and inherits none from above.

Interface Characteristics

Display Zone	Default Configuration
Left Configurable Display	Personal information: cabin and deck, assigned steward, meal sitting, booked activities, and personal messages.
Primary Workspace (Center)	Shipwide clock and schedule: ship time, mission-elapsed day, next meal, and quiet hours.
Right Configurable Display	Comms to crew (non-operational): messaging a crew member, steward and non-urgent medical requests, and an emergency call. Ship systems and operational screens are shown as no-access.

Quick Info Strip	Configurable — defaults to ship time, cabin, next meal, messages, next activity, and a locked systems indicator.

Core Capabilities

Personal Functionality

- View personal information: cabin, deck, steward, and schedule
- View booked activities and personal messages
- View ship time, mission-elapsed day, meal times, and quiet hours

Non-Operational Communications

- Message a crew member
- Submit a steward or non-urgent medical request
- Place an emergency call (with a brief confirmation hold)

Non-Operational Screens

- Access guest-facing and informational screens
- Adjust console display preferences (brightness, contrast, theme)

Explicit Restrictions

General tier has no operational authority. The following are unavailable and appear as no-access on the console:

- Operating any ship system (propulsion, navigation, helm, engineering, life support)
- Operating any functional role workspace
- Authorizing any action, guarded or routine
- Any user management or system configuration

Authority Boundary

General tier is the lowest tier on the authority ladder, sitting laterally below the Support tier (galley, hospitality, and medical functions). It provides presence and personal utility without operational reach. Any operational capability requires Operator tier or higher, assigned by Command or the Administrator.

6. Personal Audio Link

The personal audio link is each crew member's continuous, private connection to SCOUT It takes the form of a pair of compact in-ear devices — the crew earbuds — that keep the wearer in contact with the ship intelligence anywhere aboard, independent of any console. Where the console provides authenticated command authority at a station, and the public audio interface provides voice interaction in a compartment, the personal link provides presence: SCOUT is always one word away, and the crew member is always reachable.

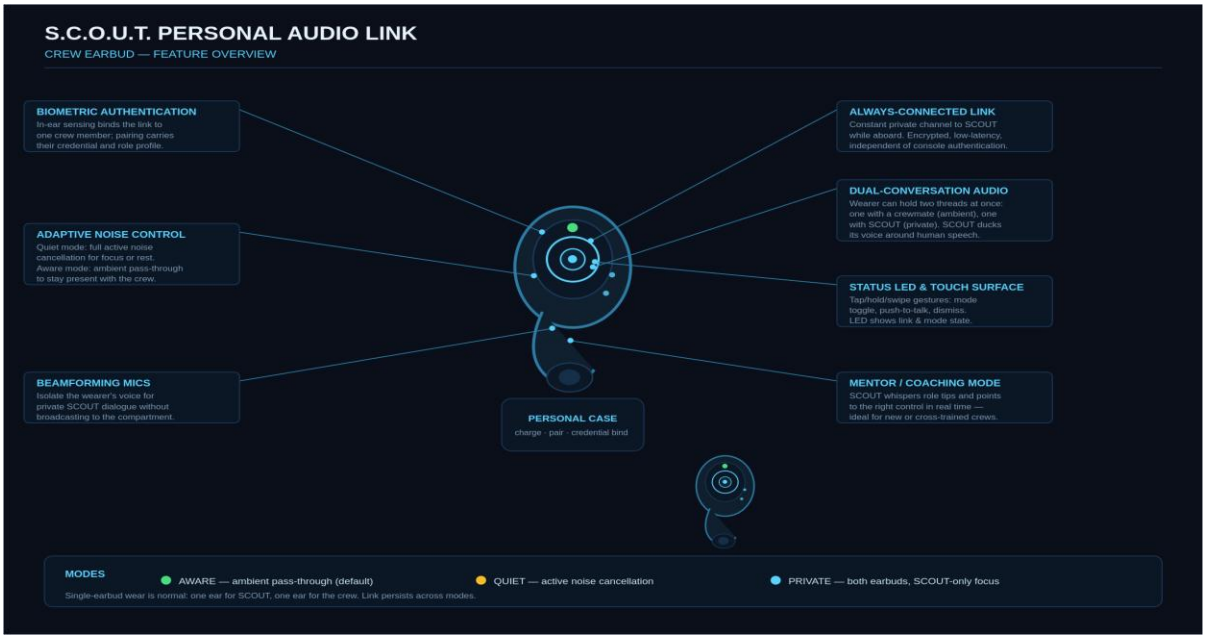


Figure 2. SCOUT personal audio link (crew earbud) feature overview. The earbud is the Personal tier of the crew interaction model and keeps each crew member continuously connected to the ship intelligence.

6.1 Always-Connected Presence

While worn, an earbud maintains a constant encrypted, low-latency link to SCOUT over the ship's internal wireless mesh. The link is independent of console authentication: contact with SCOUT is continuous from the moment the earbud is worn and recognized, whether or not the wearer is seated at a station. Command authority over ship systems is still governed by the wearer's credential exactly as at a console — the link grants conversation and advisories to anyone wearing their own earbud, but state-changing commands are validated against authority. A crew member walking the corridors can ask SCOUT a question, receive an alert, or be coached through a procedure without touching a surface.

6.2 Wear Patterns: One Ear or Two

The earbuds are designed to be worn singly as the normal case. Most of the time a crew member wears one earbud, leaving the other ear open to the compartment and to fellow

crew. This is deliberate: it keeps the wearer present in the human conversation around them while remaining in contact with SCOUT Both earbuds are worn when the crew member wants full immersion or privacy — concentrated work, a sensitive briefing, rest with active noise cancellation, or an environment too loud for a single bud to overcome.

6.3 Adaptive Noise Modes

Following the familiar model of high-quality consumer noise-cancelling earbuds, each earbud offers two primary acoustic modes, plus a focused third mode for paired wear:

Mode	Behavior and Typical Use
Aware (default)	Ambient sound passes through naturally, so the wearer hears the compartment and fellow crew normally, with SCOUT's voice mixed in. This is the default and most-used mode, because crew are usually interacting with people and the ship at the same time.
Quiet	Full active noise cancellation suppresses ambient sound for focus, rest, or work in noisy machinery spaces. SCOUT and priority alerts still come through; the AI can momentarily lift cancellation to admit a crewmate's voice when addressed.
Private (paired)	Both earbuds worn, ambient minimized, attention given to a SCOUT-only channel — used for sensitive dialogue, detailed coaching, or briefings the wearer does not wish to share with the compartment.

Mode is changed by a touch gesture on the earbud, by voice, or automatically: SCOUT may suggest Quiet mode when it detects the wearer is concentrating in a loud space or drop to Aware mode when a crewmate begins speaking to them. The wearer can always override.

6.4 Dual-Conversation Audio

The defining capability of the personal link is that a crew member can hold two conversations at once: one with a fellow crew member in the compartment, and one with SCOUT in the ear. SCOUT manages the overlap so the two threads do not collide:

- **Voice ducking.** When a human speaks to the wearer, SCOUT lowers or pauses its own speech and resumes when the human thread allows, the way a considerate second speaker would.

- **Whisper delivery.** Routine tips and prompts are delivered quietly and briefly, sized to fit the gaps in the wearer's other conversation rather than interrupting it.
- **Beamforming capture.** The earbud's microphones isolate the wearer's own voice, so they can speak to SCOUT quietly without broadcasting to the compartment, and SCOUT can tell whom the wearer is addressing.
- **Thread separation.** SCOUT tracks which remarks are directed to it versus to the crewmate, so the wearer can move between the two without prefacing every sentence.

6.5 Mentor and Coaching Mode

The personal link is especially valuable for new or cross-trained crews. Because SCOUT knows the wearer's role, credential, and the live state of the ship, it can coach in real time through the earbud while the crew member works:

- A crew member acting as Navigator can receive quiet, just-in-time guidance — which solution to choose, what a deviation means, what to check before committing a course — without that guidance appearing on shared displays or being heard by others.
- SCOUT can tell the wearer which control to interact with next, naming the keypad module or pointing to the console zone, effectively walking an inexperienced operator through a procedure step by step.
- Because coaching is private to the earbud, a crew member can learn a role under live conditions without broadcasting their inexperience to the rest of the crew.

This lets a small or green crew operate above its nominal experience level: SCOUT supplies the procedural knowledge through the ear while the human supplies judgment and authority.

6.6 Authentication and Personalization

Each earbud binds to one crew member. In-ear biometric sensing confirms the wearer's identity when the earbud is worn, and the link then carries that crew member's credential and role profile. A borrowed or unrecognized earbud provides only general, non-privileged interaction until its wearer is identified. The personal case charges the pair, holds the binding, and re-pairs a replacement earbud to the same crew member.

6.7 Controls, Privacy, and Degraded Behavior

- **Gesture controls.** Tap, double-tap, hold, and swipe on the earbud surface map to mode toggle, push-to-talk to SCOUT, dismiss or acknowledge an alert, and volume. A status LED indicates link and mode state.

- **Privacy.** The personal channel is private to the wearer. SCOUT will not relay a private earbud conversation to other crew or to the public address system without the wearer's instruction, except where a shipwide emergency override applies.
- **Public vs. private.** Alerts that concern only the wearer come through the earbud; shipwide alerts sound on both the earbud and the public audio interface so they reach crew who are not wearing one.
- **Degraded behavior.** If the personal link drops, the public audio interface and consoles remain fully available, and SCOUT notifies the wearer that the private channel is down. The earbud fails safe to a pass-through (Aware) acoustic state, so it never blocks a crew member's hearing when unpowered.

7. Persistent Utility Modules (All Roles)

The lower utility tier remains available in every console configuration. Role-specific behavior is limited to the elevations and lockouts noted below.

7.1 Alerts & Notifications

Alert levels ALL / CRIT / WARN / INFO filter what the console surfaces; audible alerts toggle independently. Role lockouts: DSA mode cannot reduce alerts below WARN while an unknown contact or breached hazard envelope is tracked; ENG mode cannot silence CRIT-level reactor or life-support alarms; distress traffic generates a CRIT alert shipwide regardless of console settings.

7.2 Communications

Channel, volume, squelch, PTT, mute, and channel management are available at every station so any crew member can answer traffic. In COM mode the module is mirrored into the keypad tier and expanded into the full traffic workspace described in Section 5.

7.3 Power & Priority

Each console can request LOW / NOM / HIGH power priority for the systems its role commands. Requests arbitrate at the Engineering station, or at the AI power manager when no Engineering console is active. LOAD SHED executes the pre-planned shed sequence and is a guarded action outside ENG mode.

7.4 Haptic Feedback

Haptic intensity and audio cue level are operator preferences stored in the crew profile, with role-specific defaults (e.g., PLT 90% haptic). Guarded actions override the operator's setting with mandatory escalating-intensity profiles so that protective actions are tactilely unambiguous in any role.

7.5 Display Assignment

Left / center / right assignment and console linking per Section 4.5. During heightened readiness the command station may force-push the DSA situational overlay to a designated zone of every linked console; the affected zone displays a LINKED — COMMAND banner.

8. Custom Role Composition

The CUSTOM ROLE function permits any credentialed crew member to compose a configuration from the full widget, module, and keybinding library. Custom roles are intended for mission-specific assignments (e.g., prize crew operations, planetary landing party coordination, medical triage) that do not map cleanly onto the six standard roles.

8.1 Composition Rules

- A custom role is assembled in the Layout Editor from the full widget library, keypad module library, and keybinding map.
- Control authority for a custom role is the union of authorities individually held by the operator's credential; composing a role never grants authority the operator does not already hold.
- Guarded actions retain their two-stage confirmation and mandatory haptic profiles in all custom roles and cannot be rebound to single-press keys.
- Custom roles are stored in the operator's crew profile and follow them to any console; they may also be published to the ship library for shared use, subject to command approval.

8.2 Representative Custom Roles

Custom Role	Typical Composition
Landing Party Coordinator	Center: party telemetry and topographic map. Left: comm status for suit channels. Right: biosign sensor feed. USER keys: recall party, mark extraction point, open suit all-call, AI environmental watch.
Medical Triage	Center: crew vitals board. Left: compartment atmosphere status. Right: medical database. Keypad numerics remapped to casualty classification.
Prize / Boarding Operations	Hybrid DSA/ENG view of a docked vessel: its schematic on center, own-ship situational sphere on right, boarding team comms on left.
Watch Officer (reduced crew)	Condensed summary of all six standard roles' Quick Info data with AI-monitored thresholds; any touched panel expands toward the relevant full role configuration.

9. SCOUT Supervisory Intelligence

The SCOUT AI is the supervisory intelligence at the center of the system. It is integral to every interface — console, public audio, and personal link — rather than an accessory to any of them. It is designed around the operational reality of the Scout Class: a small crew, long independent deployments far from support, and a workload that routinely exceeds the number of hands available. The AI's purpose is to let a reduced crew operate the vessel as though fully staffed, to keep every station useful even when unoccupied, and to keep every crew member supported wherever they are aboard.

9.1 Distributed Supervisory Architecture

The ship's AI advises, coordinates, simulates, and optimizes. It uses a distributed supervisory architecture composed of separate flight, engineering, warp-field, damage-control, habitat, science, and emergency autonomy modules. It can predict failures, optimize power and thermal loads, coordinate maintenance, pilot drones, and automate routine operations, communicating with the crew through a natural-language interface.

The supervisory intelligence is capable of:

- Mission planning and navigation support
- Crew assistance and a natural-language voice interface
- Situation summaries and anomaly detection
- Emergency recommendations
- Training simulations and live coaching
- Power and thermal optimization

Critical actions such as warp initiation, reactor mode changes, and main-engine burns require human authorization and are enforced by local controllers and hardware interlocks (Sections 11 and 12).

9.2 Voice Command and Natural Interaction

Every function reachable by touch is reachable by voice, whether spoken at a console, into the public audio interface, or privately through the personal link. The AI accepts natural conversational commands rather than rigid syntax, resolves them against the active role's control authority, and confirms any guarded action verbally before execution exactly as the touch interface does. Voice and touch are interchangeable mid-task: an operator may begin plotting a course by voice and complete it by touch, or the reverse, with state preserved across both.

- **Authority-aware.** A voice command is validated against the speaker's credential and the active role; the AI will not execute an action the operator could not perform by touch, regardless of which interface the command arrives through.
- **Confirmation-preserving.** Guarded actions (all-stop, load shed, reactor SCRAM, distress transmission, coordinated evasion) require the same two-stage confirmation by voice as by touch, including the verbal read-back of what is about to happen.
- **Context-carrying.** The AI tracks the active selection and recent actions, so follow-on commands such as “track that one” or “put it on the right screen” resolve correctly. Context follows the crew member across interfaces — a conversation begun on the personal link continues when they reach a console.

9.3 Autonomous Monitoring

The AI continuously monitors all ship systems and the full sensor picture in parallel, independent of which role any console currently displays. It surfaces what matters to the operator's current role and escalates anything that crosses a threshold, regardless of role:

- System thresholds: reactor output, power margin, hull integrity, life-support reserves, and consumables, with predictive failure analysis that flags trends before they become faults.
- Situational thresholds: new or unknown contacts, breached hazard envelopes, and closure rates that warrant attention, raised to the DSA picture and to the command station.
- Communications watch: continuous monitoring of guard and distress frequencies, raising a CRIT alert shipwide on distress traffic even when no console is in COM mode.

Critical actions such as warp initiation, reactor mode changes, and main-engine burns require human authorization and are enforced by local controllers and hardware interlocks.

9.4 Recommendation and Layout Assistance

The AI proposes, the operator disposes. It may recommend a layout preset suited to the developing situation — surfacing the Engineering Damage Control preset when hull faults register, or the DSA Hazard Watch preset when a debris field is detected — but it never reconfigures an occupied console without acknowledgment. Recommendations appear as a dismissible prompt on the affected zone; a single touch or a word accepts.

9.5 Role-Specific Delegation

Each standard role assigns one USER key (and the equivalent voice command) to a role-relevant AI delegation function, allowing the operator to hand a bounded task to the AI while retaining oversight:

Role	Delegated AI Function
PLT	Hand off helm to the AI for hold-attitude, hold-course, or station-keeping, with verbal confirmation and instant manual resumption.
NAV	Request AI verification of a plotted course solution against ephemeris, hazards, and fuel state before committing it to the helm.
DSA	Delegate coordinated evasion: the AI computes and proposes the evasive vector and, on acknowledgment, coordinates the handshake with the Pilot console.
ENG	Request AI narration of the active fault tree and recommended damage-control sequencing during a casualty.
COM	Toggle AI live translation and transcription on the active channel, including first-contact linguistic support.
SCI	Run AI comparison of current sensor readings against the survey database to classify objects and flag anomalies.

9.6 Coaching Through the Personal Link

The supervisory intelligence delivers its most direct crew support through the personal audio link (Section 6). Because the AI knows each wearer's role, credential, and the live ship state, it can coach privately and in real time: guiding a Navigator through a course solution, naming the next control an inexperienced operator should touch, or talking a crew member through an unfamiliar procedure — all in the wearer's ear, without appearing on shared displays. This is the principal mechanism by which a small or green crew can operate above its nominal experience level.

9.7 Reduced-Crew and Unmanned-Station Operation

Because every station's data and authority are available to the AI, an unoccupied console is not a lost capability. The AI maintains watch over the functions of any vacant station and routes alerts to a crewed console, to a crew member's personal link, or directly to voice. A single watch officer can supervise the whole vessel through the Watch Officer custom role

(Section 8.2), with the AI holding the routine workload of the unstaffed roles and escalating only what needs a human decision.

- **Graceful escalation.** Routine matters are handled or logged; threshold events are raised to the nearest crewed console or to a crew member's earbud; anything requiring a guarded action is brought to a human, never executed autonomously.
- **No autonomous guarded actions.** The AI will recommend and prepare guarded actions but will not arm, shed, scram, transmit distress, or maneuver evasively without human confirmation, in any crewing state.

9.8 Degraded and Failure Modes

The interfaces back each other up. Loss of the AI leaves the touch console fully functional; loss of console surfaces leaves voice control available; loss of the personal link leaves the public audio interface and consoles available. If multiple paths are degraded, each console falls back to a minimal direct-control layout for its assigned role. The AI's monitoring and recommendation functions fail safe: on uncertainty it raises an alert to the crew rather than acting, consistent with the no-autonomous-guarded-actions rule.

9.9 Operating Guide and Checklist Execution

SCOUT's operational knowledge of the vessel is grounded in two companion documents: the Scout Class Operating Guide, which itemizes all 21 ship systems in a common six-phase structure (Startup, Operate, Monitor, Shutdown, Diagnose, Repair) with every item classified as a Control, Adjustment, or Sensor, and the per-system checklist workbooks derived directly from that itemization. SCOUT treats this itemization as its task vocabulary: every Control is an action it can execute by voice command or delegation, every Adjustment a setpoint it can verify or set within the operator's authority, and every Sensor a telemetry point it monitors continuously.

Checklist execution. An authenticated operator may direct SCOUT to run any phase checklist for any system ("SCOUT, run the FMS startup checklist"). SCOUT executes eligible items in sequence, announces each item with read-back, records per-item status (Pending, In Progress, Complete, N/A, FAULT), and presents the live summary rollup in the console Detail zone. An item returning FAULT halts the sequence and raises the system's Diagnose workflow.

Authority boundaries. Checklist execution obeys the same rules as all delegation (Sections 9.5 and 9.7): guarded and two-stage actions — hydrazine emergency dump, warp initiation, reactor mode changes, capacitor discharge, and their kin — always halt the sequence for authenticated human authorization, and the hardware interlocks of Section

11.4 cannot be bypassed in any crewing state. SCOUT prepares such items and presents the read-back; a human commits them.

Reduced-crew and physical work. Under reduced crewing, SCOUT may run Monitoring-phase checklists autonomously across unmanned stations, logging results and escalating exceptions per Section 9.7. Items that require physical presence — component-level valve line-ups, compute-blade replacement, Repair-phase service tasks — are assigned to crew (or to drones, where the Exploratory Drone System applies), with SCOUT coaching step-by-step through the personal audio link.

10. Operational Applications

SCOUT hosts the operational software the crew uses to run the ship. Applications are presented through the console widgets, addressable by voice, and monitored by the supervisory intelligence. The following applications are provided in the standard exploration configuration:

Application	Application	Application
Calibration System	Drone Control System	Damage Control
Cargo Management	Life Support Control	Docking
Ship Maintenance	Waste Management	Astronomical Suite
Diagnostic System	Propulsion Control	Communications
Food Inventory	Entertainment	Crew & Habitation
Sublight Propulsion	Training Software	Sensor & Science
Medical AI	Passenger Guidance	RCS Thruster Control
Door Access	Scheduling	Orbital Mechanics
Collision Avoidance	Internal Communications	Gravitational Stability
Enhancement & Analysis Systems	Reactor & Power Management	Warp Field Management System

Each application maps to the role configurations and control-authority profiles defined earlier: for example, Propulsion Control, Sublight Propulsion, and RCS Thruster Control are exposed at the Pilot and Engineering stations within their respective authority limits, while the Astronomical Suite and Sensor & Science applications anchor the Science role. Safety-critical applications (Reactor & Power Management, Warp Field Management, Life Support Control, Door Access) are subject to the hardware interlocks specified in Section 11. Each application also exposes its system's Operating Guide itemization, so the checklist workflows of Section 9.9 execute through the same applications the crew uses manually.

11. Computing Core

SCOUT runs on an all-classical, radiation-hardened distributed computing architecture. Three identical primary compute cores carry the full computational load of a frontier exploration vessel — warp-field modeling, navigation and orbital-mechanics solutions, sensor and survey data processing, and AI inference — under a two-out-of-three voting model, and a separate, physically protected survival core guarantees that survival-critical control never depends on the primary tier. Quantum processing is deliberately excluded from the architecture (Section 11.2).

11.1 Architecture Overview

The computing architecture is organized in three tiers that mirror the command structure of the vessel:

Tier	Function
Command Layer	Bridge, captain, mission control, and flight authority — where human command intent enters the system.
Autonomy Layer	The supervisory intelligence: navigation AI, fault management, maneuver planning, and safety-interlock supervision.
Control Layer	Reactor control, propulsion control, life support, RCS, doors, and sensors — the local controllers that act on the physical ship.

11.2 Triple-Core Classical Model

Critical computation is performed by three identical classical compute cores under two-out-of-three voting: the cores evaluate the same problem independently, and a disagreeing core is outvoted and flagged for diagnostics, so a single faulted core cannot drive a wrong result. Each core is independently capable of carrying the entire ship workload; the vaults are separated through the hull so that no single compartment loss — and no two adjacent compartment losses — disable computation. A physically protected survival core stands ready to assume survival control if the primary tier is lost.

Core	Location	Primary Role
Compute Core Alpha	Forward vault, near the bridge / command section	Lead: command, navigation, warp-field and mission planning, AI inference
Compute Core Bravo	Aft vault, engineering section near reactor / power control	Lead: engineering computation — reactors, propulsion, power routing, thermal control
Compute Core Charlie	Midship vault, Service Deck, physically protected	Voting third and science/survey lead; assumes either lead role on a vault casualty
Survival Core	Service Deck workshop, physically protected	Hardened, deterministic survival-control core; assumes life support, basic navigation, and damage control if the primary cores or their compartments are lost
Local hardware interlock	All critical systems	Physical safety mechanism that prevents dangerous operations unless real-world conditions are met
Manual mechanical override	All critical systems	Breaks or overrides automated control logic to force a critical system into a specific state

Quantum processing is deliberately excluded from the Scout Class computing architecture. Practical quantum hardware demands deep-cryogenic operation and extreme isolation from vibration, electromagnetic noise, and radiation — precisely the disturbances a working starship generates continuously and that casualty conditions amplify. Its advantages concentrate in problem classes peripheral to SCOUT's actual workloads, while the workloads that matter — real-time control, physical simulation, and AI inference — are served better per kilogram, per kilowatt, and per failure mode by dense classical processing. A quantum tier would add mass, power draw, cryogenic plant, and

fragile failure modes without adding mission capability; the all-classical architecture provides both frontier computational power and an unconditional floor of survivability.

11.3 Core Hardware Configuration

The three primary cores are identical in every respect — hardware, firmware, and installed capacity — so any core can carry any lead role and maintenance spares are common across all three vaults. Each core occupies a dedicated, environmentally isolated compute vault.

Element	Configuration (per vault)	Notes
Compute modules	24 hot-swappable compute blades	Any 16 blades sustain the full ship workload
General processing	512-core radiation-hardened chiplet CPU per blade; lockstep-capable pairs	Deterministic partitions supervise the Control Layer
AI inference	8 tensor-accelerator modules per blade (~2 PFLOPS FP8 per blade)	~50 PFLOPS FP8 per vault for SCOUT inference and voice
High-precision compute	Wide-vector units, ~1.5 PFLOPS FP64 aggregate	Warp-field modeling, orbital mechanics, survey reduction
Working memory	0.5 PB high-bandwidth memory + 4 PB solid-state working store	Mirrored across blade pairs
Mission archive	50 PB radiation-tolerant solid-state array	Erasure-coded across all three vaults; survives loss of any one
Power	~220 kW nominal from the Ship Service Bus (protected load)	Under 0.1% of one reactor's DEC output; Survival Core on the Emergency Bus

Cooling	HAB-loop cold plates (TMS), redundant supply	Passive thermal ride-through ≥ 30 min; over-temp sheds inference before control
Mass	~3.5 t per vault; ~11 t computing plant total	Excludes local controllers and consoles
Environment	EMI-hardened vault, vibration-isolated racks, inert-gas fire suppression	Vaults sited adjacent to inter-hull water-shield cells

Survival core. The survival core is deliberately minimal: quad-redundant lockstep controllers, fully radiation-hardened, with no AI inference capability. It draws under 2 kW from the Emergency Bus with an independent battery reserve, connects to local controllers over the physically separate Emergency Net, and runs fixed, formally verified survival-control software — life support, basic navigation, and damage control — that is never updated underway.

Distributed edge tier. Below the vaults, the Control Layer is physically distributed: every ship system carries dual local autonomous controllers that continue safe operation if the vaults or networks are lost, and every console retains sufficient local compute to run its active station function stand-alone. The personal audio links perform wake-word detection and basic command processing locally.

Interconnect and sparing. The vaults interconnect over dual counter-rotating optical fiber rings carried in the armored service trunks (routed with the PDS superconducting conduits, away from casualty zones), with a deterministic time-triggered segment reserved for control traffic. Compute blades are hot-swappable at the rack; the vessel carries 25% blade spares, common to all vaults, and blade replacement is a certified crew maintenance task.

11.4 Hardware Interlocks

All critical ship systems employ local hardware interlocks: physically independent safety circuits wired directly to sensors and actuators that prevent unsafe operations regardless of software state. Reactor containment, warp-ring synchronization, airlock sequencing, propulsion ignition, and capacitor discharge all require hardware-safe conditions before activation. These interlocks remain operational even during network failure, AI malfunction,

partial power loss, or a complete outage of the primary compute tier. No software state can bypass them.

12. Network Architecture

The Scout Class uses a distributed, hardened command-and-control network with isolated flight, engineering, habitat, science, and emergency domains. Critical systems use triple modular redundancy, local autonomous controllers, physical safety interlocks, and manual fallback controls. The supervisory intelligence coordinates navigation, power, life support, damage control, and diagnostics across the domains, but warp initiation, reactor mode changes, and major propulsion events require human authorization.

12.1 Isolated Network Domains

The network is partitioned into independent domains so that a fault or compromise in one cannot propagate to another:

Network	Purpose
Command Net	Bridge and command authority
Flight-Critical Net	Navigation, propulsion, RCS
Engineering Net	Reactor, power, cooling, thermal systems
Habitat Net	Cabins, galley, lighting, environment
Science Net	Observatory, sensors, mission data
Maintenance Net	Drones, diagnostics, repair systems
Emergency Net	Independent backup control

The Emergency Net is physically separate, with its own power and cabling, so that it survives the loss of any other domain. The personal audio link and public audio interface ride the Command and Habitat nets with emergency fallback onto the Emergency Net, ensuring the crew can always reach SCOUT

12.2 Redundancy Model

A triple modular redundancy model is implemented for critical computation: three independent cores run the same calculation, and if one disagrees the other two outvote it (Section 11.2). Critical systems combine this with local autonomous controllers, physical

safety interlocks, and manual fallback controls, so that control degrades gracefully rather than failing outright. The supervisory intelligence coordinates the domains, but human authorization and hardware interlocks gate every irreversible physical action.

Appendix A. Cross-Role Comparison Summary

Role	Primary Workspace Focus	Cursor Pad Behavior	USER A (Guarded / Primary Action)
PLT	Helm plot and flight path	RCS translation / throttle	All-stop
NAV	Course and waypoint chain	Chart pan/zoom/rotate	Commit course to helm
DSA	360° situational sphere	Sensor reticle slew	Initiate coordinated evasion
ENG	Interactive ship schematic	Schematic navigation	Execute load shed
COM	Traffic workspace / spectrum	Frequency tuning	Transmit distress
SCI	Scan analysis workspace	Sensor pointing	Commit deep-scan

Role	Quick Info Strip Contents	Notable Lockouts / Automatics
PLT	Speed, heading, altitude, ETA, damper load	Auto layout-lock above 2G
NAV	Waypoint, cross-track error, burn countdown, ETA	Course commit requires Pilot acknowledgment
DSA	Tracks, nearest range, closure, evasion state, ECM	Alerts floor at WARN with unknown contact / hazard
ENG	Reactor %, power margin, hull, life support hours	CRIT reactor/life-support alarms unsilenceable

Role	Quick Info Strip Contents	Notable Lockouts / Automatics
COM	Channel, signal, encryption, unread count	Guard channels monitored in all modes
SCI	Scan target, completion %, storage remaining	Deep scans auto-negotiate power with ENG

Note: the Scout Class mounts no weapons; the DSA role provides assessment, avoidance, and non-weapon countermeasures only. No role exposes offensive controls in standard configuration.

Appendix B. Forward Compatibility — Optional Tactical Module

Vessel Mandate and Absence of Weapons

The Scout Class is an unarmed exploration and scientific survey vessel. Per the vessel specification, it carries no conventional tactical or weapons systems; its design emphasizes state-of-the-art propulsion, advanced and experimental sensor suites, and scientific instrumentation. Accordingly, SCOUT defines no weapons-management role. The situational-awareness and self-protection functions an explorer genuinely requires — contact detection, hazard tracking, threat assessment, evasion, and non-weapon countermeasures — are consolidated in the Defensive & Situational Awareness (DSA) role defined in Section 4.

However, the existing architecture remains forward-compatible with an optional tactical module for armed refits or non-exploratory Scout Class variants, but no such module is fitted on standard exploration vessels.

It is recorded here so that the console architecture's extensibility is specified rather than implied, and to support potential armed refits or non-exploratory Scout Class variants.

Applicability

- The standard Scout Class exploration vessel is unarmed and ships with no tactical weapons-management module. The DSA role (Section 5) is the complete situational and self-protection capability of a standard vessel.
- An optional Tactical (TAC) module may be provisioned only on vessels that carry actual weapon systems — armed refits, escort variants, or other non-exploratory derivatives outside the baseline mandate.

Provisioning Constraints

- The TAC module, where fitted, installs as an additional selectable role in Mode Select alongside the six standard roles; it does not replace DSA.
- Activation is gated behind command-level credentials AND a physical hardware arming interlock independent of the console software, so that no software state alone can arm weapons.
- All guarded-action protections (two-stage confirmation, escalating haptic profiles) defined for standard roles apply, with the master-arm function rendered amber until authorized and red only when the hardware interlock is live.
- Fitting the TAC module does not alter any standard role; an unarmed vessel's consoles behave exactly as specified in the main body of this document.