



Submarine Operations & Navigation Simulator

The Submarine Operations & Navigation Simulator from ARI is a cutting-edge, high-fidelity training platform built specifically for the operational and instructional needs of modern naval forces

Developed with input from experienced naval personnel, the submarine operations & navigation simulator replicates the complex dynamics of submarine missions—from navigation and propulsion to sonar tracking and emergency procedures—within a safe and immersive virtual environment.

Purpose-built for training commands, and operational fleets, this simulator delivers a true-to-life submarine environment—empowering naval personnel to train, rehearse, and perfect mission-critical operations with unmatched realism.



Submarine Steering Console



- **Delivers high-fidelity,** immersive training for submarine officers to tackle mission-specific challenges.
- **Navigation Systems:** Simulates Sonar, GPS, AIS, Radar, and Periscope Depth Navigation with both hardware and software periscopes.
- **Control Interfaces:** Includes realistic panels, propulsion, and periscope operations.
- **Operations Modules:** Features sonar and communication systems for realistic scenario-based training.
- **Platform Management System (PMS):** Replicates propulsion, ballast, and auxiliary systems to support training and operational efficiency.
- **Position Plotting System** Tracks and predicts target movement over a plot board.
- **Periscope Simulation:** Offers hardware-based and digital optronic periscope options.
- **Scenario-Based Training:** Includes navigation, contact detection, and emergency drills.
- **Environmental Simulation:** Replicates pressure, currents, and visibility.
- **Crew Coordination:** Enhances teamwork and decision-making under stress.
- **Performance Feedback:** Analytics tools deliver actionable insights for skill improvement.

SYSTEM ARCHITECTURE & MODULAR LAYOUT

The Submarine Operations & Navigation Simulator is structured as a collection of highly specialized modules, enabling scalable deployments. Each module replicates a key aspect of submarine operations and interfaces, providing high configurability based on user needs.

Key Subsystems

- **Navigation Suite:** Combines surface, submerged, and periscope-depth navigation.
- **Sensor Integration:** Interfaces with sonar, radar, GPS, AIS, and gyro compass.
- **Control Consoles:** Physical replicas for propulsion, rudder, trim, ballast, and periscope.
- **Mission Management:** Supports simulated command scenarios with instructor oversight.
- **Tactical Simulation Core:** Links own-ship data, contact behaviour, and engagement zones.



PLATFORM MANAGEMENT SYSTEM (PMS)

Simulates internal submarine systems such as propulsion, power, ballast, QD tanks, mast control, and alarms.

Key Features

- Control of electric/diesel propulsion system.
- Mast deployment status and blind sector modelling.
- Ballast and trim tank control with surfacing & dive simulation.

POSITION PLOTTING SYSTEM

Enables operators to track targets using data from multiple sensors and displayed over a plot board.

Key Features

- Plot the positions over the ECDIS/nautical charts.
- Calculate Course, Speed, CPA, TCPA.
- Simulate sonar plots, bearing line overlays, and stealth mode tracking.

SOFTWARE & HARDWARE INTEGRATION

- Seamless connection between real-time simulation software and HMI hardware.
- Customizable to different submarine classes and training levels.
- Expandable architecture for new sensor or weapon modules.

PERISCOPE SIMULATOR

Designed to emulate the advanced functionality of modern optronic periscopes used in naval operations. Integrated seamlessly into the broader submarine simulation environment, this module replicates the photonics mast's imaging and sensor systems, providing realistic training for submarine crews.

Key Features

- **High-Fidelity Visual Simulation:** Delivers realistic high-definition colour, low-light, and thermal imaging, accurately rendering diverse environmental conditions (day, night, fog, etc.).
- **Virtual Sensor Integration:** Emulates infrared (SWIR/MWIR), laser range finding for comprehensive sensor operation training.
- **Interactive Control Interface:** Replicates multifunction consoles with customizable displays for real-time data visualization and periscope control.

CAPABILITIES

- **Situational Awareness Training:** Simulates 360-degree panoramic views, allowing trainees to practice scanning and identifying surface, air, and coastal targets in a submarine context.
- **Stealth Operation Simulation:** Trains operators in low-profile periscope use, minimizing exposure while maintaining effective surveillance, critical for submarine missions.
- **Target Acquisition and Tracking:** Enables practice in locking onto and tracking targets, with seamless integration into the simulator's combat systems.
- **Navigation Support Training:** Facilitates obstacle detection and safe navigation at periscope depth under varied environmental conditions.

The periscope module enhances the Submarine Navigation Simulator:

- Submarine crew training (surveillance, targeting, and navigation at periscope depth).
- Tactical decision-making exercises (coordinated with other simulated submarine systems).
- Mission rehearsal (simulating real-world scenarios for reconnaissance or combat).

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