# Subsurface Navigation and Systems

Subsurface WECDIS
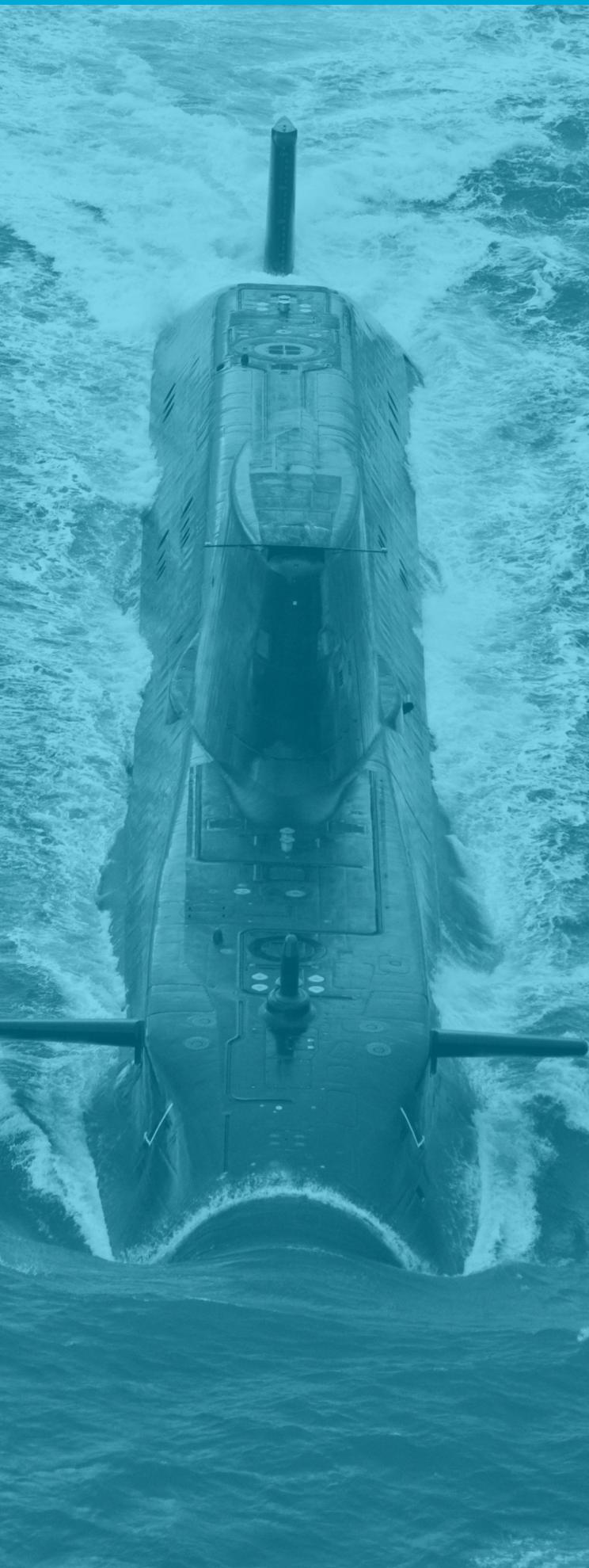
Submarines manoeuvre through operationally challenging and diverse environments. Whether tasked to intercept an adversarial task group or to conduct Intelligence, Surveillance and Reconnaissance (ISR) collection activities, the strategic value of a proficient submarine capability cannot be understated.

While achieving the operational aim remains central to the submarine's priorities, the Command must concurrently manage mission priorities in alignment with the safety of the submarine and crew.

Operational Risk Management

Submarines are unique seagoing platforms in that their normal state of operation allows the platform to manoeuvre through the water at various keel depths. This freedom of manoeuvre offers both tactical advantage and risk in equal measure; demanding that the submarine crew must proactively shift focus between safety, remaining undetected and achieving operational aims as the tactical environment shifts.

Submarines will often be required to operate in confined waters and be either depth restricted or limited in manoeuvre due to a combination of subsurface navigation hazards and movements of surface vessels. Additionally, the crew must contend with limited positional resources which are typically intermittently available when the platform can safely expose its sensors above the water surface.
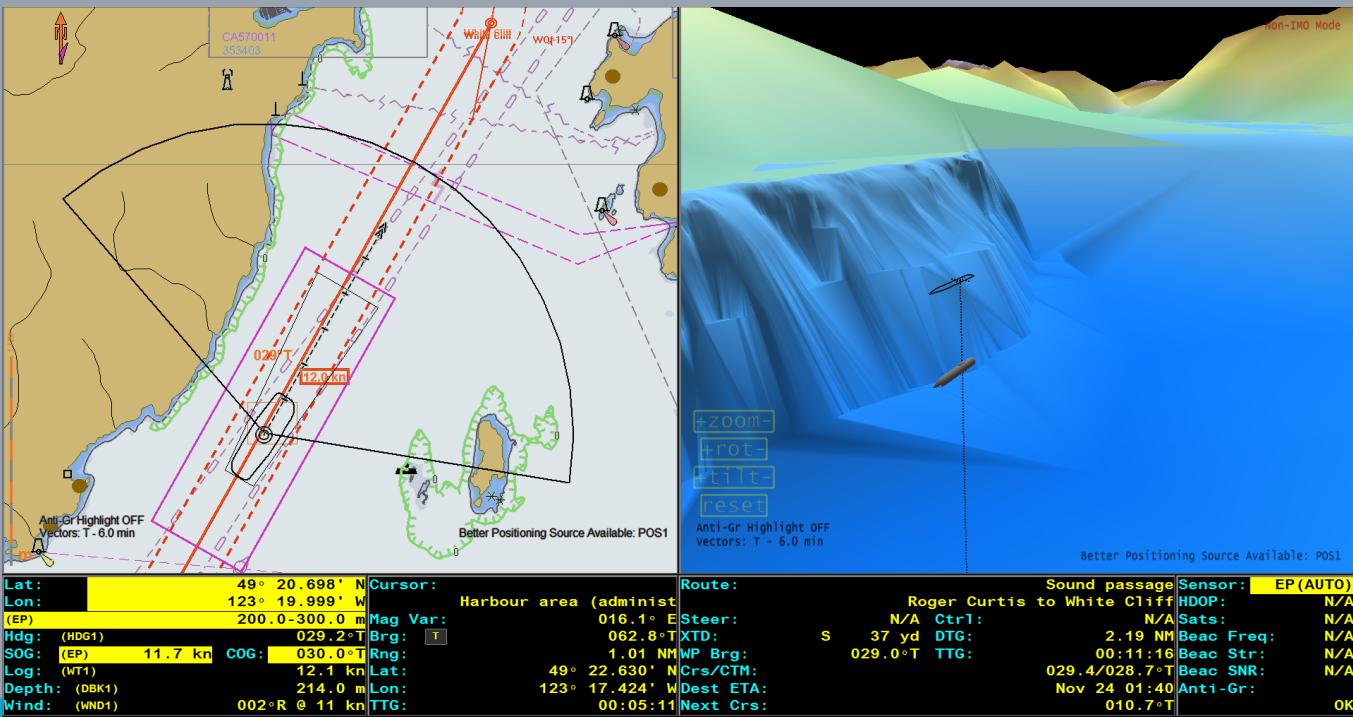
ECPINS: The OSI Advantage

ECPINS delivers the OSI Maritime Systems (OSI) submarine navigation advantage; a robust Warship Electronic Chart Display and Information System (WECDIS) that merges procedural compliance with NATO STANAG 4564 with doctrinal Submarine Navigation standards in accordance with the widely used UK Royal Navy's Admiralty Manual of Navigation (BR 45).

ECPINS extends beyond the scope of a standard WECDIS, merging OSI's proprietary chart engine with an enhanced suite of digitised Submarine Navigation processes including, but not limited to:
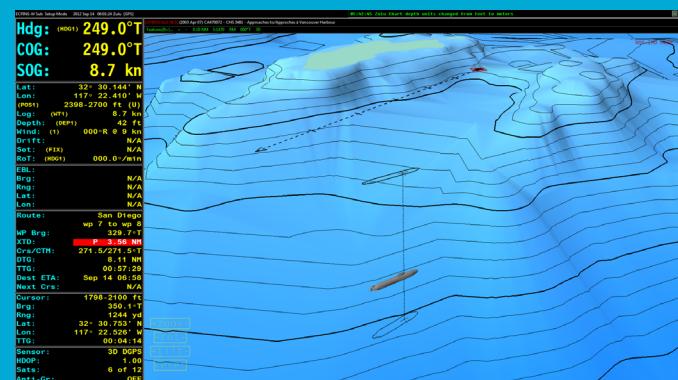
Display and Fusion of Additional Military Layers (AMLs)

ECPINS is designed on the foundation of OSI's powerful chart engine, allowing users of the product to install, process, load and fuse a variety of: general ENC and specialised charts and navigation products, including AMLs for Contour Line Bathymetry, Submarine Exercise Areas and Bottoming charts.

The ECPINS interface enables the navigator to interact with the chart database during the construction of dived navigation charts and overlays for the various submarine duck depths; significantly reducing workload and optimising the navigation plot for safe and sustained operations in confined waters.

Digital Pool of Errors

Construction, expansion and reduction of Pool of Errors (POE) in accordance with governing BR 45 doctrine is digitised by the ECPINS software. This aids the navigator in maintaining an accurate compilation of the Fix, Log, Gyro and Set errors associated with the submarine's Estimated Position when operating without access to GNSS reception, and without having to manually reconstruct the error ellipses as the submarine alters course and speed. It also allows 'what if' scenarios to help inform the Command of safe navigation options in the dynamic under-sea environment.

Bottom Contour Fixing techniques

ECPINS simplifies two complex navigation techniques: Contour Advancement and Line of Soundings fixing techniques, allowing the operator to establish the submarine's position independent of GNSS or Inertial Navigation Systems. These fixing techniques enables the navigator to safely reduce the POE without resort to external sources. The navigator can also monitor INS accuracy, when dived and relying on inertial navigation systems for positional information, particularly when considering the catastrophic risk associated with vertical deflection and gravity disturbance.

Integrated Tactical Dived Navigation System

Astute Class	Trafalgar Class	Vanguard Class	Dreadnought Class
Collins Class	Victoria Class	Walrus Class	**TACTICAL DIVED NAVIGATION**
Heroine Class	T209	T218	A26 Blekinge Class
Tupi Class	Scorpene Class	A17	A19

Submarine navigation is one of the ultimate tests in naval defence. OSI has designed an innovative submarine solution to address this need. As a result of decades of experience and working with some of the most advanced NATO and Allied submarine fleets, OSI's Tactical Dived Navigation System (TDNS) brings submarine navigation to a new level with its leading system integration solutions and flexible system architecture.

Operational on over 60 Submarines and 18 Classes, TDNS allows subsurface navigation to go beyond the limits of surface navigation by unimaginable measures. Through the Power of ECPINS, TDNS safely navigates the submarine in its normal 3-dimensional state of maneuvering through confined waters, restricted depths, or a combination of navigation hazards above or below the surface.

TDNS combines the most advanced navigation and tactical capabilities to safely navigate the submarine through demanding and diverse operational requirements. With TDNS, the submarine is ready to perform seek-and-destroy missions on enemy ships and subs, surveillance and reconnaissance, irregular warfare, covert troop insertion, mine and anti-mine operations and more.

From New builds to mid-life upgrades and retrofits, TDNS fits all applications. Over 20 years of experience and close cooperation with shipyards make OSI uniquely positioned to provide systems that are designed and delivered seamlessly.

Each step of the design, from installation to operational capabilities, is matched by our team of specialists, ensuring an experience that meets needs and expectations.

Combat Management System Integration

ECPINS® has been integrated with all major combat management systems. Exchange of Position, Navigation and Time (PNT) data as well as tracks, water space management areas and other information. Able to provide bespoke solutions for User requirements, such as Mine Like Objects from Forward Looking Avoidance Sonar. Can generate and receive NATO FORMAT operational Messaging, including SUBNOTES.

Operational on over 60 Submarines and 15 Classes

ECPINS Submarine
Leading Subsurface WECDIS

Experience unparalleled performance with ECPINS® Submarine, the leading global subsurface WECDIS that fully complies with NATO STANAG 4564 and adheres to doctrinal Submarine Navigation standards described in the UK Royal Navy's Admiralty Manual of Navigation (BR 45).

Its advanced GNSS denied functionality, including Automatic and future Pool Of Errors, sets ECPINS® apart and makes it crucial for tactical submarine navigation. With certification as the primary submarine navigation system for many navies worldwide, including the UK, Canadian, Australian, Netherlands, Chilean, South African, Brazilian, and Swedish navies, you can trust in ECPINS® for your submarine navigation needs.

Scalable scope, New builds,
Retrofits, Mid-Life Upgrades

OSI's Tactical Dived Navigation System (TDNS) is a versatile and customizable solution that caters to a broad spectrum of requirements, from new builds to retrofits, mid-life upgrades, and specific design demands. TDNS offers an array of choices, including ECPINS WECDIS submarine software on a standalone console, a fully integrated WECDIS in the CMS, or a comprehensive, integrated navigation suite.

A complete TDNS system comprises all navigation sensors, WECDIS, integration with all sensors, CMS, other networks, DDU's, and dedicated hardware. TDNS also seamlessly integrates with third-party hardware system architectures or can be supplied with its own hardware, ranging from large horizontally or vertically mounted displays, or rugged navigation displays at the bridge.

D-MOP
Operational Precision

ECPINS® D-MOP was the first digital maritime operations plot. OSI has built upon its success and has leveraged user insights to develop the next level of D-MOP technology, featuring enhanced full navigation functionality and situational awareness on a large format display suitable for team briefings.

D-MOP is a powerful navigation tool that combines modern electronics and information technology to provide unparalleled situational awareness. Its advanced features include Waterspace Management (WSM) plotting and display, Advanced Operator Contacts for LOP or GOP construction and management, Weapons ARCS, MIL 2525C Contacts, 4W Grid, and the ability to accept track messages from other systems such as AIS and ARPA.
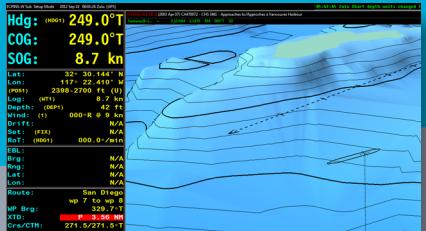
Cyber secure

ECPINS® (including the chart engine) NavTac DDU and D-MOP are all 100% Canadian developed OSI proprietary products. OSI is very familiar with stringent cyber security rules and technical solutions, having integrated ECPINS® with various CMS according to a variety very demanding cyber security regulations of e.g. USN, RAN, RNZN and most recently FGN.

A typical ECPINS software package for submarines consists of ECPINS and these modules:

- GNSS Denied
- 3D
- Weapons Safety
- Sub Ops
- TMA
- Signals

Sub-specific capabilities in ECPINS

- Safety Contour: Dived depth dependent
- Simultaneous position display
- Vessel templates
- Auto dead reckoning with/without set & drift
- Set & drift calculation methods
- Periscope bearing continuous display
- LOPs by periscope bearing and range
- Peri Brg & Peri Rng for fixin
- Secure Mode
- Controlled access (user accounts)
- Waterspace management areas & moving havens
- Tides & currents integration
- Depth contour creation
- Limiting danger line creation
- High-density sub-specific chart display

Worldwide Support, Service and Installation Network

OSI is dedicated to providing customers with support, starting with in-country Certified Support Partner delivering Level 2 customer support, service, and installation.

Offering 24/7 support tailored to the Customer's needs, provides the peace of mind that there is a certified technician standing ready to support their queries in their local shipyard.

10 Navies

Operational on subsurface vessels

18 Classes

- Australia
- Brazil
- Canada
- Chile
- Indonesia
- Singapore
- Netherlands
- South Africa
- Sweden
- United Kingdom

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