

Ultra Electronics Integrated Sonar Suite

COMPREHENSIVE NETWORK CENTRIC
WARFARE SYSTEM COMPRISING:

- HULL-MOUNT SONAR
- VARIABLE DEPTH SONAR
- TORPEDO DEFENCE

Overview

Ultra's Integrated Sonar Suite is a modular sonar system which provides a fully integrated, flexible networked Anti-Submarine Warfare (ASW) solution. The Integrated Sonar Suite provides ASW **force defence, torpedo detection** and **countermeasures**, it has been designed to allow customers to select those modules and sub-systems that meet their specific operational requirements whilst permitting spiral development and integration over time as new requirements and equipments emerge.

Integrated Sonar Suite modules and sub-systems have been purchased by the UK Royal Navy, the Royal Australian Navy and the Turkish Navy.

Key innovations in Ultra's Integrated Sonar Suite include:

- A single integrated variable depth sonar: all towed elements, including a Horizontal Projector Array (HPA), Towed Low Frequency Source (TLFS), Passive Receive Arrays (which can include left/right bearing resolution) and Torpedo Defence System, are integrated into a single tow cable, removing the need for large, expensive hard-body handling systems.
- A lightweight, single-drum winch, removing the need for multiple-tow streaming.
- No requirement for a complex handling system, substantially reducing installation costs.
- High levels of automation reduce operator workload, manning and enhance system effectiveness.
- A modular, open architecture using standard interfaces and protocols to support future technology refresh without the need for system redesign.



SYSTEM CONCEPT

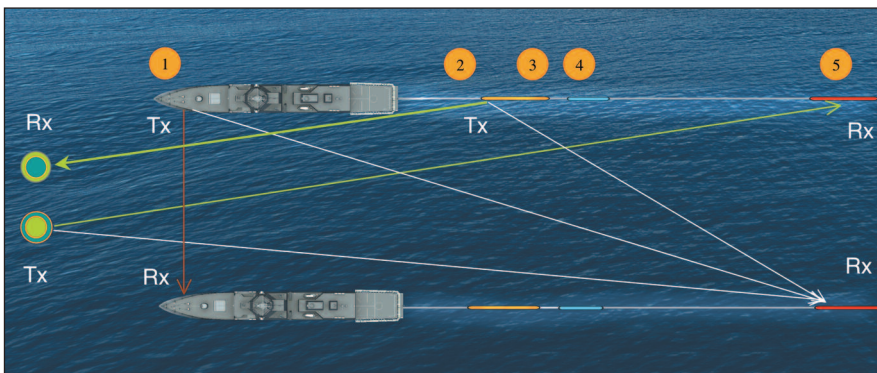
Ultra's Integrated Sonar Suite fuses all sensors including Hull-Mount Sonar, Variable Depth Sonar and bi-static data into an integrated ASW picture.



System hardware and software open architecture flexibility

Ultra delivers modular systems, allowing the customer to select each component individually. This design philosophy enables individual components to be integrated or replaced as required, whilst allowing technology refresh without the need for system re-design or major software modification. Such an approach yields significant cost savings through a typical anticipated 30-year in-service life of the system as equipment or processing is updated.

Flexibility is provided through an innovative application of existing Open Architecture protocols, to allow the provision of full “plug and play” capability at both the component and the system level. This is achieved through use of an Ultra innovation called “Adaptors”. Adaptors are machine-generated from a XML description of the equipment’s interface, and allow the system to both interface to, and fully integrate with, legacy, current and future equipment without major software source-code modifications.



SYSTEM OPERATIONAL CONCEPT

Ultra's Integrated Sonar Suite provides a networked force ASW Capability through all of its Force sensors.

Ultra's Integrated Sonar Suite incorporates:

- **Hull-Mounted Sonar (HMS):** A dual-frequency active sonar.

The HMS operates nominally at medium and low/medium frequencies to provide both ASW and high fidelity mine and object avoidance capabilities.

- **Variable Depth Sonar (VDS):** A modular, multi-frequency system, incorporating both active transmitters and a passive receive array. The system is designed to minimise vessel impact by saving space and weight, whilst still achieving performance comparable to a traditional hard-body system.

The **VDS** and **towed array** have been initially developed for the Canadian and Dutch navies, following demonstration at sea by the Canadian research organisation, DRDC. The optional Towed Low Frequency Source (TLFS) is an adaptation of proven sonobuoy technology. Signal processing software for the TLFS is common with the Horizontal Projector Array (HPA).

Multi-sensor Processing System:

The **HMS** and **VDS** are integrated at the data element level using common sonar processing to provide 360° coverage with bistatic and multi-static fusion.



Hull-mounted sonar



Two-man deployment and recovery

Torpedo Defence System

A combined expendable and towed system, integrated in the single tow, the system features a Flexible Towed Body (FTB) countermeasure able to decoy and jam acoustic torpedoes, as well as providing highly effective defences against wake-homing torpedoes. This is combined with pneumatic launchers for the deployment of Expendable Acoustic Devices (EAD) in pre-programmed decoy patterns. Use of a pneumatic launch system avoids the significant safety issues associated with explosive and mortar-launched devices. The launcher also allows a range of other stores to be accommodated, such as Ultra's LESCUT countermeasure. The system can be operated in manual, semi-automatic and fully-automatic modes.

The **Torpedo Defence System** has been proven at sea and is in-service with the Royal Navy, fitted across the fleet on a rotational basis.

The Sonar 2170 SEA SENTOR **Torpedo Defence System** will classify and detect all known torpedoes, including those fitted with advanced countermeasures, and wake-homing torpedoes fitted with a non-acoustic fuse.



Loading EAD launcher



EAD launcher control unit



EAD launcher

“Ultra’s attitude, and integration with the MoD’s IPT, was crucial to the programme’s success, and I hold it up as a shining light for reference on other programmes. It is something we can all be proud of.

It is not an insignificant statement, and was a real achievement, to say that we hit the in-service date, and at the same time delivered a world-class system.

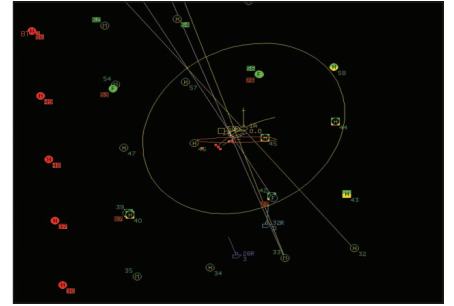
Key to the success of the programme was Ultra’s approach to joint problem solving. It has been commented to me many times that you could walk into the room and you did not know who was UK MoD and who was Ultra. That is what I call a real integrated project team”

Underwater Defence Systems and Countermeasures IPT, UK MoD

Fully Integrated System

Maximising interoperability through the careful selection of operating frequencies, Ultra is able to offer a **bi-static capability** between the HMS and the towed sonar elements. The system also facilitates interoperability with other sensors on other platforms, including active and passive sonobuoy processing as part of a larger **multi-static capability**. Sensors are integrated at both the processing and the display levels.

- **ASW Control System:** A comprehensive and highly capable ASW Control System to create, manage and display the Undersea Warfare tactical picture and incorporating a networked ASW capability.
- **Sonobuoys:** Ultra provides sonobuoys to 70% of the world market as well as sonobuoy receivers, processors and multi-static processors. Embedding this capability within the Integrated Sonar Suite allows the system to utilise and process sonobuoys organically on the vessel.
- **Bi-Static Multi-Static Processing:** Through advanced acoustic processing, Ultra's Integrated Sonar Suite processes data across all sensors as opposed to traditional systems that process each sensor individually. As a result of Ultra's innovative approach, the system is able to execute both bi-static and multi-static processing between the Hull-Mount Sonar and Variable Depth Sonar not only on a single vessel, but also between vessels, creating a Force ASW capability.



Multi-static data track fusion

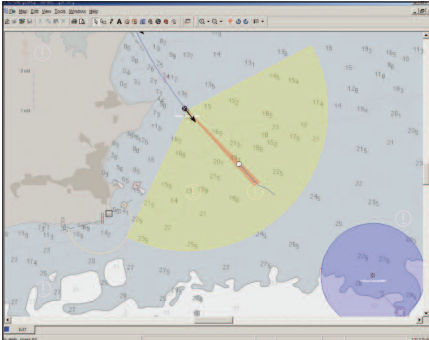


Ultra's Integrated Sonar Suite delivers an unprecedented Anti-Submarine Warfare capability by fusing data from multiple sensors generating an integrated underwater battlespace picture.

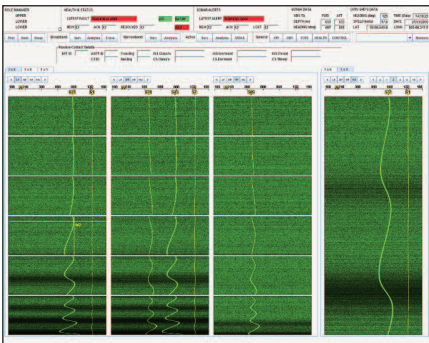
Innovative solution

Single Integrated Towed System

Ultra's Integrated Sonar Suite provides the functionality of the VDS, towed array and Towed Torpedo Defence System (TDS) in a single tow from one winch. The VDS and TDS are fully flexible and, unlike a conventional 'hard body' VDS system, can be safely **deployed and recovered by two people in up to Sea State 6**. The tow is designed to be streamed through a standard fairlead and, unlike a hard body VDS, does not need a large and cumbersome VDS handling system. Ultra's flexible VDS design allows it to be deployed, operated and recovered in sea states and conditions that would be impossible to achieve with traditional hard-body systems, dramatically increasing operational availability.



ASW geospatial display and planning



Conventional sonar displays

Automated Functionality

The Ultra ASW Combat System offers a high degree of automation, from detection, classification and localisation of submarines and torpedoes through to tracking, track correlation and data fusion. These features both maximise system effectiveness and ease the burden on the operator, thus enhancing overall system performance.

The ASW Control System provides a comprehensive and capable method of creating, managing and displaying the tactical picture, and incorporating third-party data for networked ASW.

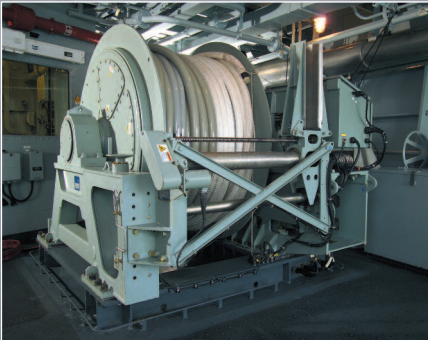
The ASW Control System provides the following functionality:

- Display of the ASW tactical picture integrated with track data from the Combat System.
- Management of ASW tracks including correlation between ASW sensors and the Combat System.
- Multi-static planning, coordination and calculation.
- Automatic Target Motion Analysis, track calculation and generation.
- Calculation of predicted environmental conditions and sensor performance.
- Calculation of weapon engagement plans.
- Calculation of defensive manoeuvres and countermeasures (expendable decoy) patterns for torpedo defence.
- ASW mission planning including sonar coverage, limiting lines of approach, and navigational planning aids, which can be integrated into command team training scenarios.
- On board training and simulation modes.

Retro-fit and upgrade for existing vessels

Ultra's Adaptors innovation allows the Integrated Sonar Suite architecture to accommodate existing vessel sensors without impact to the system design or concept. The fully configurable design allows, for example, an existing Hull-Mount Sonar to be integrated into the system through the use of a "Software Driver".

The compact and lightweight winch allows installation on vessels that were not initially designed to accommodate a Variable Depth Sonar and can therefore substantially increase the capability of existing multi-role vessels.



Single winch and tow



"The (Ultra Electronics S2170) Surface Ship Torpedo Defence System, which entered service with the Royal Navy in 2005, is a world class system of torpedo detection and countermeasures. The system is able to inform commanders of RN ships when they are under attack, and will tell them how to manoeuvre the ship and engage off-board countermeasures to negate the threat. The system introduces additional capability over existing equipment, such as a detection and classification process which enables commanders to take balanced and timely decisions, and is targeted to defeat modern intelligent torpedoes"

Item	Weight (kg)	Height (m)	Width (m)	Length/depth (m)
Variable depth sonar				
Winch (fully loaded)	9500	2.10	2.60	2.20
Processing cabinet	271	1.21	0.64	0.55
VDS transmit cabinet	750	1.84	0.64	0.80
Torpedo countermeasure				
Towed countermeasure	60	0.012	Ø 0.012	-
Hull-mount sonar				
Processing cabinet 2	434	1.72	0.60	0.90
Matching Units (3 off)	125	0.91	0.61	0.26
Switching and Acquisition Unit	145	0.91	0.61	0.39
HMS transmit cabinet 1	440	1.72	0.60	0.56
HMS transmit cabinet 2	440	1.72	0.60	0.56
HMS array assembly	2622	1.72	Ø 1.20	-
Torpedo countermeasure (ship)				
Expendable launcher	583	1.69	1.21	1.54

“Ultra demonstrated active and passive detection and tracking, easy installation compatibility with existing surface ship towed systems... detection and alerting at tactically significant ranges, minimum false alarms, and highly accurate ATT targeting. The sea trial was a resounding success.”

Undersea Defensive Warfare Systems, US DoD



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© Ultra Electronics Limited 2009.
Printed in England
1109 / TC / 300 / HaT
UE-Sonar(M) – 006/MAFB022