The Ultra Electronics Group manages a portfolio of specialist capabilities, generating highly-differentiated solutions and products in the DEFENCE & AEROSPACE, SECURITY & CYBER, TRANSPORT and ENERGY markets, by applying electronic and software technologies in demanding and critical environments to meet customer needs.

Ultra businesses constantly innovate to create solutions to customer requirements that are different from and better than those of the Group’s competition. By applying these differentiated solutions to a wide range of international platforms and programmes, Ultra has built an exceptionally broad range of specialist capability areas. Where the Group has a number of complementary capabilities it can also combine these to offer wider solutions. Furthermore, the products, capabilities and the associated domain expertise uniquely position Ultra to be able to provide system and sub-system solutions. These solutions are underpinned by through-life management support offerings that ensure the capabilities are delivered and sustained in service. The Group has an active programme of reinvestment of funds to strengthen its capabilities in its specialist markets.

Ultra offers solutions to its customers through the design, delivery and support phases of a programme. Ultra’s businesses have a high degree of operational autonomy so that they provide exceptionally agile and responsive support to customers and partners normally associated with a smaller business. These benefits of customer focus and agility are augmented by the access to wider and complementary technology and expertise that lies elsewhere in the Group and by Ultra’s strong financial position.

Ultra’s advanced underwater systems are developed to overcome the unique challenges of the undersea environment. The Group’s innovative solutions deliver dominance in the underwater battlespace, providing a critical operational advantage to its customers.

Sonar systems
For surface ship applications, Ultra has developed sonar systems that range from standalone hull-mounted and towed sonar installations to fully-integrated sonar suites, constituting a broad range of solutions. The capabilities are delivered with a high degree of operational autonomy so that they provide exceptionally agile and responsive support to customers and partners normally associated with a smaller business. These benefits of customer focus and agility are augmented by the access to wider and complementary technology and expertise that lies elsewhere in the Group and by Ultra’s strong financial position.

Torpedo defence
Ultra is a world-leader in towed torpedo defence. Drawing on its expertise in active and passive anti-submarine warfare (ASW) sonar processing, Ultra has designed innovative signal processing algorithms for automatic detection, classification, and tracking of ASW threats to surface ship, submarine, and unmanned underwater vehicles (UUV) systems. Ultra Combines innovative signal feature extraction algorithms and target classification architecture while leveraging mature beamforming, signal processing, and tracking technologies. Improvements in passive ranging and localisation capabilities are being achieved through novel Direction of Arrival estimator algorithm technology to further enhance systems’ performance.

Acoustic torpedo countermeasures
Ultra provides a range of towed and expendable off-board acoustic countermeasures systems to ensure the survivability of ships and submarines in the face of a range of advanced torpedoes threats. Ultra’s family of acoustic countermeasure expendables include mobile and towed devices that are specifically designed to complement towed systems, such as the SLQ-25 Nixie and Ultra’s own towed torpedo countermeasure system. Ultra’s Defender and Dector represent the next generation of acoustic torpedo countermeasures.

Sonobuoys and sonobuoy receivers
Ultra is the world’s leading provider of sonobuoy, with its products spanning the entire spectrum of sizes and uses, including development of miniature sonobuoy optimised for use from UUVs. In parallel, Ultra’s proven range of sonobuoy receivers extends from very lightweight naval/remote patrol aircraft sonobuoy receivers, to the wireless broadband software-defined receiver. Ultra’s multi-mission active capability enhances the detection of extremely quiet submarines, in both deep and littoral waters, by using a field of active and passive sonobuoys, controlled and monitored by an advanced airborne processing suite.

Underwater warfare
Capabilities related to underwater warfare covering military, paramilitary and civil domains. These include transducers, hydrophones, sonobuoys, sonobuoy receivers, towed arrays, periscope detecting radars, torpedo defense systems, acoustic countermeasures, and surface ship sonar systems.

Maritime
Capabilities related to signal and power management, operating, controlling, supporting and maintaining maritime (surface and subsurface) military platforms, both manned and unmanned.

Land
Capabilities related to operating, controlling, supporting and maintaining land military platforms, both manned and unmanned, and the dismounted soldier.

Aerospace
Capabilities related to the design, manufacture, production, operation, support and maintenance of commercial and military aircraft, both manned and unmanned.

C2ISR*
Capabilities related to C2, Security and Surveillance solutions, covering both military and civil domains as well as Defence Electronic Warfare, reconnaissance and targeting systems, and forensic solutions for law enforcement.

Communications
Capabilities related to the secure communication and timely exchange of data, voice and video information providing some of the most capable communication systems, platforms and integration support in the world.

Nuclear
Capabilities related to nuclear, covering both civil energy, national radiation monitoring systems through defence to radiation monitoring on tactical platforms.

Infrastructure
Capabilities related to airport and airline information systems, rail transit power control and monitoring, as well as non-nuclear civil energy related capabilities.

2016 revenue by segment

- Underwater warfare 25%
- Maritime 7%
- Land 3%
- Aerospace 17%
- C2ISR* 21%
- Communications 15%
- Nuclear 8%
- Infrastructure 4%

* C2ISR = Command & Control, Intelligence, Surveillance and Reconnaissance

Did you know?
Ultra’s broad range of specialist capabilities are positioned on over 350 platforms and programmes worldwide, often in high integrity or safety critical applications.

To see how Ultra’s capability segments map to each business, see pages 9-10.
Sonobuoys and sonobuoy receivers

Ultra is the world’s leading provider of sonobuoys and software defined sonobuoy receivers with its products spanning the complete spectrum of airborne and shipborne ASW requirements.

SONOBUOYS

Due to the proliferation of modern, stealthy submarines, traditional anti-submarine techniques continue to be challenged in their ability to deliver effective submarine detection and tracking capability. With facilities in the UK, UK, and Canada, Ultra remains at the forefront of the design, development, and manufacture of air-launched, expendable sonobuoys. Ultra’s latest generation of multistatic sonobuoys have just entered service and they are once again restoring NATO’s ASW advantage. In order to enable more nations to access the capabilities associated with the latest generation of sonobuoys, Ultra has developed its multistatic active application that empowers traditional acoustic processors to achieve the benefits associated with multistatic operation. Through Ultra’s partnership in ERAPSCO and Sonobuoy TechSystems (STS), Ultra is able to fulfil all US Navy sonobuoy requirements for the P-8, P-3 and MH-60R air platforms. Internationally, STS sonobuoys have been selected by more than 20 countries to meet their ASW needs.

MINIATURE SONOBUOYS

Ultra is leading innovation in collaboration with key government and industry partners and is undertaking development of a miniaturised sonobuoy system. The aim is to create a series of sonobuoys optimised for carriage and deployment from small patrol aircraft, helicopters, and unmanned air vehicles (UAVs). This will allow non-traditional assets to be successfully introduced into the ASW force mix. The miniaturisation activity encompasses the broader system including the sonobuoys, the sonobuoy carriage system, sonobuoy receivers and the wider communications network. This exploits the Group’s leading capabilities in network communications and tactical data links such that the platform, and the sonobuoy it has deployed, can contribute to the integrated underwater warfare picture and the ASW mission.

SONOBUOY RECEIVERS

Ultra has over 5,000 receivers installed around the world, supporting a variety of helicopters, maritime patrol aircraft, surface combatants and laboratories. Ultra continually builds upon its experience gained with existing systems, new developments, and technology advances to push performance and functional envelopes for these highly sophisticated advanced receivers, while reducing the cost per channel. The latest sonobuoy receivers are software-defined wideband solutions, which receive signals over long ranges and with very low distortion. The flexibility of the systems allows customers to vary data rates, enabling a greater flow of information in today’s increasingly multistatic ASW operations. Ultra’s systems save the customer weight and power and are compatible with outputs from area networks. Ultra’s products range from lightweight systems for use on UAVs and helicopter, to the wideband software defined receiver currently found on the P-8 Poseidon maritime patrol aircraft, which offers the ultimate in flexibility and performance. The wideband receiver has the ability to manage the RF spectrum dynamically, to find and amplify the signals of interest and remove interference.

Innovation in sonobuoys and airborne acoustic processing has enabled Ultra to develop state-of-the-art multistatic active solutions for the maritime patrol aircraft community.

MULTISTATIC ACTIVE (MSA)

Innovation in sonobuoys, software-defined sonobuoy receivers, and airborne acoustic processing has enabled Ultra to develop state-of-the-art multistatic active solutions for the maritime patrol aircraft community. Ultra’s MSA application enhances a legacy airborne acoustic processors to enable the detection of quiet submarines, in both deep and littoral waters. MSA uses multiple sources and receivers, positioned in different locations, so that echoes from active sources are picked up by a pattern of receivers, which take advantage of multiple returns from the submarine at multiple aspects. These multistatic combinations of sonobuoys are collectively exploited to produce an accurate target track. MSA provides the ability to both enhance the probability and the range of detection of potential threats.

Underwater warfare

Ultra is driving innovation in collaboration with key government and industry partners and is undertaking the development of a miniaturised sonobuoy system. The aim is to create a series of sonobuoys optimised for carriage and deployment from small patrol aircraft, helicopters, and unmanned air vehicles (UAVs). This will allow non-traditional assets to be successfully introduced into the ASW force mix. The miniaturisation activity encompasses the broader system including the sonobuoys, the sonobuoy carriage system, sonobuoy receivers and the wider communications network. This exploits the Group’s leading capabilities in network communications and tactical data links such that the platform, and the sonobuoy it has deployed, can contribute to the integrated underwater warfare picture and the ASW mission.

US Navy

Ultra is leading work in developing miniature sonobuoys optimised for deployment from unmanned air vehicles.
Underwater warfare

Torpedo defence

A proven comprehensive sensor-to-countermeasure capability, that delivers torpedo detection, classification, threat evaluation and neutralisation.

Ultra is a world leader in torpedo defence for both submarines and surface ships, with systems currently operational with the US Navy, UK Royal Navy and the Turkish Navy. Using a combination of passive and active sonar systems, Ultra’s technology provides platforms with the ability to detect and classify all known torpedoes. To counter the identified threats, the systems integrate with anti-torpedo torpedoes to automatically recommend the optimum evasion course, whilst simultaneously using both towed and expendable countermeasures to confuse and defeat the threat. Ultra has fielded two Surface Ship Torpedo Defence (SSTD) systems.

Ultra’s Sea Sentry SSTD can be either standalone or incorporated into its Integrated Sonar Suite (ISS). As a stand-alone system, it is designed to be operated by minimally-trained operators and provide simple operator actions on sounding a torpedo alert. Furthermore, Ultra’s ISS enables the SSTD Function to be augmented by off-board sensors such as sonobuoys. Ships steaming through a previously laid sonobuoy field can therefore re-use the same field for area torpedo defence at no additional cost or effort. Torpedo countermeasures could also be deployed by organic assets, such as helicopters or unmanned air systems, well away from threatened ships.

Acoustic torpedo countermeasures

Ultra provides a complete range of expendable and towed acoustic countermeasures.

ACOUSTIC TORPEDO COUNTERMEASURES

As a pre-eminent supplier of acoustic countermeasures, Ultra provides a range of towed and expendable off-board systems to ensure the survivability of ships and submarines in the face of a range of advanced torpedo threats. Ultra’s family of acoustic expendables, including a complete array of NATO standard devices, is complemented by towed systems, such as Nixe or Ultra’s flexible towed torpedo countermeasure. The flexible towed torpedo countermeasure permits an active countermeasure jammer to be towed in-line with the active-passive towed receive array. This eliminates the need for a separate winch and handling system, normally associated with stand-alone towed countermeasures.

COUNTERMEASURES

Ultra is able to supply a complete torpedo countermeasures sub-system incorporating Expendable Acoustic Devices (EAD), Expendable Device Launchers (EDLs) with a Launcher Control Unit (Remote) and a flexible towed torpedo countermeasure. It also can supply individual EADs that have the ability to ‘hover’ in the water mass or are self-propelled enabling them to draw the incoming torpedo away from the intended target.

The system includes threat and tactics databases to optimise evasion and survival.

...a range of countermeasures to ensure the survivability of ships and submarines in the face of advanced torpedo threats.
Ultra’s game-changing Integrated Sonar System (ISS) solves the Anti-Submarine Warfare (ASW) problem from all aspects.

Detecting and deterring the submarine threat by using multiple sensors and multiple frequencies simultaneously; then defeating the submarine’s primary weapon by detecting, classifying and localising the heavy weight torpedo, coupled with threat neutralisation through a comprehensive towed and expendable countermeasure suite.

INTEGRATED SONAR SYSTEM
For surface ship applications, Ultra has developed a comprehensive, fully integrated Sonar System (ISS), comprising both hull-mounted and towed arrays. It is a modular system, built on a common multi-sensor processor, within an open architecture “system of systems”. It fuses data from on-ship and off-board sensors to build a complete underwater tactical picture and delivers a bi-static sonar capability from hull-mounted and towed array sonars. To maximise detection and localisation of underwater threats, the system further facilitates interoperability with sensors on third-party co-operating platforms, including ‘inline processing’.

Ultra’s ISS is a single sonar with multiple sensors. It can operate at multiple frequencies and has bi- and multistatic functionality to increase the probability and range of detection, classification, and localisation of both submarines and torpedoes. Traditional ASW installations typically treat each sonar as a separate, independent system, linked via a network, “a systems” system. Ultra’s ISS draws together the information from each acoustic sensor into a single modular solution with multiple sensors.

In ISS, the transmitters and receivers can be physically separated, but operate as a single system in a geographically dispersed network. The data from all sensors is integrated and used to generate a single graphical display. ISS can also integrate track data from the Combat Management System. This enables management of the ASW space, autonomous target motion analysis and track calculation and generation. All the integrated information is displayed on intuitive, interactive, geographically orientated displays. The operators have a number of tools, including the option to analyse the energy map and to simply switch on various geo-spatial overlays and multi-ke y filters, to aid them in rapidly identifying and releasing contacts and potential underwater threats.

Sonar systems
Ultra’s world-leading capabilities are delivering dominance in the underwater battlespace

...optimises the probability of submarine and torpedo detection whilst avoiding the problem of acoustic ‘clutter’.

ACTIVE-PASSIVE VARIABLE-DEPTH Sonar
Ultra’s family of variable depth sonars (VDS) include both an innovative single tow, in-line, horizontal projector array coupled with a directional passive-receive array as well as a modular dual tow solution combining the additional source level and bandwidth available in tow body with echo reception occurring on a separate directional receive array. Ultra’s fully-modular in-line VDS marks a step change in technology and capability, away from the constraints of traditional towed sonars. It needs only a single, lightweight winch, which can be operated by two personnel. Additionally, the low weight and footprint of the in-line VDS allows it to be fitted to smaller warships and these vessels not specifically designed for ASW operations. In its full specification, Ultra’s modular VDS combines both systems to offer the option to use the in-line tow for littoral operations and torpedo defence and stream tow body when additional detection ranges are required in deep water ASW operations.

VARIABLE-DEPTH SONAR
Ultra’s digital acoustic module hull-mounted sonar (HMS) is a combined active/passive array, with dual-frequency transmit flexibility. This HMS can be operated in omni-directional mode, or in sector search and employs a range of FM and CW waveforms to optimise the probability of detection and avoid clutter. It has a heavy weather mode to increase sonification during high sea states and a close contact mode for detection and tracking of close targets. Ultra’s HMS also incorporates mine avoidance capabilities. It can transmit in a wide bandwidth to avoid mutual interference from other ships, enabling increased freedom of manoeuvre during multi-ship operations.

HULL-MOUNTED SONAR
Ultra’s digital acoustic module hull-mounted sonar (HMS) is a combined active/passive array, with dual-frequency transmit flexibility. This HMS can be operated in omni-directional mode, or in sector search and employs a range of FM and CW waveforms to optimise the probability of detection and avoid clutter. It has a heavy weather mode to increase sonification during high sea states and a close contact mode for detection and tracking of close targets. Ultra’s HMS also incorporates mine avoidance capabilities. It can transmit in a wide bandwidth to avoid mutual interference from other ships, enabling increased freedom of manoeuvre during multi-ship operations.

DUAL-FREQUENCY TRANSMIT FLEXIBILITY
This HMS can be operated in omni-directional mode, or in sector search and employs a range of FM and CW waveforms to optimise the probability of detection and avoid clutter. It has a heavy weather mode to increase sonification during high sea states and a close contact mode for detection and tracking of close targets. Ultra’s HMS also incorporates mine avoidance capabilities. It can transmit in a wide bandwidth to avoid mutual interference from other ships, enabling increased freedom of manoeuvre during multi-ship operations.

NEXT GENERATION SURFACE SEARCH RADAR
Ultra has exploited modern hardware and software data fusion technologies to develop a robust real-time data aggregation and synchronisation radar architecture. This has enabled the development of an affordable, operationally effective next generation surface search radar.

The system is based on the 4VSPS-74 system that is deployed on the US Navy’s aircraft carrier fleet and is designed to detect submarine periscope targets with high probability while maintaining a low probability of false alarm. Its open architecture is designed to enable integration with multiple types of radar systems to enable common data acquisition and processing environment.

SEA SEARCH RADAR
Ultra has exploited modern hardware and software data fusion technologies to develop a robust real-time data aggregation and synchronisation radar architecture. This has enabled the development of an affordable, operationally effective next generation surface search radar.

The system is based on the 4VSPS-74 system that is deployed on the US Navy’s aircraft carrier fleet and is designed to detect submarine periscope targets with high probability while maintaining a low probability of false alarm. Its open architecture is designed to enable integration with multiple types of radar systems to enable common data acquisition and processing environment.

Underwater warfare

visit. ultra-electronics.com

...
Underwater warfare

Ultra has a broad portfolio of specialist capabilities which can be combined flexibly to generate innovative, highly-differentiated solutions, which are delivered in close collaboration with customers, partners and suppliers.

Ultra is well positioned to support customers and provide solutions to complex needs across the Defence & Aerospace, Security & Cyber, Transport and Energy markets.

<table>
<thead>
<tr>
<th>Capabilities related to underwater warfare covering military, paramilitary and civil domains. These include transducers, hydrophones, sonobuoys, sonobuoy receivers, towed arrays, periscope detecting radars, torpedo defence systems, acoustic countermeasures, and surface ship sonar systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime</td>
</tr>
<tr>
<td>Land</td>
</tr>
<tr>
<td>Aerospace</td>
</tr>
<tr>
<td>C2ISR*</td>
</tr>
<tr>
<td>Communications</td>
</tr>
<tr>
<td>Nuclear</td>
</tr>
<tr>
<td>Infrastructure</td>
</tr>
</tbody>
</table>