AEROSPACE

making a difference
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 competitors. 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 provides high integrity mission-critical products and systems for the most challenging aircraft requirements. These include electronic systems, control and instrumentation solutions for military and civil aerospace applications on both manned and unmanned aircraft.

Ultra’s broad range of specialist capabilities

Ultra focuses on developing specialist capabilities that provide highly-differentiated solutions to customers’ requirements. Eight clearly defined market segments allow Ultra to provide more complex offerings from across the full range of the Group’s capabilities. The eight capability segments are:

- **Underwater warfare**
- **Maritime**
- **Land**
- **Aerospace**
- **C2ISR**
- **Communications**
- **Nuclear**
- **Infrastructure**

### 2016 revenue by segment

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

*Command & Control, Intelligence, Surveillance and Reconnaissance*

Did you know?

Ultra’s broad range of specialist capabilities is 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 13-14.

Specialist capabilities

- **Avionics**
  - Underwater warfare
  - Maritime
  - Land
  - Aerospace
  - C2ISR
  - Communications
  - Nuclear
  - Infrastructure

- **Aircraft systems**
  - Underwater warfare
  - Maritime
  - Land
  - Aerospace
  - C2ISR
  - Communications
  - Nuclear
  - Infrastructure

- **Aerospace**
  - Underwater warfare
  - Maritime
  - Land
  - Aerospace
  - C2ISR
  - Communications
  - Nuclear
  - Infrastructure
Ultra is a world leader in high integrity electronic systems for military and civil aerospace applications.

Ultra is the leading manufacturer of compact on-board gas solutions.

Ultra supplies landing gear control units, steering, door and hydraulic position sensing and control products to a wide range of aircraft including: Airbus A330/340 families, Boeing 787 Dreamliner, Gulfstream G550, Gulfstream G500/600, Airbus A400M, Eurofighter Typhoon, Mitsubishi’s Regional Jet, Embraer KC-390.

PRESSURISATION SYSTEMS
Ultra is the leading manufacturer of compact on-board gas solutions, including compact gas compressors (HiPPAG™), for the defence industry worldwide. Applications include cryogenic cooling systems, stores ejection/release systems and pneumatic systems. These capabilities, coupled with Ultra’s advanced filtration technology, have led to the development of a wide range of pure air and oxygen generating products. These products feature increased reliability, whilst reducing the logistics footprint by removing the need for refillable gas canisters.

HIGH INTEGRITY DYNAMIC HARNESSES
Ultra’s services range from providing a simple point-to-point power harness, through to full design support for more complex harness systems. Many harnesses are hand assembled, using high grade materials to ensure product reliability in the toughest of environments. Ultra specialises in dynamic harnesses, used for applications where harnesses must cross a moving interface, such as between the wing and the moving slats. These dynamic harnesses provide rugged and reliable connections that can be extended and retracted for the life of the aircraft without the need for maintenance. Harnessing solutions are provided for a large range of applications, from aircraft fuel system measurement and gauging to MIL-STD-1553 physical layer testing, C4Ibus, ARINC-429 and Ethernet data busses. In addition, harnesses for digital and analogue video, discrete signal, power and fibre optics can also be provided.

ACTIVE NOISE AND VIBRATION CONTROL
Ultra is the leading supplier of aircraft active noise and vibration control products with systems installed on more than 1000 aircraft worldwide including Bombardier’s Q series, Beechcraft King Air, Saab 340 and 2000, and Lockheed C-130. Ultra’s systems are designed to reduce the cabin noise and vibration generated by the aircraft’s props. The system uses an array of sensors (both microphones and accelerometers) to measure the noise and vibration in the cabin and an array of actuators (either loudspeakers or vibration actuators) to cancel this noise. All system components are hidden behind the aircraft trim and provide noise control where it is needed, at the passenger’s head-height.

ELECTRO-THERMAL ICE PROTECTION
Ultra provides the innovative electro-thermal ice protection system for the leading edge of Boeing’s new 787 composite aircraft wing. The system is designed to provide high availability and low cost of ownership and it is a key enabler of the advanced wing design which contributes to the 787’s high fuel-efficiency. Ultra’s specialist capability has been further endorsed by selection to provide engine intake and lift fan (STOLV) variants’ ice protection for the F-35 Joint Strike Fighter (JSF) aircraft. This system also incorporates custom, rugged harnesses and connectors. Ultra provides ice protection systems for helicopter engine inlets, propellers and windshields which are designed to operate in either an anti-icing, de-icing or hybrid mode.

PROPELLER BALANCE MONITORING SYSTEM (PMS)
Ultra provides systems capable of monitoring the vibration caused by propeller imbalance. They monitor this during normal service flying. The PMS can be installed in conjunction with active noise and vibration control, or as a stand-alone system. To add PMS to the active noise control system requires the addition of a single accelerometer per engine. The operator determines the balance solution using an intuitive laptop-based user interface. As Ultra’s system uses flight data, it provides a superior balance solution to systems which rely on ground running for propeller balance. Up to four engines can be monitored simultaneously and there is no requirement for dedicated flight or ground crew.

PROPELLER CONTROL
Ultra has a long history in the design, development and production of high integrity, safety-critical control systems. In many cases, these products are located in very harsh (high temperature and high vibration) environments, such as engine casings and nacelles. An example of this is the propeller electronic controller supplied to the Bombardier Q400 aircraft which provides the critical interface and control between the engine electronic controller and the pitch actuation system. It incorporates a dual-lane architecture featuring a number of interlocks to ensure safety, including propeller ‘auto feather’ function and is designed to Design Assurance Level A.

TEMPERATURE SENSORS
Ultra is an innovative supplier of temperature instrumentation for the Original Equipment Manufacturer (OEM), military/civil aerospace, process industry and nuclear power markets. Ultra has proven capabilities to not only design temperature sensing devices for extremely demanding applications, but also meet the unique requirements of its customers. Ultra has provided sensors to measure temperature in aircraft environmental control systems, wing de-icing, fluid immersion and engine test stands. The Group also has the capability to design and manufacture sensors for the demanding brake and surface temperature measurement market segments.

FUEL TANK INERTING
Ultra has developed a fuel inerting systems capability for civil and military aircraft. The capability is a natural progression from Ultra’s pneumatic systems work on the F-35, 5th Generation Fighter and other military gas separation projects for the US Army. Through its partnership with others, Ultra can offer the complete range of equipment and services from initial design studies up to delivery of qualified equipment and support through to certification.

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Ultra’s active noise and vibration control systems are installed in more than 1300 aircraft worldwide.
**Avionics**

Ultra offers a number of rugged Human Machine Interface (HMI), control and instrumentation solutions to the military, civil and general aviation markets.

**COCKPIT & GROUND STATION EQUIPMENT AND LIGHTING SOLUTIONS**

Ultra supplies a range of rugged, ergonomic HMI equipment for cockpit, loadmaster and UAV crew stations. Cost-effective solutions with high reliability and proven performance are in service with military and civil operators around the world. Ultra has provided internal and external aircraft lighting in both civil and military markets. In the cockpit, these include high visibility indicators, wander lamps, panel illumination and night vision goggle compatible indicators. Externally, the range includes formation lights, landing/taxi lights and external safety-critical indicators. All lighting solutions are designed for high reliability use, maximising modern technologies and are fully qualified for their operational environment using Ultra’s in-house photometry facilities.

**COCKPIT RESOURCE MANAGEMENT**

Cockpit resource management is improved by alerting pilots to critical engine conditions.

Ultra’s AuRACLE engine management systems provide discerning pilots with primary engine management, compatible with 95% of all single and twin-engined general aviation aircraft.

Cockpit resource management is improved by alerting pilots to critical engine conditions including fuel data, exhaust gas temperature and cylinder head temperature. Each unit is configured to the respective airframe and engine combination. All versions of the AuRACLE aircraft engine monitor feature a revolutionary glass panel MFD display which mimics analogue aircraft gauges and is capable of replacing them. Ultra’s versatile multi-function flight instruments provide intuitive access to all critical engine data at a glance. In addition, they are supplementary type certificated for primary operation.

**MAINTENANCE INTERFACE EQUIPMENT**

Ultra provides rugged equipment fitted to external parts of aircraft designed to allow ground crew to interface with the aircraft. These parts are designed to withstand harsh environmental conditions, such as hail, fluid contamination, humidity, extremes of temperature and exposure to hydraulic fluid. Applications to date have included panels to control nose wheel steering disconnect for towing, communication interfaces for ground crew, switches, indicators and landing gear bay doors controls. All parts have been tested to DO-160 environmental conditions and are provided to some of the leading aircraft manufacturers.

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**AIRCRAFT ENGINE MANAGEMENT SYSTEMS AND INSTRUMENT SOLUTIONS**

Ultra offers a competitive range of digital engine instrumentation which provides the cockpit with a more modern look than traditional analogue instruments at less than half the cost of the average flat panel display. Ultra’s instruments are ideal for retrofit markets as they eliminate the cost associated with panel modification, necessary when installing flat panel displays. These instruments contain software which has been audited to DO-178B level C and the whole instrument has been environmentally tested to DO-160D to support TSO certification. Ultra’s instruments have been installed in many types of aircraft including general aviation, business jet, helicopter and military trainer platforms as standard OEM equipment.
Aerospace

Avionics Unmanned Airborne Vehicle systems (UAVs)

Ultra provides innovative power, communication, control products and system solutions to UAVs, ranging from small tactical platforms all the way to large, high altitude long endurance systems.

Creating new options for how soldiers power mission-critical systems.

UAV CONTROLLERS

Ultra’s technologies and options for grip and throttle solutions have proven to be ideal for use in UAV ground control stations. The Group has been manufacturing the payload and flight controls for the Predator and Reaper UAVs for several years. Leveraging its expertise in both human factors engineering and traditional hand controls, Ultra’s most recent development projects focus on the dismounted soldier. The warfighter today has to be ready to take immediate and appropriate action at the tactical edge and requires the control systems to interface effectively with the brigade, as well as individual mission assets, including UAVs. Recognising the need for lightweight, soldier-portable controls which concentrate functionality and asset accessibility into the warfighter’s hands, Ultra introduced the first fully ruggedised game-style controller in 2004. By using this form of hand controller, a design already familiar familiar to today’s soldiers, Ultra was able to militarise a control system which reduced training time and has become an ideal controller for the operation of numerous UAVs.

PORTABLE FUEL CELLS

Ultra designs, tests and manufactures the future of portable power: solid oxide fuel cell technology. Ultra is committed to providing dependable portable fuel cell power, using readily accessible fuel, which can be taken into the wild or into combat. The Group’s solid oxide fuel cell power systems have been proven reliable in field testing for military, leisure and emergency use. Ultra’s FuelCell™ is a family of flexible, networkable, software-definable digital data links which are optimised to meet highly sensitive, time-critical (low latency) information exchange needs, such as unmanned airborne systems platforms, weapon systems and mission critical sensors.

Ultra can offer high-bandwidth, reliable, secure and inter-operable network communications solutions for military users.

COMMUNICATIONS

Ultra’s full suite of communications products underpins the secure video, voice and data communication networks and systems which enable net-centric connectivity across the battlefield. Ultra can offer high-bandwidth, reliable, secure and inter-operable network communications solutions for military users. The Group’s capabilities, covering voice, video, data and chat, include: high-capacity networks for C4I; air-to-ground communications; on-the-move network extensions; beyond line-of-sight communications; covert comms; logistics operations and sustainment; search, rescue and quick response; security overlays; gateways; communications and network planning; secure data links for unmanned airborne vehicles; full motion video receivers.

SECURE COMMUNICATIONS

Ultra specialises in avionics, secure command and control (C2), imagery and tactical data links, airborne secure voice and data communications and system integration. Ultra’s HIDL™ is a family of flexible, networkable, software-definable digital data links which are optimised to meet highly sensitive, time-critical (low latency) information exchange needs, such as unmanned airborne systems platforms, weapon systems and mission critical sensors.

Ultra can offer high-bandwidth, reliable, secure and inter-operable network communications solutions for military users.
Aerospace

Aircraft weapon systems

Ultra provides an array of innovative mission-critical products and solutions which form part of the aircraft weapon systems for a large range of military aircraft.

WEAPONS EJECTION

Ultra supplies a range of integrated high pressure pure air generators (HiPPAG™) for the supply of high-pressure dry air for use within pneumatic cold-gas stores ejection systems. HiPPAG™ 500 Series systems are designed to meet the demanding requirements of precision ejection systems and provide flexibility of installation within ejector racks, aircraft pylons or in internal weapons bays on high-performance manned and un-manned military aircraft platforms. Each HiPPAG™ compressor system comprises a high pressure compressor module featuring a highly efficient brushless DC motor, a filter module with a desiccant filter cartridge and a compact electronic control unit. HiPPAG™ sensors control the system pressure within a set band to ensure accurate and repeatable release characteristics.

The HiPPAG™ 500 Series can also be offered with a multi-way solenoid manifold valve and accumulator and fast-acting valve modules for a complete ‘induction to ejection’ pneumatic system solution. Ultra is at the forefront of developments in cold-gas ejection systems, its systems having been selected for demanding programmes such as: F-35 JSF, BRU-61 small diameter bomb carriage system, X-47 J-UCAS demonstrator, F-15E Strike Eagle cost operational support savings initiative.

SEEKER COOLING

HiPPAG™ for infrared detector cooling is an integrated pure air compressor and filtration system which is designed to replace rechargeable gas bottles. HiPPAG™ has proven its reliability in-service on key US Navy and NATO platforms. The system draws in atmospheric air to provide a continuous supply of high pressure pure air, which results in unlimited mission duration and eliminates the logistics burden associated with gas bottles. HiPPAG™ generates the gas where it is needed, within the launcher, and reliably purifies it to the very highest standards. Gas is always available ‘on-demand’ and the potential sources of contamination are eliminated.

HiPPAG™ has proven its reliability in-service on key US Navy and NATO platforms.

Ultra’s capabilities in aircraft weapon systems extend from the cockpit, where the Group provides high reliability and safety-critical switches and controls such as the master armament switch, through highly sophisticated sensors and targeting systems including the Litening III advanced laser targeting pod, all the way to the precision ejection of the weapon from the aircraft.

 Versions of HiPPAG™ are available that can perform the weapons ejection and seeker cooling functions from the same unit. The system can be scaled to provide services to multiple pylons from a single unit, such as for weapons bay applications. Ultra has designed and tested a unique capability to provide high pressure hoses that are flexible at 5000 PSI. This allows for pylons mounted on weapons bay doors to be serviced from a HiPPAG™ fitted to the non-moving part of the weapons bay.
Logistics and mission support

As well as supplying automatic portable test equipment and harnesses Ultra offers a number of through-life support services.

Ultra offers a number of through-life support services such as obsolescence management, condition-based monitoring and maintenance, repair and overhaul services.

LOGISTICS & MISSION SUPPORT

Ultra supplies automatic portable test equipment and harnesses for integrity validation, safety testing and calibration of fixed and rotary-wing aircraft fuel, data-bus and electronic filtering systems. Ultra also offers a number of through-life support services such as obsolescence management, condition-based monitoring and maintenance, repair and overhaul services.

AIRCRAFT ON GROUND (AOG) SERVICE

Ultra recognises that an aircraft’s value is only realised in the air. As such, Ultra is able to offer its customers a worldwide AOG material and technical support service, 24-hours a day, 365 days a year. Orders are handled through procedures which have been established in accordance with the World Airline Supplier Guide.

Tailored to meet the client’s specific needs.

PLATFORM SUPPORT & TESTING

Ultra designs and supplies first-line/operational (‘O’) level ground support equipment and special-to-type test equipment to both the military and civil aerospace markets. Working closely with OEMs and end-users, the Group has developed equipment which meets stringent technical, quality and safety specifications. Example products include: databus network analyser; Eurofighter HOTAS test set; fuel quantity test set; high ARINC 429 data analyser; nose wheel steering test set; THe6293 RF filter integrity analyser.

TECHNICAL PUBLICATIONS

Ultra offers a wide range of publications services, ranging from the creation, reviewing, editing and sustaining of content for technical product documentation, through to conducting documentation usability tests, handling graphics and illustrations and migration of data across various formats. Working in both traditional and modern formats and media, Ultra has the ability to tailor solutions for the specific audience.

TRAINING

Ultra provides training services to operators and maintainers of equipment. Tailored to meet the client’s specific needs and delivered through a variety of modern training techniques and media, the courses provide clients with the ability to operate and support equipment in the field.

ENVIRONMENTAL TESTING

Safety and mission-critical equipment must maintain performance across a wide range of environmental scenarios to ensure compliance against safety and regulatory conditions. Ultra provides organisations with professional and accredited environmental testing services using its in-house facilities, encompassing vibration, shock, acceleration, temperature, humidity, altitude, salinity, burn analysis, electro-magnetic compatibility and photometry.

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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.

### Aerospace

- **Underwater warfare**: Capabilities related to underwater warfare covering military, paramilitary and civil domains. These include transducers, hydrophones, sonobuoys, sonobuoy receivers, sound arrays, pinger and torpedos detecting radars, torpedo service systems, acoustic countermeasures, and surface ship sonar systems.

- **Maritime**: Capabilities related to signal and power management, operating, controlling, supporting and maintaining maritime (surface and sub-surface) 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 military 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 conversion and control, as well as non-nuclear civil energy related capabilities.

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*Command & Control, Intelligence Surveillance and Reconnaissance*