Advanced Technology Solutions
Micro & Nano Systems
BAE SYSTEMS is an international company engaged in the development, delivery and support of advanced defence systems in the air, on land, at sea and in space.

The company designs, manufactures and supports military aircraft, surface ships, submarines, radar, avionics, communications, electronics and guided weapon systems. It is a pioneer in technology with a heritage stretching back hundreds of years. It is at the forefront of innovation, working to develop the next generation of intelligent defence systems.

BAE SYSTEMS has major operations across five continents and customers in some 130 countries. The company employs more than 83,000 people and generates annual sales of approximately £12 billion.

Advanced Technology Solutions was formed in January 2016 to bring together the two technology businesses which had transferred from the BAE Systems Shared Services Advanced Technology Centre in 2015.

The new organisation is a centre of excellence for research, development and manufacture of low observable materials and micro and nano scale technologies.
Micro and Nano Systems (M&NS) offers novel methods of manufacture for sensors, actuators and displays which are smaller, lighter and offering new manufacturing capabilities than conventionally engineered devices.

BAE Systems Advanced Technology Solutions (ATS) offers a comprehensive capability in MEMS (Micro-Electro-Mechanical Systems) from concept through detailed design to fabrication and evaluation.

The facility is set up to perform specialist R&D, proof of principle and niche manufacture of sensors, actuators and displays using MEMS technologies and processes.

The team has developed devices covering display, inertial, optical, RF, aerodynamic, biological, chemical and electro-magnetic functionality.

We are accredited to ISO 9001 and UK Ministry of Defence security standards, ensuring quality throughout the product lifecycle and customer service you can rely on.

Our corrosion sensors are helping to reduce the through life costs of inspection on the F35 platform.

To build small we think big
Our Micro & Nano Systems (M&NS) facility in Filton, Bristol is a unique ‘centre of excellence’ for the manufacture of devices on the micro and nano scales. The team has been involved in MEMS research and development for over 30 years.

We have a proven track record in the miniaturisation of a variety of sensors, actuators and to provide our customers new capabilities in an ever decreasing weight and volume.

Devices have been developed that are recognised as world leading, these include the Silicon Gyro which has been successfully transferred to a high volume manufacturing line delivering several million devices per annum into the automotive and other commercial sectors.

Our scientists and engineers have access to the latest modelling tools, processing equipment and analysis kit within our secure facility.

Our research teams have strong links to academia and research organisations. A key strength at BAE Systems is that virtual teams are formed between the customer and MEMS fabrication experts, so that knowledge is shared to ensure the best technical solution is developed.
MEMS is the application of silicon processing technology to fabricate electro-mechanical sensors and actuators to complement electronic systems/computing.

ATS has a full design and prototyping capability for custom MEMS technology. Our team of highly skilled scientists and engineers are leading the way in the miniaturisation of devices such as actuators, sensors and displays. Working with customers to develop technologies and fabrication methods for novel devices where platform real-estate and weight budgets are prime or to increase survivability in harsh environments.

Our specialist research and development, proof of principle and niche volume manufacturing facility which includes a class 100 clean room is located in Filton, Bristol.

We have access to a comprehensive range of fabrication, packaging and characterisation equipment and strong links to a vast range of facilities to ensure your requirements are realised.

We have experience in maturing R&D projects including a silicon MEMS gyro that has been used for both military and civilian applications (Seawolf and the Segway). For example a corrosion sensor developed by ATS was selected by Lockheed Martin for corrosion monitoring of F35. We are also developing sensors for DSTL to monitor the corrosion of legacy aircraft.
BAE Systems ATS have over 30 years’ experience and knowledge in developing MEMS technologies and devices for defence and commercial applications. By utilising the skills of the Micro & Nano System team and the wider BAE Systems competencies, the facility is unique in the UK for R&D, proof of principle and niche manufacture.

Integrated Sun Sensors
Satellites currently employ a variety of attitude sensors including sensors to determine the position of the sun. The existing conventionally-constructed models are large and expensive. MEMS versions which integrate optical chips with electronic sensor chips are more compact, and can be made cheaper, so that multiple sensors can be employed to good effect on small and/or complex spacecraft.

Inertial Sensors
Silicon MEMS Gyros have been developed for dual civil and military use. This has been a commercial success within excess of 25 million sensors delivered. It has proven gun hardening to 20,000g shock and been used in several military programmes.

In the case of the Seawolf missile IMU, a silicon based solution has realised size and weight savings of 10X and furthermore, mass production has brought the cost down by a similar factor.

Corrosion Sensors
Advanced Technology Solutions have developed a corrosion monitoring system that is designed to help reduce the through life inspection costs of an aerospace, land and maritime platforms.

The sensor is designed to be fitted into a number of difficult or expensive to access areas of a platform. The ability to understand the environment remotely and thus the need for physical access will significantly reduce the through-life-maintenance costs attributed to inspection.

The smart witness plates are designed to inform the platform HUMS system of corrosion damage before it becomes significant or could be detected by human eye. This data enables maintenance engineers to determine when visual inspections and maintenance routines are required.

Case Studies

TPS
Thermal picture synthesis devices are used for generating thermal images for use in developing and testing infrared radiation sensitive electro-optical equipment.

ATS have developed a system that contains an array of individually addressable emission resistor that enables high fidelity, high accuracy and high speed IR imagery to be presented to an IR seeker under test.
Our secure facility based in Filton, Bristol has a comprehensive range of fabrication, packaging and characterisation equipment for the development of devices in the micro and nano scale. Our team are leaders in the design and demonstration of MEMS devices and technologies.

We would be pleased to invite you to our modern facility to discuss your requirement and how our team can assist.

### Facilities

#### Fabrication
- Photolithography
- Wafer bonding
- Physical Vapour Deposition
- Chemical Vapour Deposition
- Spin Coat Deposition
- Screen Print Deposition
- Electroplated Deposition Processes
- Wet Etch processes (Parallel Plate, Reactive and Deep Reactive Ion Etching (RIE & DRIE))
- Laser Ablation

#### Packaging
- Wafer saw
- Wedge wire-bonder
- Ball wire-bonder

#### Characterisation
- Microscopy (optical, electron and atomic force)
- Linewidth
- Topography (profilometry, non contact optical interferometry)
- Resistivity
- Analytical and probe card test stations
- Film thickness (profilometry, interferometry and ellipsometry)
- Composition (Surface Analysis, X-ray Diffraction, IR and UV spectroscopy and many more)
- Wafer bow and stress measurements from room temperature to 500°C
- Environmental stressing (temperature, humidity, salt spray etc.)
- Ultrasonic and real time micro-focus X-ray imaging