Innovation in space for advantage on Earth

Digital Intelligence

BAE SYSTEMS

Space technology helps us achieve incredible things – from protecting citizens to securing communications and defending nations. And, for the last 25+ years, BAE Systems has been at the forefront of space innovation.

Our specialist technologies in waveforms, electronics, antennas, digital signal processing and analytics have opened the door to a brave new world of opportunities. Today, we are committed to further investing in our space capabilities.

Our 2021 acquisition of In-Space Missions and close collaboration with ICEYE means we can now integrate our technologies into complete satellites and operate them in orbit. We are combining our expertise in highly secure satellite communications with In-Space Missions' agile full lifecycle satellite capability and ICEYE's advanced SAR technology to give our customers the advantage.

Our space mission

Our mission in space is to deliver space-enabled solutions for security and future prosperity of the space domain.

As a pan-global domain, space enables integration across land, sea, air and cyber. It sits at the heart of achieving military and economic advantage on the world stage, providing secure and rapid access to critical information from anywhere on Earth. Working with In-Space Missions, we are building Low Earth Orbit satellite networks that help deliver information advantage and multi-domain operations.

We are also focused on using our heritage in delivering complex defence programmes to develop the UK's sovereign space capability, build a more diverse UK space industry, and increase our global influence through partnerships both in the UK and internationally.

Our core capabilities

We can help enable the digital backbone that will provide actionable intelligence at the edge. Our technology supports our customers' communications, intelligence, imaging and positioning needs in bold and innovative ways:

- **Low Earth orbit satellites –** innovative multi-sensor clusters to deliver a step-change in capabilities
- **Software defined payloads –** satellites that can be upgraded while in orbit for an enhanced lifespan and greater mission flexibility
- **Rideshare space missions –** making it easier than ever to launch payloads into orbit
- **ISR Solutions –** software that can autonomously collect, process and disseminate data to users
- **Geo-intelligence analytics –** using machine learning and artificial intelligence to interpret and deliver solutions
- **Secure communications –** digital optical comms for more advanced data sharing, platform agnostic STT&C system and waveform design, sub-sea to space communications chain
- **Space operations –** space mission delivery and operations
- **Small & Cube satellites –** miniature in size so that they can be built quickly, and launched cost-effectively

Azalea

Our low Earth orbit satellite cluster currently in development, Azalea will provide secure digital intelligence in near real time for our UK and allied defence and military customers. It will use multiple sensors to monitor the Earth's surface, analyse data, and deliver the resulting intelligence anywhere in the world.

Uploadable, reprogrammable service options mean that the cluster can be fully reconfigured while still in orbit, ensuring it can deliver future customer missions and expanding the satellites' lifecycle.

Image courtesy of ICEYE

Tracking, Telemetry and Command Processor

Our Tracking, Telemetry and Command Processor (TTCP) delivers a next-generation technology solution for processing the communication signals sent between near-Earth and deep-space European Space Agency spacecraft and ground stations.

- The system allows deep space ground stations to track, communicate with and control spacecraft travelling away from the Earth at up to 180,000 km/h
- Using stations positioned at key locations on the Earth's surface, TTCP can triangulate the position of a spacecraft with an accuracy of 0.2 millionths of a degree
- The system can download information with data rates of up to 75 Mbps, from 1.5 million km away
- The system can measure the distance of a spacecraft to within 10 cm anywhere in the solar system

Satellite Communications

- Design of hybrid RF/optical ground stations
- Manufacture of space qualified microwave components
- Design and manufacture of UK MILSATCOM cyber threat resilient and configurable payloads
- Free space underwater to air/space communications

Satellite Applications

- EO/ISR geo-intelligence analytics
- Implementation of non-GNSS navigation
- Design of UK GNSS satellite antenna

Our work in space

Supporting ESA's Jupiter mission

- Our TTCP technology is supporting the European Space Agency's (ESA) Jupiter Icy Moons Explorer – known as Juice – on its mission to carry out detailed observations of Jupiter and its three large ocean-bearing moons.
- It is providing vital uplink and downlink communication services. The uplink transmits commands to control the spacecraft, while the downlink receives Juice's spacecraft and sensor data.
- This enables ESA operation centres to communicate with Juice, track its whereabouts in deep space, and receive crucial data that could enable the next scientific breakthrough.

Taking Rosetta to comet 67P

- Our Intermediate Frequency Modem System (IFMS) gave the ESA the capability to communicate with and control the Rosetta probe on its mission to the Jupiter-family comet 67P/ Churyumov-Gerasimenko.
- IFMS was used to measure the position and speed of the spacecraft on its journey to comet 67P, as well as receive the signals from Rosetta to help produce the amazing images seen from the mission.

Faraday-1 Phoenix Rideshare

- Faraday Phoenix was developed by In-Space Missions in less than 8 months and was the world's first commercial rideshare satellite mission when it launched in July 2021 on Spaceflight's SXRS5 Transporter 2 mission from Cape Canaveral, USA.
- The spacecraft carries payloads for six customers including Airbus, Lacuna, SatixFy and Aeternum as well as In-Space's own Babel payload.

For more information, contact: **Learn@baesystems.com**

Or visit: **Baesystems.com/futurespace**

Subscribe to our Space Insights newsletter to stay up to date with the latest news and insights: **Baesystems.com/spaceinsights**


Watch our video to find out more about our space capabilities.

We are Digital Intelligence

BAE Systems Digital Intelligence is home to 4,800 digital, cyber and intelligence experts. We work collaboratively across 16 countries to collect, connect and understand complex data, so that governments, nation states, armed forces and commercial businesses can unlock digital advantage in the most demanding environments. Launched in 2022, Digital Intelligence is part of BAE Systems, and has a rich heritage in helping to defend nations and businesses around the world from advanced threats.

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