Partnership Provides Space for Success

Aerospace, defence, security: three words synonymous with opportunities and challenges presented by the world today, and each signifying a sector crucial to the drive for sustained UK growth. BAE Systems is the UK’s largest company active in these spheres and a major global player, with a track record of turning upstream science into downstream products and services generating nearly £4 billion/year in export earnings and supporting over 120,000 jobs in total. These achievements are rooted in a relentless quest to innovate, to improve and to meet customers’ existing and emerging needs. In 2014, BAE Systems invested no less than £63 million in R&D, including £10 million spent harnessing and fostering UK universities’ world-class capabilities through grant funding and PhD studentship support and at the time of printing, are partnered with an EPSRC grant portfolio worth over £200 million.

A vital role is played by the Strategic Partnership established over a decade ago between BAE Systems and EPSRC which has resulted in advancing technologies in key areas such as robotics and fluid dynamics. Adding an extra dimension to the company’s relationship with the UK research base, this has strengthened dialogue, boosted cross-fertilisation of ideas for ventures facilitating the journey from raw science to competitive commercial offerings – helping to underpin the ongoing global success of this flagship UK firm.

A Flavour of the Future

Unmanned air vehicles (UAVs) are in growing demand for both military and civil uses, but unleashing their full potential depends on cutting maintenance costs, enhancing reliability, boosting fuel efficiency and optimising aerodynamic performance. One of the first initiatives jointly funded through the Strategic Partnership, the £6 million FLAVIIR programme addressed this challenge head-on, developing an array of next-generation UAV technologies – including lighter airframe materials and airflow-based flight control systems eliminating the need for moving flaps. Managed from Cranfield University and involving nine other university partners, the close interaction fostered between research groups, each with their own specialisms and skill sets, was a particular feature. A suite of technologies was integrated into DEMON, a 2.7m-wingspan demonstration UAV that became the first-ever aircraft to fly without flaps. Working with Manchester and Liverpool Universities and supported by the Defence Science and Technology Laboratory, BAE Systems has
now taken selected FLAVIIR technologies forward for testing at the flight scales typical of real-world service.

**Exposing Corrosion**

Corrosion is the silent enemy. Undetected, it can compromise safety, inflate repair bills and put equipment out of service. Prevention really is better than cure, as underlined by the predicted $4 billion savings resulting from installation of innovative corrosion sensors in Lockheed Martin’s new F-35 Lightning II fighter aircraft. Weighing just half a gram, these tiny chrome-free, non-toxic sensors developed by BAE Systems embody two decades’ work dedicated to understanding and combatting corrosion – work where EPSRC-supported research has made a pivotal contribution.

This research has shed light on fundamental questions such as corrosion’s behaviour at atomic level and the effect of humidity, salt and other environmental factors on corrosion processes. The University of Birmingham has been at the forefront, with PhD studentships zeroing in on key aspects of the problem. The outcome has been an invaluable platform of knowledge informing BAE System’s corrosion modelling and sensing initiatives, product design and manufacture and even the development of coatings, paints and sealants that keep corrosion at bay.

“EPSRC’s in-depth knowledge of the UK research landscape ensures we can access the academic powerhouse that is the UK universities system.”

Dr Steve Harris, Head of External Partnerships and Brokering, BAE Systems

**Material Momentum**

Increased strength, better protection, reduced weight, lower costs – these are just some of the benefits that emerging materials technologies can potentially deliver. Within the framework of the Strategic Partnership with EPSRC, BAE Systems has worked with university partners to add momentum to such technologies’ development and to scale up over a dozen for inclusion in an Integrated Materials Demonstrator that provides an intriguing showcase for solutions of tomorrow.

Incorporating elements of land-based fighting vehicle, aircraft wing and ship’s hull, this ingenious facility makes it easy to visualise how these innovations might be utilised in the real world. From armour systems that adapt to changing threats, to a super-strong joining system combining adhesive bonds with mechanical interlocks, to composite materials that form part of a vehicle’s structure and also act as a power source – the imagination and insight on display are testimony to the researchers’ vision and the Partnership’s continuing ability to aid the development of pioneering products for a multitude of worldwide markets.

- BAE Systems’ operations contribute nearly £8 billion/year to the UK economy and in 2013 made a total tax contribution of £1.3 billion to the UK Treasury.
- BAE Systems is one of the leading filers of patent applications in the UK’s high-tech sector and, in 2014, managed R&D investment totalling over £900 million on behalf of the UK Government.
- The global aerospace market is expected to exceed $350 billion by 2023, with innovation recognised as crucial for companies seeking to sustain their successful positions in the sector.*

* Source: www.prnewswire.com, 25/8/2015