

THE UNIVERSITY OF NOTTINGHAM INSTITUTE FOR AEROSPACE TECHNOLOGY: Pioneering UK aerospace innovation & skills



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The global aerospace market is buoyant. Over the next 20 years, the original equipment market is forecast to exceed \$5trn globally, with services exceeding over \$2trn. It is predicted that by 2033, 57,000 new fixed wing aircraft and 40,000 new helicopters will be required.

The UK is at the forefront of these developments and is home to the largest aerospace sector in Europe and the second largest in the world; employing more than 230,000 people across over 3000 companies, including Rolls-Royce, Airbus, Agusta Westland and GKN; and a vast network of small and medium size enterprises. It is a high value-added, research and development intensive sector, where investment has resulted in substantial benefits, anchoring outputs and jobs for decades to come.

Recent UK Government policy has sought to protect and develop the UK aerospace sector. In 2010 the Government, working closely with the UK aerospace industry, established the Aerospace Growth Partnership (AGP) as a way of tackling barriers to growth, boosting exports and increasing the number of high value jobs in the UK. In 2013, building on the success of the AGP, the Aerospace Technology Institute (ATI) was launched to sustain and grow the UK's internationally competitive aerospace sector through investment in technologies



The Aerospace Technology Centre on The University of Nottingham's Innovation Park.

consistent with aircraft updates, new aircraft and the sector's strengths. The ATI has secured over £2.1bn in R&D funding to support the sector and, since its establishment, has funded in excess of 140 projects UK wide.

Aware of these opportunities in the UK and related opportunities in Europe, and building on a strong aerospace research heritage, The University of

Nottingham established the Institute of Aerospace Technology (IAT) in 2009. The remit of the IAT is to integrate, develop and promote the University's substantial aerospace research portfolio, enabling the University to better support the sector by contributing to knowledge exchange and innovation and driving investment in key national infrastructure and skills development.

Since its establishment, the IAT has been instrumental in the growth of Nottingham's aerospace research portfolio

from £35m in 2010 to over £75m in 2015 and has assisted in positioning Nottingham as one of the leading aerospace Universities in Europe, linking research excellence with innovative developments for industry. The IAT works closely with a range of national and international aerospace industry and research partners to address global challenges and drive the development of innovative

technological research focused on underpinning technologies based around five key strategic areas:

• Aero Engines and Propulsion

Researchers at Nottingham are carrying out cutting edge research to improve engine performance and efficiency. The University is home to two Rolls-Royce University Technology Centres and one of the UK's Synthetic Biology Research Centres which is carrying out innovative research into biofuels.

• Aerospace Manufacturing

Nottingham has substantial expertise in aerospace manufacturing across a broad range of areas, including additive manufacturing, machining, process control and optimisation. The University is home to the Airbus Centre for Aerospace Manufacturing and two EPSRC Centres for Innovative Manufacturing in Composites and Additive Manufacturing. In addition, the University was also a founding partner of the Manufacturing Technology Centre (MTC).

• Aerospace Materials and Structures

Scientists and engineers at Nottingham work closely with leading aerospace equipment manufacturers to develop and analyse next-generation materials designed to produce lighter, safer, more fuel efficient aircraft. The University is home to the EPSRC Nottingham

Nanotechnology and Nanoscience Centre (NNNC) and also a key member of the UK Research Centre in Non-Destructive Evaluation.

• Aerospace Operations

As the aviation industry grows, there are increased challenges around capacity, sustainability, passenger comfort, safety, supply chains and security. Nottingham is home to a range of high profile centres and institutes with a focus on addressing these challenges. These include: the Nottingham

... researchers from the University are working with a series of UK and European Aerospace companies ...

Geospatial Institute, the Nottingham Transportation Engineering Centre, the Centre for Risk and Reliability Engineering and the Automated Scheduling, Optimisation and Planning Research Group.

• More Electric Aircraft

The development of more electric aircraft is a key priority for the future of the aerospace sector. Home to the largest power electronics research group in the world and the George Green Institute for Electromagnetics Research, Nottingham is at the cutting edge of this, with internationally renowned expertise in power management, control and distribution, electrical machines and electromagnetic protection.

A Research Leader in Europe

Across these strategic areas, the University has been successful in securing funding for a suite of research projects. These include a number of projects funded through the EU's Clean Sky Joint Technology Initiative; a major European Aerospace Programme that brings together industry, academia and research centres to deliver next generation technologies for lowering pollution and safeguarding the leading position of the sector. The University of Nottingham

was the only University to be awarded Associate Partner status in its own right in Clean Sky and is currently a Core Partner in the €4.2bn Clean Sky 2 programme. Through this funding, researchers from the University are working with a series of UK and European Aerospace companies to develop a range of exciting next generation technologies such as the Helicopter Electro Mechanical Actuation System (HEMAS, see image), Green Taxiing Motor and Electric Starter Generator Motor.

Working with the ATI to Drive Forward Aerospace Research in the UK

Nottingham's IAT has also secured substantial funding from the ATI. This includes infrastructure funding to establish a national transmissions testing facility to research and develop future aircraft large engine, rotorcraft, industrial and gas turbine transmissions. Through funding from the ATI, the IAT has also developed a series of collaborative projects and strategic partnerships with global aviation leaders such as Rolls-Royce.

Supporting and Working with SMEs

As well as working with leading national and international aerospace companies, the IAT is also committed to supporting Small and Medium-sized Enterprises (SMEs) and is a member of The University of Nottingham's Ingenuity Network. This extensive business support network is part funded by the European Union and aims to transfer knowledge and expertise from the University into local and regional small and medium sized businesses. The IAT has also worked closely with SMEs to facilitate access to UK and European aerospace

research funding and was recently a partner in a successful funding proposal to the ATI with local SME Romax.

Leading Innovation

The Institute sits at the interface between university, industrial partners, government and funding bodies: acting as the bridge between academic excellence and industry, accelerating knowledge transfer and the exploitation of research, and supporting technological innovation for the sector. To assist in driving collaboration between academia and industry, the Institute has been successful in securing funding to facilitate the development of infrastructure and facilities. These include a £5.1m Aerospace Technology Centre (ATC), based on The University of



Electromechanical actuator for helicopters developed in partnership with Liebherr Group and Airbus Group Innovations on display on the Clean Sky booth at the Paris Airshow in June 2015

Nottingham's Innovation Park. The ATC is a research and knowledge transfer hub, which provides state of the art facilities and support for the development of large scale demonstrations.

Improving Education & Skills

The IAT sees skills development as a key priority for the sector and will be supporting the launch of a new Aerospace Engineering undergraduate programme during 2016-17. The IAT is also home to the University's MSc Aerospace Technologies course and

supports the recruitment of world-class students to the University's other undergraduate, postgraduate and CPD courses that have alignment with the aerospace industry. The Institute has also been successful in gaining funding from the European Commission's Marie Skłodowska-Curie actions to launch two multi-disciplinary PhD programmes: INNOVATE and INNOVATIVE, which collectively provide 37 PhD studentships related to aerospace research.

The IAT is also committed to developing and promoting interdisciplinary aerospace research and is currently working to integrate its exciting research on aerospace with the innovative research taking place across the University on transport. In doing this, the IAT is working closely with groups such as the Impetus Partnership and the Transport Systems Catapult to share knowledge and develop collaborative projects across a newly created University Aerospace and Transport Research Priority Area.

Building on these strategic interventions, The University of Nottingham is advancing its position as one of the leading Aerospace Universities in Europe by continuing to develop its European and UK research portfolio and further expanding its portfolio of fundamental science research to ensure that the UK aerospace sector continues to push the boundaries in terms of research innovation.

For further information on the Institute of Aerospace Technology contact: IAT@nottingham.ac.uk

You can also visit: www.nottingham.ac.uk/aerospace or follow us on Twitter at: @UoNAerospace