



Aviation and the environment

Clean, green and smart technologies for the future

Cranfield's global research airport

A national asset for the UK

Multi-User Environment for Autonomous Vehicle Innovation (MUEAVI)

This instrumented transport corridor runs through the middle of the campus and is used for the development of intelligent and autonomous vehicles. Sensors include lidar (laser scanners that can measure distance), radar that can detect pedestrians and cyclists at up to 200 metres, and thermal imaging cameras.
Opened 2017

Digital air traffic control centre

Housing the UK's first operational remote air traffic control tower, the centre provides air traffic services for the airport.
Operational December 2018

Boeing 737

Donated by British Airways, the aircraft is used for research and teaching and will be an important part of DARTec.

Holographic radar

State-of-the-art Avelland drone detection radar for research as part of DARTec.
Research ready 2021

Digital Aviation Research and Technology Centre (DARTec)

A unique centre addressing the global challenges of digital systems integration across aviation.
Operational Q4 2020

Gas turbine and propulsion laboratories

Living laboratory

Sensors around the airport monitor air quality, soil moisture, temperature and noise levels, including sound from wildlife. Other sensors monitor water quality and levels, and runway and ground movements.

Aviation Innovation and Technology Entrepreneurship cluster (AVIATE+)

Operational Q1 2021

Cranfield Eagle Lab

A partnership between Barclays and Cranfield University. Opened 2019

HYPER Hydrogen Production

Operational Q2 2020

'Smart' car park connected to MUEAVI

Aerospace Integration Research Centre (AIRC)

Major research facility with Airbus and Rolls-Royce dedicated to future aerospace integration challenges.
Opened 2017

National Beyond visual line of sight Experimentation Corridor (NBEC)

Designed to enable drones and unmanned aircraft to fly in the same airspace as manned aircraft. NBEC will open in phases as surveillance systems are approved. The first NBEC test flights were undertaken in February 2019 in collaboration with the CAA, innovation team and Blue Bear Systems.
Operational late 2020

SAAB 340B Flying Test Bed

Operational Q1 2021

National Flying Laboratory Centre (NFLC)

The NFLC's 'flying laboratory' provides a viable alternative to flight test and research work using simulators, wind tunnels, or more expensive turbine aircraft, often testing new parts and equipment for industry partners. The NFLC also has other light aircraft used for research.

Air Park

Future

FAAM Airborne Laboratory

Dedicated to the advancement of atmospheric science, the specially-modified BAe-146 research aircraft is owned and run by the Natural Environment Research Council (NERC). This is used by many UK and overseas universities and by the Met Office.

Cranfield Aerospace Solutions Ltd

Wholly-owned subsidiary company specialising in aircraft prototyping, modifications and approvals.

Solar power farm

Clean, renewable energy for the airport flows from a solar power farm located on the other side of the airfield.



Decarbonising travel

Covid-19 has significantly and rapidly affected and changed practices in the aviation industry, and in our lifestyles. The way this, and possible future pandemics and other shocks, will impact travel behaviour and how airlines and other transport modes respond, will be one of the key challenges for the sector in the foreseeable future.

Cranfield is developing interconnected approaches to address these challenges - from digital aviation, through manufacturing, fuels, flight operations to an environmental monitoring and mitigation.

Travel behaviour and airline fleet and network planning

Emissions produced by air transport activity are based on the traffic volume. This results from a set of decisions which are based on their perception of the flight variables, including far, travel duration, schedules and comfort. Our comprehensive analysis considers the entire air transport system, from user selection, through transport to and from the airport to operations and fleet management.

Carbon transport calculator

Cranfield has developed a tool to understand travellers and emissions produced. This internationally recognised resource has been developed to help the industry to mitigate the climate change impact.

The calculator covers 76 types of aircraft, all civil aviation airports around the world with their international Air Transport Association (ATA) codes, together with location data to enable accurate estimation of the total amount of fuel consumption and carbon dioxide emissions. This calculator has already been used extensively for academic and industry consulting to aid in the understanding of travellers to improve airline and airport management. Outputs include demand forecasting, network and fleet planning, passenger experience analysis and airport planning and operation.

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Zero-carbon aircraft (electrification and hydrogen)

Major reductions in carbon emissions are required to meet environmental targets.

Prior to the 2020 Covid-19 crisis, worldwide aviation emissions were increasing by about 3% per year. The UK has a zero net emissions target by 2050 and the EU's Flightpath 2050 programme calls for a 75% reduction in carbon emissions per passenger kilometre by 2050. Aircraft electrification and hydrogen are key enablers towards achieving those goals and tackling climate change.

Challenges in electrification being addressed by experts at Cranfield include thermal management, systems design for integration into the airframe, battery management, power to weight ratios, testing, reliability and certification of new aircraft technology.

Cranfield has world leading expertise and facilities relevant to hydrogen propulsion for aircraft and is able to draw upon its strengths in aircraft structures, systems, avionics and propulsion systems to design revolutionary aircraft. With the support of specialists in battery management and electric motors, materials technology, integrated vehicle health management, rotorcraft, aerodynamics and air transport management, hydrogen production, storage and utilisation we offer a capability that is second to none.

The £35 million Aerospace Integration Research Centre (AIRC) is one of Cranfield's newest world-class facilities, working with industry to re-imagine aircraft and airside concepts and shape the future of aerospace globally. The AIRC provides the capability to take aerospace concepts from theory to flight demonstration at technology readiness levels TRL 6/7.

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Alternative fuel options for aviation

Reducing reliance on fossil fuels is critical and major technological advances are required in a number of areas including biofuels, synthetic fuels, hydrogen and electrification.

Technology development will be central to this initiative, but it will also be important to develop methodologies which can assess the overall system impact, including economic and environmental factors, as well as how quickly such technologies can be introduced. The web of connections between aviation and society is complex and a systems approach is required to ensure a safe and environment-effective transition to sustainable growth in the aviation sector.

NASA research grant

In 2013, NASA awarded Cranfield a three-year grant for research into future distributed propulsion systems, including turbo-electric. The award was a milestone institution was a first and provided for wide-ranging research to improve both propulsive efficiency and air frame performance, as well as achieving reductions in noise, emissions and energy consumption.



Life cycle assessment of hydrogen fuel cell-powered aircraft

This project, sponsored by Cranfield-based Zenvo, analysed the environmental benefits of hydrogen fuel cells for powering small commercial aircraft. It compared the energy flow chain from electricity production through hydrogen production to electricity generation and the resulting thrust. This was compared with conventional alternative propulsion technologies using a cradle-to-grave life cycle assessment (LCA), analysing not only the main target environmental impact of greenhouse gas (CO2) emissions, but also indicators of air quality, noise, renewable resource use and safety.

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Reduced emissions air traffic management

Digital aviation has often been cited as being the next significant business transformation in the sector and one which can support the aerospace industry towards delivering greater customer satisfaction, while addressing efficiency, cost and capacity issues.

It offers a holistic approach in which aircraft, air transportation and air traffic management are integrated in our unique state-of-the-art ecosystem for transformational research towards the net-zero carbon aviation goal.

With the pace of air travel growth already causing strains across the sector, and UK passenger numbers expected to increase by more than 50% by 2050, greener solutions other than expansion of airport capacity and ground infrastructure need to be found.

The Digital Aviation Research and Technology Centre (DARTec) is being built at Cranfield and will spearhead the UK's research into digital aviation technology.

Cranfield's airport is the first in the UK to have an operational digital air traffic control centre. Supplied by Saab Digital Air Traffic Solutions, the innovative technology replicates and enhances what can be seen through the windows of a traditional air traffic control tower. It enables smarter approaches to air traffic control by digitising and integrating airport functions and improving a controller's situational awareness, enabling quick and informed decisions. The new system provides controllers with a 360-degree view of the airport and the ability to zoom-in on aircraft, improving visibility.

As well as serving Cranfield Airport, the digital control tower further enhances our research capabilities, ensuring our place as the home of the leading aerospace research facilities in Europe.

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