

Future Flight Challenge

Funded Projects



Contents

Challenge Director introduction	4
Challenge Infographic	
COVID-19 projects	7
Autonomous intelligent robotic drones for unmanned integrated delivery system (AIR DRUIDS)	
BVLOS drone communications relay technical roadmap for COVID-19 multi-function operations	8
BVLOS drone operations in non-segregated airspace	8
UAV and drone COVID-19 emergency airbridge to the Isles of Scilly (Cornish drone airbridge)	
Drone inspection & monitoring for construction, industry & infrastructure BVLOS	
Drones to protect: shared-value analysis of aerial surveillance during the covid-19 pandemic, and ethical framework development for future crises	1(
Enabling the reduction of key site personnel through real time data transfer over 4G, 5G or both networks via UAV and drones	1(
Enabling UK inter-site medical delivery drone operations: meeting the logistical and operational challenges presented by COVID-19	s 11
End to end logistic support tools for effective aerial drone delivery against COVID-19	11
MediDrone	12
Project Léman	12
Skyfarer: enabling drone powered medical logistics in the UK	13
Phase 2 projects: 2020 to 2022	14
A 4D cloud-based simulation-as-a-service digital twin of the combined atm / utm airspace (SMARTER)	15
Advanced traffic organisation and management of intelligent cargo unmanned systems (ATOMICUS)	16
Airspace of the future	17
Aviation innovation in the south-west: development of an operational environment in a	10
Core & equity: logistics use sectland (CAELUS)	۱۵ ۱۵
Computational rationality for distributed airborne delivery agente	יד מכ
Critical infrastructure resilience integrated aviation system (CIPIAS)	20 20
DigitalEVE: next generation ground system for future flight operations	20 21
Distributed BVLOS aviation system	2
Dock-to-dock (D2D)	22
Drone Defence: Edged sensing array affording Intelligent integrated airspace awareness	
Drone Swarm for unmanned inspection of wind turbines: battery health management, hybrid	
comms systems and operational platform for autonomous offshore windfarm inspection	23
EnabEl: enabling aircraft electrification	24
Enabling infrastructure for medical drone deliveries (INMED)	24
Fly2Plan	25
Future urban simulation environment (FUSE)	26
Hydrogen electric and automated regional transportation (HEART)	27
Hydrogen storage to energise robotics in air applications 2.0	28
New aviation, propulsion, knowledge and innovation network (NAPKIN)	28
Project gold dragon: airborne detect-and-avoid for BVLOS drones enabling integration with new	
aviation systems	29
	29
Rapidly deployable vertiport for drone-delivery, air-taxi, disaster management (Air-One®)	30

Retroflight alpha: a novel eVTOL charging infrastructure platform	31
Safe Flight	31
SafeZone: A dynamic safe zone system for autonomous urban flight	32
Sustainable aviation test environment (SATE)	33
Skybus	34
SkyDroCell: Establishing safe autonomous and radio controlled near-ground flight by dynamically mapping the combined aerodynamic and electromagnetic risks in complex physical environments	
and urban canyons	35
Synthetic environment risk analytics for autonomous UAS (SEER)	35
System for high integrity monitoring of advanced-air-mobility network operations	36
Towards zero emissions in regional airline operations (2ZERO)	37
UAS authentication service	38
Windracers SWARM technology: Swarm technology and digital twinning to enable coordination and utilisation of high numbers of 100kg payload UAVs in aid delivery and firefighting applications	39
XCelerate	39
Phase 3 projects: 2022 to 2024	40
Agile integrated airspace system (ALIAS)	41
Air mobility ecosystem consortium	42
Atypical airspace BVLOS solution (AABS)	43
Care and equity logistics UAS Scotland (CAELUS) 2	44
Future flight and land infrastructure programme (FFLIP)	45
High intensity autonomous drone operations	45
Intelligent drones for ports and highways technology (InDePTH)	46
Morecambe Bay medical shuttle 2 (MBMS)	47
Open skies Cornwall	47
Developing a blueprint for scalable UTM-enabled BVLOS drone operations across the UK (BLUEPRINT)	49
Project HEART: Phase 3	50
Permanent or temporary automated landings (Project PORTAL)	50
Project SeaWatch: flexible ai coastal monitoring	51
Protecting environments with UAV swarms	52
SafeZone phase 3	52
Skyway	53
Sustainable aviation test environment 2 (SATE 2)	54
Closing the Skills Gap projects: 2023-2024	56
AAM4Gov – Closing the AAM/UAM skills gap for members of city and local government	57
Advanced Air Mobility (AAM) Flight Dynamics and Performance Skills	57
Aviation Sector Insight Mentoring	58
digiLab Academy: "Al in the Wild: Foundations in Machine Learning for Future Flight"	58
DroneOps VR – Virtual Reality Training for Drone Hazard Awareness and Flight Planning	59
Future Flight in Further Education	59
Future Leaders for Advanced Air Mobility Excellence (FLAME)	60
InnovateHer's Cybersecurity Programme	60
Bringing remote pilot skills up to an advanced level through a robust programme of tests and certification	s 61
KISK QUANTIFICATION UNIOCKING BVLUS Uperations	61
Stackable Programme on Advanced Alr Mobility (AAM)	62
ZeroAvia and IKIS Future Flight	62

Introduction



Launched in 2019 as part of the Industrial Strategy Challenge Fund, the Future Flight Challenge is delivered by Innovate UK for UK Research and Innovation. The challenge involves £125 million of government funding and is planned to end in March 2025. The programme aims to develop the aviation ecosystem needed to accelerate the market introduction of zero-emissions sub-regional aircraft, Advanced Air Mobility vehicles and drones, and position the UK as a world leader in new aviation markets worth over \$675 billion by 2050.

Gary Cutts Future Flight Challenge Director

So far, the Challenge has:

- Supported 138 UK SMEs, startups, and tech entrants to aviation
- Attracted around £159 million in co-investment from industry with £247 million forecast by 2030
- Created 363 jobs with another 3800 expected by December 2024
- Funded 80+ projects involving over 240 businesses, researchers, and end-users
- Ensured that the UK is influential globally and seen as a prime investment opportunity

In addition, the Challenge has

- Established working groups on airspace integration and Community Integration – the latter driving activity such as local authority integration and creation of as local planning frameworks
- Partnered with DHSC and DSIT to lead the introduction of drones to support the NHS across the UK
- Worked with regulators, the Regulatory Horizons Council and others to promote the need for new regulatory frameworks that support industry and Government ambitions
- Launched a £1.6 million, two-year social science research programme providing critical insight to public attitudes and involving communities in establishing this new aviation sector
- Funded a £1.9 million package of standards creation in partnership with BSI.

The Challenge has completed its discovery and development phases and will conclude with an ambitious system concept demonstration phase by March 2025. This involves 17 projects showcasing real-world use cases of integrated aviation systems. Not only will these deliver technical capabilities, but they will also engage and excite the public on the possibilities for distributed, clean aviation.

In all of these activities, our prime aim is to convene the many players in this emerging new aviation sector to enable a jointly designed ecosystem: sharing knowledge to create a new industry which benefits the public and positions the UK as a world leader.

This brochure highlights the tremendous breadth, vision and ambition of the projects executed by our partners and I encourage you to reach out to the participants who are all leaders in this new aviation sector.

Statistics



143 UK SMEs, start-ups and tech entrants to aviation supported











COVID-19 projects 2020 to 2022

Run in 2020 at the height of the COVID-19 pandemic these 14 short-term projects used drones to address health, social, economic, cultural and environmental impacts of the COVID-19 pandemic.

COVID-19 projects

Run in 2020 at the height of the COVID-19 pandemic, the Challenge provided almost £4 million across 14 separate projects. Over 50 different organisations worked together across the projects to either:

- tackle a direct resourcing or transport issue for the NHS and wider medical needs
- research and develop broader solutions for COVID-19 hit industries.

In each case, the focus was on realising the benefits of these new forms of autonomous aviation technology for immediate support. They also had to develop electric-led infrastructure for longer-term needs.

The projects secured several significant achievements when it came to ground-breaking applications of technology. Including:

Autonomous intelligent robotic drones for unmanned integrated delivery system (AIR DRUIDS)

The AIR DRUIDS project was an autonomous drone delivery solution for critical medical products like vaccines and blood samples, enabled by an open systems architecture, with fully monitored payloads to ensure payload viability and integrity is sustained.

The intelligent payload system was capable of monitoring the medical samples in real-time via the multiple onboard sensors, this information was then relayed live on the mission control system through an interactive user interface.

The smart autopilot and deconfliction system made the UAV-assisted medical delivery autonomous and safe, especially in BVLOS range where safety is the main concern both for the operation of the UAV itself and the medical consignment.

The advanced mission control and monitoring system allowed operation of multiple drones, to various locations, all tasked and monitored from a central operations centre by just one person.

- the first UK drone delivery carrying chemotherapy
 drugs
- achieving approval to carry two types of COVID-19 vaccine
- completing the first shore-to-ship medical delivery of COVID-19 test kits.

We also found other direct benefits for hospitals themselves. One project completed the first UK simulation of a drone operation at hospital grounds. We also saw the first hospital on hospital trials taking place in the heart of England.

The combination of all the above existing, modified and new technology delivered a highly innovative cutting-edge drone management and delivery capability, combined with real time payload monitoring.

The modular development route allows this to be deployed as a whole system or in parts to support other programmes, making the value realisable very quickly.

Involved

• Blue Bear Systems Research Ltd

Funding given

£419,677

BVLOS drone communications relay technical roadmap for COVID-19 multi-function operations

BVLOS operations with drones often face connectivity problems because available communications networks have patchy coverage, available radio frequencies are constrained in bandwidth, power limits or both.

This project assessed the incorporation of a communications relay capability in which a Relay Drone (drone R) accompanied one or more Business Drones (drone B).

Drone R flies above drone B to avoid low-level terrain, having local connectivity with drone B whilst also maintaining the backhaul comms link.

The project included a design study using well-defined mission use cases including:

 delivery of medical supplies and testing equipment remotely to patients

- collection and transfer of medical samples
- surveillance and public order management
- replacing field-based personnel for inspection and maintenance activities
- providing a tethered and portable, mobile BVLOS communications relay capability.

The outputs from the project include a specification and roadmap for the required systems, the architecture concepts and use case assessments, prototype software and a commercial market model.

Involved

E2E Services Ltd

Funding given

£107,987

BVLOS Drone operations in non-segregated airspace

This project aimed to demonstrate that UAVs can be operated BVLOS of the pilot in airspace where other manned aircraft can also be operating at the same time.

Through the provision of a 'detect' capability for the UAV pilot, the project demonstrated the concept via a live airspace trial.

By gradually demonstrating that BVLOS operations in non-segregated airspace are safe, the project secured the necessary regulatory approval to integrate seamlessly with manned aviation, whilst still providing safe and efficient access to the airspace by all users..

Involved

- Trax International
- ANRA Technologies
- Plane Finder
- uAvionix

Funding given

£412,409

UAV and drone COVID-19 emergency airbridge to the Isles of Scilly (Cornish drone airbridge)

During the COVID-19 pandemic medical and other logistics services by ferry and air services to the Isles of Scilly were cut.

The project used the Windracers ULTRA UAV platform to deliver a range of payloads as required by the Council of the Isles of Scilly and Cornwall Council in response to time-critical COVID-19 challenges.

The trials focused on the delivery of essential items such as PPE and COVID-19 tests to those in a Care setting and extended to supplement NHS supply chains.

The project was the first consortia to:

 demonstrate UAV capability in delivering supplies to the islands whilst comparing performance of this intervention to existing manned alternatives

Drone inspection & monitoring for construction, industry & infrastructure BVLOS

With COVID-19 severely impacting construction, infrastructure and industrial site productivity new solutions were required to improve the effectiveness of some working practices.

This project aimed to increase productivity and safety, and reduce project cost and risk, by enabling remote inspection and monitoring of industrial sites by drones flown BVLOS from a central control room. Preventing the need for workers to inspect potentially dangerous or inaccessible industrial site locations.

The project carried out successful test flights at the HQ building with a second drone monitoring and filming work being undertaken. The team secured a major milestone with the completion of a demonstration to High Speed 2 at the Costain site at Ruislip building for the High-Speed rail service.

The project lead became the first company in the UK to secure permission from the Civil Aviation Authority to carry out routine BVLOS flights. This is one of the most advanced drone permissions ever given by a developed-market aviation regulator.

- explore the viability of securing multiple landing sites to allow dynamic and flexible goods transfer between islands
- 3) work toward contributing to protocols research to test the transport of dangerous goods via UAV.

Involved

- Droneprep Ltd
- Consortiq Limited
- Windracers Limited

Funding given

£178,435

Involved

- sees.ai
- Atkins
- NATS
- Sellafield
- Skanska
- Skanska Costain STRABAG (in partnership with the High Speed 2 project)
- Terra Drone
- Vodafone

Funding given

£272,898

Drones to protect: shared-value analysis of aerial surveillance during the covid-19 pandemic, and ethical framework development for future crises

The project aimed to develop insights on the effects of aerial surveillance during and after a pandemic crisis, by carrying out two surveys in an area north of London and at Heathrow Airport near Isleworth.

The surveys involved multiple drone flights from the roof of the London Ambulance Centre base at a nominal altitude of 60 metres, followed by a survey of the residents below to establish their opinion. The results were assessed by Kings College London and two reports produced.

The research focused on aerial security providers and the impact various providers may have on public trust. The data acquired provided a detailed understanding of public perception of surveillance methods used by government agencies, known tech giants, and an alternative citizen-centric model of drone application by ethical challengers.

Involved

- WECORP Ltd
- King's College London

Funding given

£245,334

Enabling the reduction of key site personnel through real time data transfer over 4G, 5G or both networks via UAV and drones

During the COVID-19 pandemic across the UK and globally there was a significant change in normal working practices across all industries and sectors. The importance of carrying out work and essential tasks safely has never been greater. New ways of working needed to be adopted that adhered to the guidelines set out by governments.

The project demonstrated how adoption of two combined technologies and the unique way that these technologies can be utilised can allow the continuation of essential work to be carried out safely, effectively, and to an extremely high standard. These aims can also be achieved whilst keeping personnel in employment, as well as having the potential to create further job opportunities as a result of the work being done through an innovative solution. Over the course of the project, 60 flights were carried out and commercial flights are now planned. The project achieved the first 4G and 5G flights from offshore and onshore oil and gas plants.

Since the project ended, Air Control Entech Limited has created four new jobs and continues to receive further investment.

Involved

Air Control Entech Limited

Funding given

£122,464

Enabling UK inter-site medical delivery drone operations: meeting the logistical and operational challenges presented by COVID-19

This project created and validated national operational standards and technical requirements enabling the secure despatch, in-flight monitoring and receipt of medical supplies between UK medical centres by centre staff.

The project partners, working closely with Milton Keynes, Bedford and Luton & Dunstable hospitals:

- 1. identified, through a national impact study, where and how medical drone flight operations can deliver the greatest need within the shortest timescales
- 2. created the first UK set of standard operational procedures (SOPs) for routine drone enabled delivery operations through collaboration with hospitals & NHS trusts
- 3. demonstrated within hospital environments; the automatic take-off, remote piloting and precision drone landing by hospital staff using SOPs
- 4. demonstrated the launch and receipt of a medical use package via BVLOS drone flight from/to a hospital-by-hospital staff

End to end logistic support tools for effective aerial drone delivery against COVID-19

The project aimed to bring to market developed tools and solutions that could enable any manufacturer's drone fleet to provide an effective response to a pandemic like COVID-19. These included a range of drone-agnostic parcel delivery mechanisms, as well as automation of cargo handling on the ground.

The aim was to ensure the tools and solutions met the needs of all response stakeholders, addressing the needs of hospitals, clinics, pop-up sites, rural areas and where speed of response is critical.

The project successfully delivered the robotic automation required to automate the process of cargo loading, cargo delivery, drone maintenance and 5. understood through simulations the air space management and operational requirements for future critical medical delivery nationally.

Involved

- DGP Intelsius Limited
- Bedfordshire Hospitals NHS Foundation Trust
- Blue Bear Systems Research Ltd
- Cranfield University
- HEROTECH8 Ltd
- King's College London
- Milton Keynes Borough Council
- Milton Keynes NHS Foundation Trust
- The Drone Office Ltd

Funding given

£310,674

activities required before take-off and after landing. The winch created allows parcels to be lowered and raised from the drone, whilst the wedge allows parcels to be held onto and released autonomously.

Involved

• Motion Robotics Ltd

Funding given

£195,100

MediDrone

COVID-19 created a need to better connect locations of care provision to improve the speed of delivery for time critical medication, to reduce transmissibility of COVID-19 to vulnerable patients and to help move care provision and testing closer to the patient via better distribution.

The team used a network of small drones following pre-planned paths between medical facilities to act as a high-speed shuttle for small medical packages.

The solution was backed by a comprehensive drone safety case strategy, which effectively mitigated ground and air risk in order to meet safety requirements and obtain approval from the CAA. The project provided a solution which not only solves an important medical problem, but which can feasibly provide value to its users beyond the limited time frame of a trial. In line with this, the project completed the UK's first shore to ship medical delivery by drone.

Involved

- Neuron Innovations Ltd
- ARPAS-UK Ltd
- Fleet UAS Ltd
- Flock Limited
- HEROTECH8 Ltd

Funding given

£256,386

Project Léman

COVID-19 highlighted the challenges and requirements for increased resilience in NHS supply chain logistics. There was never a better time to create a faster, more dependable and environmentally friendly method of transporting medical supplies.

A medical drone delivery service can break chains of transmission by taking humans out-of-the-loop, protecting NHS staff and the wider public. It also freesup staff allowing them to focus on service delivery.

The project completed the required vibration testing and gained approval to fly chemotherapy medical supplies via drone across the Solent to the Isle of Wight. Deliveries started in February 2022.

Involved

- Apian Limited
- NHS
- Synlab
- Skylift UAV

Funding given

£553,700

Skyfarer: enabling drone powered medical logistics in the UK

The Skyfarer project moved the adoption of drone solutions for logistics in the UK a step closer to reality. It paved the way for this technology to be commercially viable, at home and abroad.

Through the creation of a flight-testing corridor in the Warwick region, and further flight trials in Reading and Coventry, the project made history by providing the UK's first drone based medical deliveries in a populated suburban environment within unsegregated airspace.

By setting up this Warwick flight-testing corridor, the project enabled testing of autonomous BVLOS drone technology with detect and avoid capabilities in a suburban setting, It provided a sustainable blueprint for gaining CAA approval and paved the way for commercial deliveries by drones to begin in the UK.

Involved

- Skyfarer
- Altitude Angel
- Cranfield University
- Fly Pulse
- Phoenix Wings

Funding given

£174,999

Phase 2 projects 2020 to 2022

For a new aviation revolution to happen in the UK we need to have created solutions to numerous problems. These solutions must be safely integrated into an existing, mature operational environment and deliver reliable operation, both in flight and on the ground.

The 34 projects funded as part of our Phase 2 competition set out to design and develop integrated aviation systems, new vehicle technologies or a combination of both.

A 4D Cloud-based Simulation-as-a-Service Digital Twin of the Combined ATM / UTM Airspace (SMARTER)

Using novel machine learning and deep reinforcement learning techniques, SMARTER aimed to:

- provide an innovative, collaborative, cloud-based Simulation-as-a-Service environment
- learn, infer and deduce the new rules needed to accommodate the safe and efficient management of the combined Air Traffic Management (ATM) and Unmanned Aircraft System Traffic Management (UTM) systems
- allow users to test 'what-if' scenarios including modelling sensor failures or low coverage regions, weather, population density, loss of control of the unmanned aerial vehicle (UAV), loss of communications, special use areas or danger areas
- develop novel mathematical techniques to characterise the uncertainty associated with ascertaining the single source of truth for the presented state of the airspace



- develop next-generation, turn-key 4D visualization and user experience techniques with haptic controls to gamify the manipulation of the airspace. Users can get an account, log-in and use the environment without purchasing any specialised equipment
- provide an on-demand collaborative decision making environment where multiple stakeholders can work together to form a consensus on capacity and separation management standards.

Involved

- TEKTowr
- Cirium
- Digital Catapult
- National Physical Laboratory

Funding given

£382,747

Advanced traffic organisation and management of intelligent cargo unmanned systems (ATOMICUS)

ATOMICUS aimed to create and demonstrate the digital infrastructure and operational procedures that will allow unmanned cargo systems to share the airspace and ground infrastructure safely and efficiently with manned aircraft.

Integrating data flows between drones and existing physical infrastructure offers significant cost savings and productivity gains in the logistics market, delivering spare parts for engines in less time using less CO2.

The project demonstrated new unmanned cargo and drone inspection use cases. It also developed a safety case and concept of operations (CONOPS) for unmanned aircraft systems (UAS) operations and ground infrastructure.



Involved

- Cirium
- ANRA Technologies
- Connected Places Catapult
- Distributed Avionics Ltd
- Guild of ATC Officers
- Neuron Innovations
- Southampton University

Funding given

£776,980



Airspace of the future

The vision for the Airspace of the Future project was to enable routine operational drone services in a safe coordinated environment on a regional and national basis.

The project aimed to move from a development to demonstration phase, through five activities:

- 1. Develop the rules, system of systems and operational safety cases to allow mixed use airspace by manned and unmanned traffic.
- 2. Develop a virtual experimentation environment and digital twins to test new rules, processes, systems, technology and operating concepts rapidly at scale.
- 3. Develop customer use cases for large-scale virtual and live demonstration in an expanded and open access environment.
- 4. Develop a blueprint for the future national airspace structures and ground infrastructure.
- 5. Establish a national test and evaluation facility for commercial unmanned vehicles with representative operational environments which are digitally trusted and secure.

To deliver the project the team needed to:

- enable unsegregated beyond visual line of sight (BVLOS) and complex autonomous flights
- 2. establish a Live, Virtual and Constructed (LVC) test environment at Cranfield to support the regulatory system of system safety case
- commission an incremental national test environment to explore more complex ground and airspace challenges for the use cases



- 4. develop innovative surveillance and traffic management capabilities to safely manage airspace interaction with current systems
- 5. develop a future airspace blueprint while balancing:
 - a. the existing Air Traffic Management (ATM) systems
 - b. future Unmanned Traffic Management (UTM) systems
 - c. digital trust of users and equipment
 - d. cyber resilience of infrastructure
 - e. data connectivity.
- The project successfully created a system of systems that allowed shared airspace between manned and unmanned vehicles. They also established a national digital test facility for the UAS.

Involved

- Thales UK Ltd
- Altitude Angels Ltd
- Blue Bear Systems Research Ltd
- Connected Places Catapult
- Cranfield Airport Operations Ltd
- Cranfield University
- Inmarsat Global Ltd
- Ocado Innovation Ltd
- Satellite Applications Catapult Ltd

Funding given

£1,916,368

17

Aviation innovation in the south-west: development of an operational environment in a representative urban region

This project aimed to create a demonstration environment, a European first, within the controlled airspace of international airports in the south-west of the UK.

In order to identify and fill technological gaps and establish viable markets and business cases for these services the project also assessed the demand for Urban Air Mobility (UAM) services in the south-west of England.

It did this by:

- · developing the use cases for this technology
- evaluating the integration and impact on the wider transportation system and the benefits to cities and residents
- carrying out social research into public perceptions and attitudes to electric vertical take-off and landing (eVTOL) aircraft

To future proof flight operations the project established an automated UAM/ATM traffic management system to accommodate high volumes of users in tightly controlled airspace

The partners developed a series of documents relating to the control and operation of urban air mobility systems. They developed a number of use cases and the associated business implications. They received 700 responses to their survey on the related social and environmental issues and they completed an extensive flight trial at Cranfield airfield. The trial involved a human pilot flying a simulator based in Bristol flying circuits at Cranfield. A real drone was then flown at Cranfield at the same time to create potential conflicts. At Cranfield five Automatic Dependent Surveillance Broadcast (ADS-B) receivers provided situational awareness and the cloud-based simulation provided control of the whole event.

Involved

- Atkins
- AiRXOS
- Altitude Angel
- Bristol airport
- Cardiff airport
- Connected Places Catapult
- Cranfield University
- NATS
- Neuron
- Skyports
- Uber Air
- Vertical Aerospace
- WECA

Funding given

£1,275,235

Care & equity: logistics uas scotland (CAELUS)

This project demonstrated the technological and socio-economic viability of a drone-enabled distribution network for medical items such as organs, blood products, high-value medicines and medical consumables over Scotland.

The goal was to design an innovative logistic network capable of providing increased responsiveness and capillarity of medical delivery in urban and rural geography uniquely found in Scotland, while ensuring:

- lower costs
- reliability
- robustness
- safety
- regulatory compliance

A digital demonstrator was created with computer models of the different components of this system of systems, such as a digital model of the drones, the ground infrastructure needed to recharge the vehicles, various operating conditions, and the system used to manage the traffic of drones while flying.



A digital blueprint of the drone delivery network was then created to allow the potential connection of hundreds of hospitals, pathology laboratories, distribution centres and GP units.

CAELUS addressed regulatory challenges by conducting a series of live trials that informed the regulatory pathways in the definition of protocols and rules for safe operation of autonomous drones in the same airspace as civil transport aircraft.

They received funding from the Phase 3 competition to continue their work as part of the CAELUS 2 project.

Involved

- AGS Airports Ltd
- AVY Drones for good
- Connected Places Catapult
- NATS
- Schneider Electric UK Limited
- The NHS
- University of Strathclyde

Funding given

£1,491,274

Computational rationality for distributed airborne delivery agents

This project developed a system to integrate distributed airborne UAVs into an end-to-end customer delivery proposition. This will help develop and demonstrate a detailed commercial aviation system model and AI capability, with a specific focus on deliveries.

Their solution built on consortium expertise within systemised airspace design (SAD) to understand and evaluate how UAVs are expected to operate safely within urban environments. Including optimal routing schedules across the full spectrum of future electric and sustainable delivery modes. With a focus on deliveries, the project produced an open-source data platform to enable integrated data exchange. It de-centralised ATM solutions to allow integration with multiple unmanned vehicles and undertook flight planning to enable BVLOS operation in non-segregated airspace.

Involved

- City Science Corporation Limited
- University of Exeter

Funding given

£357,912

Critical infrastructure resilience integrated aviation system (CIRIAS)

CIRIAS developed an integrated end-to-end system of systems to enable unmanned drones to fly long-range missions BVLOS, with the aim of sustaining critical UK infrastructure.

The project comprised of:

- a hybrid drone platform, able to take off and land vertically, hover in flight to gather data or make deliveries, fly for up to five hours and travel up to 100km
- advanced avionics, communications, and navigation systems to support safe, operations
- a flight planning, control, and simulation system for precise demonstration and management
- an integrated changeable payload capability to enable precision data capture from the air, as well as delivery and collection of critical payloads
- automated data processing and analysis capability
- a system for control of operational airspace below 400 feet to enable mission planning and compliance in increasingly crowded airspace
- a tactile stakeholder management system to gain social acceptance of all proposed missions

Integration of these elements was demonstrated through commercially viable missions to inspect the condition of critical infrastructure and respond to defects or incidents at a global hub airport and on a national railway network. As well as making critical deliveries to public health facilities.

Involved

- Ameyvtol Limited
- Amey Ow Limited
- Attocore Limited
- Heathrow Airport Limited
- Lancashire Fire And Rescue Service
- National Police Chief's Council
- Neuron Innovations Ltd
- Rockwell Collins UK Limited
- Rosemount Aerospace Ltd

Funding given

£2,433,774

DigitalEYE: next generation ground system for future flight operations

DigitalEYE is a next-generation ground control system which will enable high-capacity future flight operations. It provides critical landing zone situational awareness for mixed use airspace, with integrated UAM, drone and UAS operations.

When deployed, the system enables situational awareness for varied uses cases.

The partners completed eight planned trials concluding in a demonstration of two drones moving between two 'vertiports' under the control of the management system.

The partners created a digital twin of the system and a digital dashboard as a means of interaction with the control system.

Distributed BVLOS aviation system

The project aimed to unlock the remote execution of complex missions on urban and industrial sites. It did this through an advanced system comprising autonomous drones deployed under tight human supervision from a central control room.

The project's main output was an end-to-end system that has been validated as being capable of delivering value to customers (drone service providers), end clients and to others beyond.

The consortium validated through a series of 10 tests that increased in complexity and challenge step-by-step (from subsystem tests to full system tests) towards the end-goal of a final test beside a live public road.



Sees.ai Flying complex drone missions from a central control room

The plan is to develop the technology to enable very rapid deployment of the system by non-specialist users with automated set-up and calibration. The current system can be deployed in two hours, but their goal is to significantly reduce this time. The system has been developed to interface with 'external' unmanned aircraft tracking systems and the strategy produced to achieve this was described in some detail

Involved

- SLINK-TECH
- University of Bristol

Funding given

£394,540



Each test was a use-case presented by an end client committed to helping us achieve a positive result (including the Metropolitan Police, BP, HS2, Sellafield, Network Rail).

Involved

- Sees.ai
- Atkins
- BAE Systems
- Flock Cover
- · Lancashire Fire & Rescue
- Metropolitan Police
- NATS
- Network Rail
- Sellafield
- Skanska
- Skanska Costain and Strabag JV
- Sky Futures
- Terra Drone
- UAM Consult Ltd
- University of Bristol
- Vodafone

Funding given

£976,090

Dock-to-dock (D2D)

D2D was a pilot project focused on the combined aspects of:

- route development
- vehicle performance (air & sea)
- the associated infrastructure.

These basics are necessary for the point-to-point delivery of goods and freight between coastal cities using zero emission Hydrogen fuel technology for eVTOL aircraft and electric Autonomous Zero Emission (eAZE) ships.

The objective of D2D was to repurpose port infrastructures to be an essential component of future Smart Cities in their drive towards zero emissions and energy efficient, integrated and sustainable transportation solutions. Focusing upon a specific route development that already has infrastructure associated with maritime trade, D2D can address specific vehicle parameters and the ground-based infrastructure for Hydrogen air and marine refuelling.

The partners developed a clear understanding of the benefits and challenges of using eVTOL aircraft, and electrically powered short sea journeys vs land-based alternatives and developed a digital twin to support these investigations.



Credit: Neoptera Aero Ltd

They developed plans for a vertiport and an ammonia to hydrogen refuelling plant based at Cardiff and Gloucestershire Airports.

Involved

- Neoptera Aero Ltd
- Cardiff University
- Smart Ports Ltd
- University of the West of England

Funding given

£334,531

Drone defence: Edged sensing array affording intelligent integrated airspace awareness

Drones are set to transform industries of all types by optimising processes and reducing the cost of logistics and surveillance to near zero. However, methods for tracking and increasing drone visibility need to be developed before commercial drones can gain mainstream safety and legislative acceptance around our towns and cities.

Drone Defence aimed to prove the technical feasibility of detecting the characteristic signatures from both legal and rogue drones through using innovative sensor and data processing methods. The approach enables autonomous drone tracking and a quick-response system capable of opening the 'motorways in the sky' through increased critical airspace visibility, confidence and awareness.

Involved

- Drone Defence Services Ltd
- University of Nottingham

Funding given

£352,300

Drone Swarm for unmanned inspection of wind turbines: battery health management, hybrid comms systems and operational platform for autonomous offshore windfarm inspection

This project developed drone swarming capabilities and an operational platform for an autonomous inspection in offshore wind farms.

Using a system-of-systems approach, the project focussed on building drone swarm resilience and maximising safety. These are especially important when addressing the challenges of this growing renewable energy sector such as:

- access and deployment within remote and hostile environments hazards
- increasing operational and maintenance costs
- improving drone performance.

Although drones have been used for wind turbine inspection, a drone swarm deployment offers the benefits of extensive coverage and reduced inspection time. Using satellite communications extends the



Credit: Airbourne Robotics Limited

coverage to the communication industries and costeffective backhaul services.

The 5G and satellite system reduced latency, and increased bandwidth size and speed for detection's continuous/big data relay. The project successfully enhanced drone-to-drone, drone-to-operator and sensing performance during swarming operation.

Involved

- Airborne Robotics Limited
- Avanti Communications Group plc
- Bluelark Limited
- University of Portsmouth

Funding given

£1,208,893

EnabEl: enabling aircraft electrification

Electric propulsion is an essential part of the future of aviation, to reduce greenhouse gas emissions and other pollutants, airport noise, and flying costs.

This project brought together two aircraft companies and a university to build and fly a prototype electric aircraft (E-Kub).

The project started with a basic two seat microlight aeroplane with a simple power system and fixed-pitch propeller. The second stage was a more complex two seat light aeroplane with a reconfigurable research (electrical and hybrid) power system and variable-pitch propeller.

The E-Kub had its first flight in April 2021 and has since completed 14 flights and flown over eight hours under its own power.

In addition, the project developed the ability to simulate, test and optimise electric propulsion. Using the powerplant test facilities at Cranfield University, Cranfield and Sywell airports the team gained an understanding of the necessary infrastructure for supporting electric flight.

Involved

- The Light Aircraft Company
- CDO2
- Cranfield University
- Flylight Airsports

Funding given

£394,928



EnabEl Enabling aircraft Electrification

Enabling infrastructure for medical drone deliveries (INMED)

This project focused on the development and integration of physical and digital infrastructure into medical supplies delivery between blood banks and UK hospitals. Special attention was paid to the integration of the drone operations into medical operational practices.

The project proposed a total solution for the delivery of medical drones, comprising:

- a low-maintenance launch platform for drones with integrated automatic recharging
- a drone with a temperature-controlled housing, which was approved and compliant for the medical transport of blood/blood products operating procedures and a management application.

As part of the project, the flight from the blood bank to the hospital was simulated for analysis of risks and development of risk mitigation measures related to a irspace management, communication, and navigation. During the project, a number of outreach activities took place with medical organisations. These sessions demonstrated the project outcomes including:

- demo flight videos
- developed procedures
- their integration into a tablet and smartphone app.

Involved

- DGP Intelsius Ltd
- Blue Bear Systems Research Ltd
- Cranfield University
- HEROTECH8 Ltd
- Kings College London
- Milton Keynes NHS Foundation Trust Hospital
- The Drone Office Ltd

Funding given

£356,337

Fly2Plan

The project created an open-source aviation data "Operating System" governed by the community for the community, with the expectation that competition begins on a foundation of clean, trusted data.

The opportunities for Artificial Intelligence-based and automated decision making is where new product development competition will thrive, without worrying first about data quality; the Fly2Plan initiative established a collaborative version of truth.

By focussing on the challenge that unites all aviators involved in planning to access the airspace, the project took on a significant challenge, but one that can only be solved by unifying operations and technologies.

The project considered the digital infrastructure needed to transform the legacy systems to plug-andplay interactions, as well as digital communications that will support the shift from voice to data-led traffic. Viable use cases formed part of the project, including those for:

- airlines
- airports
- ANSPs
- baggage handling providers
- drone operators
- ground handling providers
- military
- traffic controllers
- UTM platform providers

The project successfully created an open-source data platform to enable integrated data exchange. It de-centralised ATM solutions to allow integration with multiple unmanned vehicles. The flight planning enabled BVLOS operation in non-segregated airspace.

Involved

- Heathrow Airport
- Altitude Angel
- Cranfield University
- Cranfield University
- Digital Catapult
- IAG Consortia
- IBS Software
- NATS
- Oxford University
- Rockport Software
- SITA
- Snowflake Software
- TEKTowr

Funding given

£2,300,964



Future urban simulation environment (FUSE)

FUSE created an Unmanned aircraft Traffic Management System (UTM) simulator as a "digital twin". Built using the latest technologies, it blended aviation, gaming, simulation, and Geographic Information Systems to create a synthetic environment within which strategies, laws and platforms for electric aviation can be tested.

The project provides a synthetic environment through an immersive 3D simulation of a real airport, which can be used by:

- ATM, UTM vendors and delivery companies to establish and test the implementation of the Local Authority preferred schemes of operation.
- ATM authorities to test the safety of the UTM services when considered in combination with other airspace users.
- the Drone Developers, ATM and UTM vendors to establish and test drone air lanes as well as autonomous collision avoidance rules.
- the Local Authority to develop schemes and supportive legislation such that drones may be limited to operations below 400 feet with no more than 200 manoeuvres per day in a specific area and

within agreed operating hours. Public consultations to demonstrate the proposed service and its impact will also be possible.

By bringing Local Authorities and residents into the picture, FUSE allowed them to help shape this new transport revolution being implemented in their area.

Involved

- Electric Aviation Ltd
- Cranfield University
- Geoxphere Limited

Funding given

£393,067



Hydrogen electric and automated regional transportation (HEART)

The consortium's vision for HEART is to develop a subregional air transportation network that is zero carbon, affordable, scalable and safer and with a targeted entry into service in 2025.

By introducing state-of-the-art technology and infrastructure, the project will unlock a sub-regional air travel market that will avoid major congested airports and instead use the over 100 licensed airfields around the UK. Passengers can then experience shorter doorto-door travel times, cheaper ticket prices, and a zerocarbon travel option.

The project successfully achieved:

- Four hours of flight trials with automation equipment on board. Although the Satcom was not operational, characterisation flights were delivered. Each flight lasted over an hour and covered manoeuvres to characterise aircraft operation, system shakedown and data gathering
- informal conversations with the Civil Aviation Authority (CAA) to de-risk the situation
- a public engagement event with 45 attendees



Involved

- Blue Bear
- Britten-Norman
- Edinburgh Napier University
- Fleet-on-demand
- HIAL
- Inmarsat
- Loganair
- Protium
- Weston Williamson & Partners
- ZeroAvia

Funding given

£1,865,982

Hydrogen storage to energise robotics in air applications 2.0

This project aimed to develop a novel energy system that extracts clean electrical energy from low-pressure hydrogen carriers, along with automation to realise the benefits of extended flight times on existing UAVs.

The project developed a medium-sized power system for a UAV (over 20kg) and demonstrated a scalable



technology based on a successful first-generation system that was first tested on a flight in 2019.

This project focused on optimising the technology on a medium scale in the first instance and the learning from implementation will be used for large scale applications at the post market entry stage.

Involved

- H2G0 Power
- Autodesk
- Imperial College London

Funding given

£350,351

Credit: H2GO Power

New aviation, propulsion, knowledge and innovation network (NAPKIN)

NAPKIN developed the blueprint for a viable UK sustainable propulsion aviation system and construct the foundation of knowledge required to perform a series of live demonstration pilots. It will help pave the way for low and zero-carbon domestic and short haul aviation this decade.

The project explored the multi-dimensional conditions that will enable the transition and the requirements for future projects, services and infrastructure.

The backbone of the analysis was a simulation model of an integrated aviation system. Incorporated in the system were:

- consumer attitudes
- airline behaviour
- aircraft technology characteristics to identify the technological parameter space of viable electric and sustainable aircraft design
- the associated flight network

- the required physical infrastructure
- the profit-optimum business models for sustainable regional aviation in the UK.

Involved

- Cranfield Aerospace
- Cranfield University
- Deloitte
- GKN Aerospace
- Heathrow Airport
- Highland and Island Airports
- London City Airport
- Rolls-Royce
- University College London
- University of Southampton

Funding given

£1,370,913

Project gold dragon: airborne detect-and-avoid for BVLOS drones enabling integration with new aviation systems

The objective of project Gold Dragon was to help accelerate the development and testing of an active detect-and-avoid solution for drones under 150kg, that enables their safe and full integration into the UK aviation system.



Dragon drone at Llanbedr

Project Rise

Project Rise delivered an open application programming interface (API) standardised platform. It brought together the various complex disciplines required to carry out safe and reliable BVLOS flights into a package ready to be used by specific end users.

The integration platform can be considered as a Flight Management System (FMS) that functions as a hub, integrating all elements of a drone operational workflow.

Integrational influencers included UAS operators, UTM Service Providers and services, ATM service providers and services, CAA, Supplementary data service providers, public users and the UAS.

- Successful trials in September 2022 at Newbury and November 2022 at Cranfield delivered on all eight planned scenarios
- A third trial in November at Cranfield did not involve flying but the team worked through a demo of the full system filmed during the second trials.

The project successfully created a micro radar based airborne detection and avoid solution. This led to it achieving CAA certification for BVLOS flight in unsegregated airspace. Project Gold Dragon is now a drone equipment provider to the Welsh government for drone delivery services.

Involved

- Snowdonia Aerospace
- Swift Flight Avionics

Funding given

£350,000

• The trials attracted good attendance, engagement and questions with Innovate UK, CAA and NATS represented plus potential end users such as Network Rail.

Involved

- Dronecloud (ADJsoft Limited)
- Cranfield University
- Sky-Drones Technologies Ltd
- Skyports Ltd

Funding given

£375,123



Rapidly deployable vertiport for drone-delivery, air-taxi, disaster management (Air-One®)

Designed and developed by Urban-Air Port Ltd to be the 'world's smallest airport'. It is an infrastructure solution to support future Electric Vertical take-off and Landing (eVTOL) aircraft. The programme was called "Air-One".

The project employed sophisticated design, intelligent-autonomous-systems technology, sustainable renewable energy input & fabrication processes to create rapidly deployable, small footprint infrastructure with minimal impact on the environment.

The project ended with a three-week demonstration period that started with a launch event in April 2022. The event was well attended and incorporated:

- a demonstration of the elevating launch and landing platform
- demonstration flights of a Malloy drone
- a full-size static model of a passenger carrying drone supplied by Hyundai
- an exhibition by Coventry University of their 'user experience' studies, plus other relevant exhibits.

During the demonstration period, the project attracted 10,000 visitors and featured over 150 uneventful drone flights. The event received extensive, worldwide, media coverage and attracted over eight billion website hits. The site also hosted visits by 140 school children and students.

Involved

- Small. Six Miles Across London Limited
- Coventry City Council
- Coventry University
- Hyundai Air Mobility
- Malloy Aeronautics Ltd

Funding given

£1,282,107

Retroflight alpha: a novel eVTOL charging infrastructure platform

The project aimed to develop the physical and digital infrastructure to support future flight objectives. This included a highly reliable 600kW charging capability using Petalite's three-Phase SDC patent and Vanti's smart building operating system (Smart Core™), required to serve eVTOL aircraft in high density urban environments.

This would reduce the associated high cost of ground works due to "peak loads" and traditional hardware reliability issues which would make these landing sites financially unviable. Without the right charging infrastructure in place eVTOLs cannot become a feasible form of transportation.

At the anticipated power loads of eVTOL charging, wider building automation and systems orchestration are essential to ensure existing electrical supplies can be used but are simultaneously monitored to eliminate the risk of them being overloaded

Safe Flight

As unmanned and autonomous systems evolve at pace uncertainty remains around how to integrate these safely into a shared airspace. The Safe Flight project developed and integrated safe, novel, autonomous technologies, with crew functions and responsibilities, in a framework that demonstrates how risk and uncertainty can be evaluated to provide routes towards certification.

The project tackled the integration challenges of developing a system of systems for safe and certifiable unmanned and autonomous airspace operations. and users of buildings being disrupted. As well as commercial buildings other locations for this essential infrastructure will include repurposing the tops of car parks, existing helipads and even EV charging stations.

The modular design of the charging technology will enable rapid growth and unlimited scalability across the eVTOL charging network nationally, while the open source and open protocol smart building operating system will enable site operators to manage peak energy consumption and minimise impact on existing electrical infrastructure.

Involved

- Petalite
- Vanti

Funding given

£349,763

Involved

- GKN Aerospace
- 3UG Autonomous Systems
- Callen-Lenz
- University of Bath

Funding given

£518,603



SafeZone: A dynamic safe zone system for autonomous urban flight

Zenotech and FlareBright worked together to deliver safer and more effective UAVs for use in urban environments via a new aerodynamic data service.

SafeZone combined high fidelity air flow simulation for the built environment from Zenotech, with in-situ validation from FlareBright's SnapShot nano drone.

This world-first project was supported by the Welsh Government via the direct involvement of Cardiff Airport and Saint Athan Airport as live test sites for the project demonstration campaigns. Heathrow Airport also confirmed interest in the technology development programme.

Involved

- FlareBright
- Zenotech Ltd

Funding given

£348.151



Images credit: FlareBright and Zenotech Ltd

Sustainable aviation test environment (SATE)

The SATE project created the UK's first remote, lowcarbon aviation test centre at Kirkwall Airport in the Orkney Islands in Scotland. The project trialled a host of exciting aviation technologies, including low-carbon aircraft that use electric, hydrogen or synthetic fuel to replace conventional fossil fuels.

It also investigated how drones can be used to provide on-demand medical supplies directly to hospitals and health centres. With new advances in technology, cleaner air travel will become more viable, and the SATE project is an opportunity for the UK to be at the forefront of the development, testing and early adoption of low-carbon aircraft.



The SATE team celebrate the end of their Phase 2 project at Kirkwall Airport

Involved

- Highlands and Islands Airports Ltd
- Ampaire
- CloudNet
- Denchi Power Ltd
- European Marine Energy Centre
- FlareBright
- Highlands and Islands Transport Partnership
- Loganair
- Orkney Islands Council
- University of the Highlands and Islands
- Windracers
- ZeroAvia

Funding given

£1,843,502



Skybus

The Skybus transport network, based on large eVTOL vehicles capable of carrying between 30 to 50 passengers, takes the "Park and Ride" concept into the air for mass transit over extremely congested routes.

This will not only offer direct benefits in reduced travel time at affordable fares, but also reduced ground transport congestion and travel time for passengers.

A consortium of experts in aircraft manufacturing, eVTOL infrastructure and operations and transport systems carried out an extensive multidisciplinary study into this proposed transport system concept.

Involved

- GKN Aerospace
- Connected Places Catapult
- Pascall+Watson
- Swanson Aviation Consultancy

Funding given

£368,443

SkyDroCell: Establishing safe autonomous and radio controlled nearground flight by dynamically mapping the combined aerodynamic and electromagnetic risks in complex physical environments and urban canyons

SkyDroCell created a risk monitoring and assessment system to facilitate the safe and effective use of unmanned drones and other flying vehicles in complex environments, such as the Urban Canyon between the skyscrapers of modern cities.

This a first step of evaluating the feasibility of the concept, with a team of highly experienced aerodynamic and electromagnetic experts intending to establish the feasibility of a practical system that could form the basis for a dynamically updated ATM or UTM service, including transition to ground.

Synthetic environment risk analytics for autonomous UAS (SEER)

The project combined risk analytic methods with high-fidelity physics-realistic simulations to rigorously assess the first- and third-party risk associated with UAS and UAM.

An online risk analytics tool, as well as a realistic physics-based simulation environment for testing autonomous systems were developed. The successful use of these two technologies can help further enable the expansion and success of the UAS and UAM sectors in the UK.



Image credit: Skybus consortium

Involved

- CyberVector Ltd
- Zenotech Ltd

Funding given

£349,311

Involved

- 3UAG Autonomous Systems
- Claytex Services
- University of Bath

Funding given

£384,183

System for high integrity monitoring of advanced-air-mobility network operations

This project looked to provide a clear path for development, test and ultimately exploitation of UAVs. The main areas of expertise included:

- heavy lift UAV platforms
- radar and radar identification technology
- BVLOS communication
- UTM data systems and integration
- regulatory approval
- public exploitation

The project addressed the challenge of how truly resilient and cost-effective localised communication, navigation and surveillance is possible in high risk very low-level flight environments. It also looked at how this localised information can augment existing ATM and UTM technologies to provide enhanced situational awareness. The systems developed in this project demonstrated resilient, accurate and safe operations of a UAV capable of delivery of medical equipment into complex high-risk environments.

Involved

- Malloy Aeronautics Limited
- Cambridge Sensoriis Ltd
- Makutu.io
- Oxfordshire County Council
- R4DAR Technologies
- Satellite Applications Catapult

Funding given

£394,987

Credit: SHIMANO project

Towards zero emissions in regional airline operations (2ZERO)

The UK government pledged to make air transport net zero by 2050 so sustainable transport and mobility are crucial to the global environment, economy and society. Today's larger aircraft can operate efficiently with high passenger numbers or high freight loads which has led to the current Hub-and-Spoke (HAS) model of airport operations designed for large aircraft.

This results in congested major airports and long door-to-door travel times for passengers. This is costly to passengers and air transport system operators. These larger aircraft also contribute significantly to the climate emergency through carbon emissions.

Tomorrow's smaller electric aircraft, with more frequent departures, will enable the move from HAS operations to a more direct point-to-point model.

This net zero aviation system could:

- improve public access to flight routes
- reduce congestion at major hub airports
- create more economically viable regional air transport operations
- cut carbon emissions

Ampaire's Electric EEL (Credit Ampaire)

The 2ZERO team delivered a whole systems approach. They showed how hybrid electric aircraft can be integrated with existing airport and airline operations for rapid adoption of sustainable air travel within a new, net zero aviation system. It advanced clean aviation technology with a flight demonstration of a six-seater electric aircraft as well as running baseline operations simulation models.

Involved

- Ampaire Ltd
- Cornwall Airport
- Exeter and Devon Airport Ltd
- Heart of the south-west local enterprise
- partnership community interest company
- Loganair Ltd
- Rolls-Royce PLC
- University of Nottingham

Funding given

£2,443,013

FUTURE FLIGHT CHALLENGE

UAS authentication service

Unmanned Aircraft System Traffic Management (UTM) is a system of systems, made of a multitude of participants in the form of operators, service providers and public entities and authorities. High connectivity, automation and integration of such complex systems inevitably will open doors to a range of security threats.

Although a user will be required by law to register and be uniquely identifiable within UTM, a malicious intruder could fool the system by impersonating an authorised user, potentially causing great damage. Being able to foil such attempts is of absolute importance for the safety and security of the integrated airspace and all its users.

The project also assessed the requirements for integrating this technology, which can be adapted and transferred from Connected Autonomous Vehicles to UAS, to make it impossible for attackers to forge their identity.

Involved

- Angoka
- Connected Places Catapult
- Cranfield University

Funding given

£392,637

Credit: Angoka

Windracers SWARM technology: Swarm technology and digital twinning to enable coordination and utilisation of high numbers of 100kg payload UAVs in aid delivery and firefighting applications

Swarm solutions build on the ability of UAVs to react to their local environment and neighbouring UAVs without having to coordinate through a central control station, making solutions more scalable to large numbers and robust to individual robot or ground station failure.

This raises new challenges in the design of algorithms that coordinate the UAVs throughout their deployment, from refuelling and loading to in-air navigation, and delivery of their payload (goods, aid, extinguishing agent).

These algorithms need to be developed in realistic digital twin environments that are just one-click away from testing on board the actual UAVs, seamlessly switching between simulation and reality.

This proposal focusses on enabling swarm deployments of the ULTRA UAV through the development of this digital twin. Two use cases were developed, centred around humanitarian aid delivery, and forest fire mitigation.

XCelerate

The project's goal was to take UTM systems out into the real world, by providing a repeatable framework that towns, cities and wider can follow.

Incorporating existing air traffic management and communications systems and supported by new technology such as 5G, cyber secure Drone Remote ID, and Drone Detection and Surveillance/ Counter capability with the most advanced aviation infrastructure in Europe.

This would open up portions of the skies and enable suitable safe BVLOS operations, including highly automated (no-pilot-in-the-loop) scenarios.

The use of 4G and 5G as primary or backup infrastructure ensured the drones remained connected for greater situational awareness, positional accuracy, and collision avoidance. The project aimed to demonstrate a proof-of-concept flight with five UAV, as well as new hardware for the ULTRAs to allow for inter-robot communication essential for swarming.

Involved

- Windracers
- Distributed Avionics
- University of Bristol

Funding given

£394,818

Credit: Windracers

Through these actions, XCelerate established certainty to the regulator, public, and the drone industry on the scalability and safety of routine BVLOS flights.

Involved

- BT
- Altitude Angel
- Angoka
- Dronecloud
- DroneStream
- HEROTECH8
- SkyBound Rescuer
- Skyports

Funding given

£1,505,809

Phase 3 projects 2022 to 2024

For the UK to be a leader in the third revolution of aviation we need to have successfully integrated the technical, regulatory and social challenges of a new aviation system.

Our 17 phase 3 projects all focus on demonstrating different aspects of the new air vehicles and systems and how these new modes of transport could support the UK's travel and aviation industries.

Agile integrated airspace system (ALIAS)

ALIAS is an innovative and ambitious project that brings together nine technology companies to demonstrate a scalable and cohesive airspace system for the future.

This system will incorporate drones, air taxis and manned aircraft operating in unison to deliver economic and societal benefit for the UK.

During the initial phases, the partners will integrate their individual technologies, incrementally building a regional airspace system that includes ground and flight testing of the sub-systems.

The project ALIAS team

Credit: ALIAS project

The project culminates in the deployment of the ALIAS system to the Channel Islands. A perfect test environment for a regional airspace system that can be replicated across the UK. This deployment will include drones performing maritime and public health missions, a helicopter acting in the role of an air taxi, alongside scheduled manned operations from the local airports.

Involved

- Volant Autonomy Limited
- Adjsoft Limited
- Angoka Limited
- Cambridge Sensoriis Ltd
- Drone Defence Services Ltd
- Ports of Jersey Ltd
- Sky-Drones Technologies Ltd
- Skyports Deliveries Ltd
- TEKTowr Ltd

Funding given

£2,533,933

Air mobility ecosystem consortium

This project brings together the leading experts of UK aviation to develop and demonstrate end-to-end operations that will drive the development of a commercially viable AAM network in the UK.

It includes demonstration flights between a new Skyports vertiport and London Heathrow and Bristol airports, which will deliver the world's first eVTOL flight between urban hubs, and the UK's first AAM demonstration flights.

The project will include the building and operation of a vertiport at London General Aviation airport to create a testbed for ground, passenger and air operations to integrate all aspects of the AAM ecosystem for the first time.

Top image Vertical Exterior Helipad Plan

Involved

- Atkins Limited
- Bristol Airport
- Connected Places Catapult
- Cranfield University
- EVE air mobility
- Heathrow Airport
- London City Airport
- NATS
- Skyports Infrastructure Ltd
- The University of Warwick Manufacturing Group
- Vertical Aerospace Group Ltd
- Virgin Atlantic Airways Limited

Funding given

£9,568,745

Atypical airspace BVLOS solution (AABS)

Sees.ai has developed an autonomous drone inspection system that enables national-scale drone operations to be piloted and managed from a central location. This technology removes the requirement for skilled pilots to travel to the inspection site, dramatically increasing the scalability of drone operations whilst maintaining the highest standards of quality and safety.

This technology is well suited to inspection and survey of the electricity grid and other industrial assets and infrastructure in hazardous or inaccessible environments. The system simultaneously captures both 2D and 3D information, greatly improving the ability to automate analysis, reducing time and cost of inspection and maintenance. Using telemetry, diagnostics, analytics and simulation, it's therefore possible to deliver national scale solutions.

Involved

- sees.ai
- Across Safety
- BT
- Imperial College London
- Keen.ai
- Lancashire Fire and Rescue Service
- Livelink Aerospace
- National Grid
- Network Rail
- Terradrone

Funding given

£1,181,261

Care and equity logistics UAS Scotland (CAELUS) 2

Following the difficulties of the COVID-19 pandemic, the focus for the NHS is now on the remobilisation, recovery and redesign of services, but this requires transformation of care delivery whilst simultaneously ensuring safe, effective, personalised care, and reduced harm and waste.

The novel use of Unmanned Aircraft Systems (UAS) or drones is one way in which the industry can substantially disrupt models of service delivery and transform patient pathways. In order to achieve this, the CAELUS 2 project is testing a medical drone logistic service will focus on new approaches to delivering care that reduces the need for patient travel, whilst maximising efficiencies within services. By using live and digital flight demonstrations, CAELUS is proving a network of multiple drones that can integrate safely with existing flight operations and therefore addresses regulatory needs and social acceptance issues.

Based on the learning from CAELUS 1 in NHS Ayrshire & Arran in the West of Scotland, CAELUS 2 will see NHS Grampian in the north as a lead board, taking a once for Scotland approach, whereby all other boards with the Scottish Ambulance Service will be invited to participate.

Involved

- AGS Airport
- ANRA Technology
- Arup
- Atkins
- Cellnex Telecom
- Commonplace Digital
- Connected Places Catapult
- DGP Intelsius
- Dronamics
- NATS
- NHS Scotland
- Planefinder
- Skyports Deliveries Ltd
- The Drone Office
- Trax International
- University of Strathclyde

Funding given

£7,075,083

The CAELUS 2 project team. Credit: CAELUS 2 project.

Future flight and land infrastructure programme (FFLIP)

The power demands for eVTOL vehicles create unique charging challenges, with high-capacity 600kW fast-charging capability needed to serve intended duty cycles.

An important challenge is to level these peaks through load management, enabling 24-hour utilisation to solve this issue for economical charge point operation.

Fast-charging and economically viable smart building infrastructure will be critical to support market development and growth. FFLIP builds on previous progress in this space by creating innovative AAM infrastructure that demonstrates the SDC charging operation of vehicles in a representative environment, whilst also meeting the requirements to ensure the creation of a viable economic case.

HADO: High intensity autonomous drone operations

Moving from concept to demonstration, this project will demonstrate the use of multiple drones, all operating as a BVLOS service in a defined geographic area. Over a four-month period, the project will evaluate a live, 24/7 commercial autonomous BVLOS drone service in the high intensity airspace of Heathrow Airport.

Involved

- Operational Solutions
- Carmenta Technologies
- Cranfield University
- Dynamic Intelligence Solutions

Involved

- Petalite
- Custom Interconnect Limited
- Oxfordshire County Council
- Midlands Aerospace Alliance
- Vanti (t/a RTS Technology Solutions Limited)
- ARC Aero Systems

Funding given

£3,328,394

Credit: Petalite

- Heathrow Airport
- HEROTECH8
- Rinicom Intelligent Solutions
- Thales UK
- UAVTEK
- UAVTEK Production

Funding given

£8,613,581

Intelligent drones for ports and highways technology (InDePTH)

The vision for the future of UK infrastructure encompasses fleets of unmanned aircraft systems (UAS) powered by renewable energy to deliver more efficient applications and processes in high-cost areas, such as search and rescue and highway maintenance, whilst reducing the economic and environmental impact currently caused by interruptions such as road closures.

The InDePTH project will investigate the use of autonomous drones to deliver this vision. The aircraft will be used to regularly survey wide infrastructure estates, including ports and highways, to create digital models and obtain detailed insight of these dynamic environments. InDePTH will also utilise onboard sensing, data and image processing equipment to autonomous drones, currently available as drone-in-abox (DIAB) solutions.

Current DIAB offerings include mission-tailored sensing equipment and minimal human input and supervision but lack end-to-end and real-time data analytics integration. DIAB solutions require lengthy manual data offloading after missions, making realtime analytics impossible, while data offloading is typically not fully integrated with analytics software.

This project aims to fast-track data transport, while providing enhanced AI analytics in near real-time. InDePTH will augment the drone data analytics using state-of-the-art machine learning (ML) algorithms, creating optimised image processing aiming at modelling environments to a 3D digital twin.

Demonstrators will be developed to support critical use cases in both port and highway environments, which change rapidly due to constant movement of people, vehicles and goods. For ports, two vital use cases are identified:

- InDePTH will investigate the use of UAS to improve inventory management, focusing on vehicle inventory
- using drones in off-shore surveillance and maritime operations in the second project demonstrator.

Thirdly, in the highways area, InDePTH will look at deploying UAS to continuously assess the ground surface quality of highways.

Involved

- BT
- Associated British Ports
- Connected Places Catapult
- HEROTECH8
- Kier Highways
- RoboK

Funding given

£885,658

Morecambe Bay medical shuttle 2 (MBMS)

The vision for the MBMS project is to demonstrate how the pathology services of three hospitals may be optimised through new forms of transportation.

The project aims to fly RPAS as a shuttle delivering pathology samples between Lancaster Royal Infirmary, Furness General Hospital and Westmoreland General Hospital. Benefits include the ability to speed up their processing and to provide better healthcare to the Morecambe Bay community that the hospitals service.

Open skies Cornwall

Open Skies Cornwall will create four thematic demonstration environments in Cornwall for realworld end users, technical specialists, UAS operators, regulators, innovators and academics to:

- Test new Detect and Avoid Systems and concepts in real world Cornish environments that will lead to advancements in UTM and new market opportunities for UAS use locally, nationally and internationally.
- 2. Seamlessly link end user viable drone delivery requirements to end user supply chain challenges and opportunities, which will lead to market

Involved

- Digital & Future Technologies Limited
- Lancashire Teaching Hospitals
- Miralis Data Limited
- · University Hospitals Morecambe Bay NHS Trust

Funding given

£836,850

A fixed wing drone sat on a launch and landing pad.Credit: Digital and Future Technologies Limited

validation and the route to future integration and commercialisation or adoption.

- Pursue, unpack, explore and test solutions, procedures and concepts to overcome regulatory requirements relating to airspace access, land access (bylaws, land access permissions and local planning authorities) and medical products transit compliance (NHS and MHRA).
- 4. Progress industrial research to integrate enabling technology and support infrastructure to real-world end users within our thematic environments.

The consortium has secured exclusive demonstration partnerships to explore with our technology providers and innovators how to:

- Integrate drones seamlessly within Royal Mail's supply chain network, ground assets and customers to provide a lean, quick, cost effective and robust connection to remote Cornish communities for parcel, next day and pharmacy postal delivery.
- 2. Explore and demonstrate how drones can be incorporated into the into the NHS Kernow logistics supply chain to provide new options for time critical medical delivery and the optimisation of transport and pathology lab assets.
- Integrate autonomous drone solutions and enabling infrastructure to complement and supplement maritime end user requirements at Falmouth Harbour to data capture, ship to shore delivery and remote healthcare/telemedicine/flying defibrillator applications.
- 4. Explore, test and demonstrate how the JHUB Med at MOD can develop a humanitarian/disaster relief medical re-supply drone capability for the purposes of deployment to support the logistical needs of NGOs (like UNICEF) in pandemic/epidemic/disaster scenarios both domestically and internationally.
- 5. Explore how detect and avoid solutions tested on the project can enable opportunities for drones to contribute toward economic growth in Cornish wind power, maritime, lithium extraction, agriculture and tourism markets.

Involved

- Droneprep Ltd
- Cornwall Development
- Hub-Med
- Neuron Innovations Ltd
- NHS Kernow Integrated Care Services
- Royal Mail Group Limited
- Skyports Deliveries Ltd
- TFC Inc. (t/a The Flight Corp)
- Trust Port: Falmouth Harbour Commissioners
- University of Southampton

Funding given

£1,608,270

OSC team photo and above OpenSkiesMap

Developing a blueprint for scalable UTM-enabled BVLOS drone operations across the UK (BLUEPRINT)

This project aims to create and demonstrate digital infrastructure and operational procedures that will allow safe and efficient shared airspace. Recent BVLOS projects have focused on operating in Temporary Danger Areas (TDAs), which are both temporary and closed off to other airspace users, so are not scalable or relevant for building a business case.

To transition to persistent and routine operations, BVLOS drones need to be fully integrated with other airspace users. To achieve this, there are six challenges to overcome:

- development of airspace which is inclusive to all airspace users
- development of airworthiness and software assurance requirements for the enabling technologies
- development of scalable detect and avoid solutions
- effective governance to manage aviation stakeholders
- integration and development of a UTM minimum viable product
- integration of drones within an airport environment

BLUEPRINT aims to solve all of these problems as follows:

- Airspace: Shared Airspace Zone via mandated Electronic Conspicuity and use of UTM Apps
- Governance: An industry body which incorporates senior leaders across the whole aviation sector, to help come to a consensus on rules for shared airspace
- Detect & Avoid: Distributed surveillance and tracking service integrated with Command Units
- UTM: Building on the CPC Open Access Framework and ASTM standards of interoperability
- Aerodrome: Development of project Atomicus for airport integration

• Regulatory: Assurance standards for manufacturers, software providers and drone operators

This makes Blueprint applicable to many use cases and opportunities. Especially within the specific category for both multi-rotor, single rotor and fixed wing drones where the growth is predicted to explode in size and scale up to approximately 500kg within controlled and uncontrolled airspace for all airspace users who want to share the air.

The aim of the BLUEPRINT is to provide regulators, technology providers and operators with a blueprint for UK wide rollout of BVLOS drone operations which can be commercialised at scale.

Involved

- Neuron Innovations Ltd
- AdjSoft Ltd
- Anra Technologies UK Ltd
- Cranfield Airport Operations Ltd
- Cranfield University
- Distributed Avionics Ltd
- Ebeni Ltd
- Future Aerial Innovations Ltd
- Sky-Drones Technologies Ltd
- University of Southampton

Funding given

£2,782,489

Project HEART: Phase 3

Project HEART works to deliver a new holistic business model for sub-regional travel that is innovative, environmentally friendly, highly automated, cost effective, safe, reliable, commercially viable, and, crucially, serves the people who need it the most.

The project has assembled a world-leading consortium of technology providers, operational experts, research organisations, airline and airports to create a programme that will utilise the synergy between Hydrogen-Electric powertrains and infrastructure, with operational innovation and safe, reliable aircraft automation to undertake a programme to demonstrate Hydrogen Electric Autonomous Regional Transport.

Involved

- Blue Bear Systems Research Ltd
- ARQIT
- Britten-Norman
- Edinburgh Napier University
- FOD Mobility
- GENEO

- HIAL
- LoganAir
- Mott MacDonald
- RDM Group
- SAAB
- Weston Williamson + Partners

ZeroAvia

Funding given

£6,808,228

Permanent or temporary automated landings (Project PORTAL)

Project PORTAL is being developed as the infrastructure launchpad for the future of flight. Between seven UK-based SMEs and research partners, the project is developing a disruptive approach to landing infrastructure for drones and air-taxis, with a technology-enabled solution that can deploy landing operations at any location.

Investment in the infrastructure of vertiports, not just pads, but safe, efficient, scalable, and resilient systems to transition people and goods from ground to air and vice versa, is essential for a successful electric aviation future.

By leveraging automation to manage air traffic through the PORTAL technology, any location can be turned into a safe and accessible drone port, and any business can become a drone capable business.

Involved

- SLiNK-Tech Ltd
- Angoka Limited
- Auriga Aerospace Ltd
- Cambridge Sensoriis Ltd
- R4dartech Ltd
- Snowdonia Aerospace LLP
- University of Bristol

Funding given

£2,706,676

Project SeaWatch: flexible ai coastal monitoring

Surveillance of the United Kingdom's coastal, maritime environment is more important than ever. As an island nation and trading power, the UK must protect and secure the seas along its coastline. Fisheries, cargo, Search and Rescue, and environmental protection alone combine to provide a significant challenge for available resources. These challenges are mirrored overseas contexts, including the challenging coastal areas of Africa.

Project SeaWatch provides a low-cost contribution to maritime surveillance, via an autonomous UAV with a specially-adapted, AI-enabled 3D camera system. UAVaid and Archangel Imaging have combined to produce an innovative system designed with proven technology to deliver a significant uplift in capability and resources to the user. SeaWatch can autonomously monitor vast areas of the sea, only reporting alerts for anomalies that are desired by the user.

Using a UAV to search reduces cost, eliminates risk and makes better use of scarce human resources, but currently has a drawback of requiring human involvement to spot the particular issue.

This project will design, develop and demonstrate a fully-integrated and fully-automatic system, specifically optimised for carrying out coastal maritime searches, using an extended development of an existing UAV platform, developed to operate in the challenging maritime environment, to conduct the physical search, coupled with an extended development of an existing artificial-intelligence based image processing system to identify issues of interest in the images and a new development in rapidly-deployable wireless networks to allow the system to be deployed quickly to any desired location. The system will integrate with AIS databases for vessel cross referencing to support automation of management and enforcement of coastal waters regulations.

Involved

- UAVaid Limited
- Archangel Imaging Ltd

Funding given

£428,755

Protecting environments with UAV swarms

Demonstrating how the Windracers ULTRA and SWARM technology can be used in applications that protect the environment. SWARM technology allows for extensive coverage and at reduced survey time and human resource.

The project will demonstrate how Windracers' aircraft can be used to conduct environmental protection missions. One of the main goals would be to show how the systems can gather environmental data in Antarctica as part of the project.

Furthermore, the project plans to demonstrate how the aircraft can be used to detect and locate wildfires, building on the work conducted in Project SWARM with support from the Lancashire Fire & Rescue Service.

For these operations to scale, the ULTRA platforms need to be operated in large numbers and in difficult environmental conditions. This raises several technological challenges, some of which are centred around navigation, situational awareness, resilience to failures and degraded performance states.

Involved

- Windracers Limited
- British Antarctic Survey
- Distributed Avionics Limited
- Helix Geospace
- Lancashire Fire and Rescue Service
- University of Bristol
- University of Sheffield

Funding given

£5,863,677

Credit: Windracers

SafeZone Phase 3

The SafeZone project is continuing work to develop safer unmanned drones in urban spaces. Safety is critical, with airports worldwide planning to significantly increase autonomous facilities inspections to improve cost-efficiency.

SafeZone team

The SafeZone team will generate and use localised aerodynamic meteorological data to allow UAVs to adapt their inspection route as they fly through wind changes and close to buildings. The partnership plans to use these results to enable the delivery of a new live data service to provide real-time information about aerodynamic hazards in the urban environment.

Involved

- Zenotech
- Cardiff Airport
- Cranfield University
- Flare Bright

Funding given

£520,413

Skyway

Project Skyway is using drones powered by renewable energy sources on a 165-mile superhighway connecting the airspace above cities including Reading, Oxford, Milton Keynes, Cambridge, Coventry, and Rugby. The corridor will enable inspection times of infrastructure to be cut significantly and speed up parcel delivery times from hours to minutes.

Involved

- Altitude Angel
- Angoka Limited
- ARPAS-UK Ltd
- BT Group Plc

ARRO

- Connected Places Catapult
- Coventry County Council
- HEROTECH8
- Oxfordshire County Council
- Reading Borough Council
- Skyfarer Limited
- Skyports Deliveries Ltd
- Vizgard Limited

Funding given

£8,871,813

Sustainable Aviation Test Environment 2 (SATE 2)

SATE 2 is based at Highlands and Islands Airports Limited (HIAL)'s Kirkwall Airport in the Orkney Islands. Phase one of the SATE project allowed HIAL, with support from partners, to create the UK's first low-carbon aviation test centre operating from a commercial airport.

The second phase of the project, SATE 2, will expand on the work of the original project to create a UK Centre for Excellence of Sustainable Aviation Systems. This will enable SATE to host pre-commercial demonstrations of novel aviation technologies with proven use cases, like airlines, offshore energy, NHS services, deliveries, and remote inspection, to commercialise clean innovation in a real-world environment.

The implementation of these projects will not only equire advances in technology but shifts in regulations and policy. This activity is reflected as part of interlinking activities, which include establishing a dedicated test environment airspace; matchmaking technology to community and business needs; accelerating technology innovation; and mapping out the future of the Highlands and Islands aviation system.

Involved

- Highlands and Islands Airports Limited
- Arcadis Consulting (UK) Ltd
- Connected Places Catapult
- Flarebright
- Highlands and Islands Enterprise
- HITRANs
- Loganair
- Orkney Islands Council
- The European Marine Energy Centre Ltd
- University of the Highlands and Islands
- WindRacers
- ZeroAvia

Funding given

£9,386,174

The SATE site at Kirkwall Airport under construction.

Closing the skills gap projects 2023 to 2024

Launched in 2023, these 13 short-term projects are promoting STEM careers, upskilling the UK's aviation workforce, and providing enhanced vocational training and Continuing Professional Development (CPD) opportunities by creating new educational and training materials to build awareness of the Future Flight sector and fill gaps in the UK's workforce talent and training capabilities.

AAM4Gov – Closing the AAM/UAM skills gap for members of city and local government

Local authorities have a critical role to play in the development of advanced air mobility/urban air mobility (AAM/UAM) and municipal drone services in the UK. AAM4Gov will develop an internet-based educational platform with six initial courses designed for professionals working in local government, complemented by a resource library and a series of 'ask-the-expert' interactive webinars which will provide local authorities with a vital resource to understand their role in developing drone and AAM/UAM ecosystems. These resources will help transform the lives of their citizens and accelerate the UK's industrial potential in this strategically important global industry.

Advanced Air Mobility (AAM) Flight Dynamics and Performance Skills

To address knowledge gaps in the AAM industry around flight physics, the University of Nottingham is creating and delivering an advanced course on AAM flight dynamics and performance both for undergraduate aerospace engineering students and as a CPD course for industry.

The course is based on modelling of electric vertical take-off and landing (eVTOL) aircraft and consists of lectures and seminars, as well as simulator sessions using the university's Alsim AL250 flight simulator to provide a better understanding of pilot perception and aircraft performance for eVTOLs. The course includes topics such as flight physics, electric propulsion, flying and handling qualities, and modelling and simulation techniques. Involved

• PMI Media

Funding given

£28,936

Involved

• University of Nottingham

Funding given

£48,674

Aviation Sector Insight Mentoring

Mentoring charity Brightside has partnered with ARPAS-UK, the UK's trade association for drones, UAS, and RPAS, to support 100 year 10-13 students from disadvantaged backgrounds to explore roles and opportunities in the aviation sector.

Students will learn how they can pursue a career in aerospace and aviation and explore the different career options available to them such as apprenticeships, college, vocational education, university, or work. They will also hear experiences from dedicated mentors in the sector, sharing ideas about their future and setting goals and targets to work towards.

Involved

- The Brightside Trust
- ARPAS-UK

Funding given

£22,376

and Flight Planning

DroneOps VR aims to transform the way drone pilots are trained using Virtual Reality (VR). VR is particularly useful for simulating scenarios that could be dangerous, impossible, or expensive to replicate in the real world and the aim of DroneOps VR is to provide a realistic and immersive training platform that enhances drone pilots' hazard assessment, flight planning, and flight management skills.

digiLab Academy: "AI in the Wild: Foundations in Machine Learning for Future Flight"

digiLab's AI in the Wild programme offers hands-on courses that explore topics relating to data science, machine learning (ML), and artificial intelligence (AI) by combining strong theoretical foundations with realworld applications. This project is building a new online training course, tailored to Future Flight, to help upskill employees in AI and ML techniques.

The course will demystify key concepts and introduce entry-level techniques before exploring more complex models and applications, all of which will be informed by industry partners and focussed on aviation data challenges and case studies, such as safety-critical component modelling and airspace management.

Involved

digiLab Solutions

Funding given

£49,966

Future Flight in Further Education

Aimed at students studying full-time aviation courses in further education colleges across England, this project is running a 'Vertiport Design Challenge' to raise awareness and develop students' understanding of Future Flight technologies and service. Students will tackle vertiport design scenarios that will challenge them to demonstrate creativity, teamworking and leadership skills and present their ideas to a panel of expert judges.

DroneOps VR – Virtual Reality Training for Drone Hazard Awareness

Involved

• Nudge Reality

Funding given

£49,876

Involved

• Harlow College

Funding given

£49,923

Future Leaders for Advanced Air Mobility Excellence (FLAME)

Project FLAME brings together academia and industry to develop a unique and exciting Masters university course for the future leaders of the Advanced Air Mobility (AAM) sector. The course unlocks technical and social barriers to accelerate the growth of this important transport sector.

The course delivers a whole-systems perspective of AAM, including vehicle design and technology, ground and airspace infrastructure, policy and regulation, and commercialisation. The course blends theoretical and practical knowledge and is delivered in a hybrid format to make it more accessible both to recent graduates and industry professionals.

Involved

- The University of West London
- Coptrz
- Safeguard Engineering

Funding given

£49,022

InnovateHer's Cybersecurity Programme

InnovateHer is expanding its outreach activities for teens aged 13-17 by designing a cybersecurity learning programme on its e-learning platform, with supporting initiatives to be delivered in schools across the UK. The 6-8 week interactive cybersecurity course is being created to inspire and intrigue young people to consider careers in the Future Flight sector.

Students begin their journey as cybersecurity 'apprentices' and receive virtual mentoring throughout the course, while learning about the different roles and opportunities within the cybersecurity profession and taking on challenges to emulate solving real-world cyber problems related to Future Flight.

Involved

Innovating Education

Funding given

£49,455

Bringing remote pilot skills up to an advanced level through a robust programme of tests and certifications

In recent years, the Future Flight sector has identified a mismatch between the basic skill assessments required in current drone certifications and the advanced skills required to operate UAS in complex industrial environments. Industry stakeholders have also identified a need for specific flight skills for particular operational scenarios.

Project Elevate is enabling the production of a series of advanced skills tests that will provide remote pilots with certification to state they have met the minimum operational and technical flight skill requirements to allow them to operate in specific scenarios within the engineering construction industry.

Risk Quantification Unlocking BVLOS Operations

Aerofirm will develop a training course which focuses on the quantification of the risks associated with BVLOS to support the development of safety cases which unlock routine, scalable operations. The course will help address the gap of personnel who can generate these complex safety arguments, providing the tools needed to support this and develop a safety mindset to be embodied in current and future organisations. ARPAS-UK will also support the project by bringing together an initial cohort of its members to undertake and provide feedback on the course alongside a route to scaling the course.

Involved

- Drone Training
- Engineering Construction Industry Training Board (ECITB)

Funding given

£35,117

Involved

- Aerofirm
- ARPAS-UK

Funding given

£29.866

Stackable Programme on Advanced Air Mobility (AAM)

This project will develop a stackable AAM programme to train engineers in the overall system-of-systems architecture of integrated ATM and UTM ecosystems, their enabling technologies and infrastructure, and associated intelligent solutions (e.g., Al and cyberphysical systems). The programme will be based on a suite of CPD courses with attendees gaining credits from each of them, enabling attendees to stack modular credentials to build to the level of education at a pace that suits them, e.g., Postgraduate Certificate, Diploma and MSc. Throughout this journey, attendees will be recognised for their successful completion of a programme module.

Involved

Cranfield University

Funding given £49,986

ZeroAvia and IRIS Future Flight Project

ZeroAvia has partnered with The Institute for Research in Schools (IRIS), a charity that aims to nurture critical thinking skills and inspire STEM careers by providing opportunities for research-based activities in the school curriculum to empower young minds, foster active participation in the scientific process, and nurture the engineers and scientists of tomorrow. This project will bridge the gap between education and industry by empowering secondary school students across the UK to learn about net-zero aviation by tackling real world challenges through a blend of webinars, face-to-face visits to industry facilities, decision making activities, and 3D printing their own aircraft design models, as well as attending an IRIS conference to present their work to their peers.

Involved

- ZeroAvia
- The Institute for Research in Schools (IRIS)

Funding given

£35,411

Closing the skills gap projects

For more information on the Future Flight Challenge visit

https://www.ukri.org/what-we-offer/ browse-our-areas-of-investment-andsupport/future-flight/