Results of Competition: EUREKA Collaborative R&D: UK Sweden Aerospace 2020

Competition Code: 2004_EUREKA_ATI_UKSWEDEN

Total available funding is £2,500,000

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ROLLS-ROYCE PLC	FibreSense	£483,145	£241,572

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
FibreSense is a collaborative research programme to develop on-engine sensing capability using novel Fibre-optic technologies. Initially considering bay monitoring for overheat and fire protection applications this technology development and evaluation programme is envisaged to provide higher resolution data compared to incumbent technologies enabling improved life/ failure diagnostics and reduced in-service events. Through this programme the partners aim to develop joint technology roadmaps to explore future opportunities for technology exploitation in health monitoring and propulsion system control.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MICROCHIP TECHNOLOGY CALDICOT LIMITED	COMPASS :- COMpact Phased Array Sensors and Systems	£426,548	£213,274
COMPOUND SEMICONDUCTOR APPLICATIONS CATAPULT LIMITED		£127,446	£127,446

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Project description - provided by applicants
COMPASS aims at developing a new compact, lightweight, energy efficient, reliable, and cost efficient solution for microwave front-end modules up to at least 18 GHz. COMPASS will integrate multiple transceivers in a single module (e.g. 4 by 4 active antenna solution), and embed common building blocks of a communication/sensor system such as amplifiers and filters. The solution enables heterogeneous integration of different semiconductor technologies to maximize performance, allowing cost efficient solutions. Focus will be on embedding GaN MMICs due to the high power and high temperature capability of this relatively new semiconductor technology. Though the main focus is on the microwave front-end, there is a clear path towards integration of CMOS logic for fully digital and compact transceiver solutions. The antennas could either be integrated in the module or surface mounted, and COMPASS will provide an interface to enable this. Improvements in the developed packaging technology would directly address commercial microwave sensor and communications systems. By starting with the perhaps most complex use-case of high frequency phased arrays, the developed approaches could in the future be adapted to low frequency as well as high-efficient power electronic solutions. The power electronics have the same drivers for solutions optimized for compactness, reliability, and thermal performance, which has been highlighted as a clear requirement for both hybrid and electrical propulsion, clearly a key future direction for aviation.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PHOENIX SCIENTIFIC INDUSTRIES LIMITED	Development of Advanced Manufacturing Technologies for Repairing Next Generation Aeroengines (DEMAND-REPAIR)	£567,020	£283,510
TWI LIMITED		£121,500	£121,500

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Project description - provided by applicants
The aerospace industry is working towards building a sustainable industry to reduce its environmental impact and effect on climate change. Replacing damaged parts with the new ones is a costly affair, which can be avoided if the parts can be repaired and remanufactured. However, traditional technologies such as electron beam patch welding or high-velocity-oxy fuel or plasma spray are not suitable to effectively repair next generation parts. The extensive heat input from these processes can cause thermal and geometrical distortions and degrade mechanical properties, resulting in an unacceptable risk to safety. Therefore, new alternative technologies must be explored for repairing such advanced components. The emerging processes of cold spray, high velocity air fuel (HVAF) spray, extreme high speed laser cladding (EHLA) and laser metal deposition-powder (LMDp) have been identified by the consortium as promising surface engineering and additive manufacturing technologies, due to their lower heat input compared with traditional techniques. All of these emerging technologies make use of powder feedstock material, with the process reliability and deposit quality dependent on well-controlled powder properties (composition, microstructure, morphology, powder size distribution). Ti-6Al-4V powders are typically manufactured via gas atomization and result in a low yield of powders in the desired size distribution. This results in high costs and limits the uptake of many emerging repair and additive manufacturing technologies. Novel approaches to manufacture of high value Ti-6Al-4V powders will create highly flowable titanium powders with a fine and narrow size distribution at a much lower cost. The process is also expected to result in powders with novel microstructures. While less of a concern for the laser-based repair processes that re-melt particles, such changes to microstructure are expected to increase ductility during deformation and as such, significantly benefit the spray-based processes of HVAF and cold spray. Therefore, the DEMAND-REPAIR project plans to explore novel advanced manufacturing technologies and innovative titanium powders to repair the next generation aero-engine components.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
INTERNATIONAL TECHNEGROUP LIMITED	SIMLIGHT - Simulation of Electromagnetic Effects of Lightning Strike for the Connected Aircraft	£348,738	£174,369

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
The SIMLIGHT project is concerned with the computational electromagnetic (CEM) simulation of the effects of lightning strikes on the fully connected aircraft, and the impact on the design, performance, compatibility, compliance and certification of aircraft structures, integrated sensors and components. Modern aircraft contain an ever-increasing array of complex electronic systems. The ability to predict electromagnetic environments for new concepts and undertake qualification and clearance into service is critical. Products must be protected against electromagnetic interference, induced effects of lightning strikes, and high intensity radiated fields following rigorous testing and international standards. CEM simulation is essential for predicting electromagnetic performance, but significant challenges remain. Pre-processing tools must effectively handle complex multi-scale aircraft geometry, including cabling and electronic equipment. Computational requirements must support simulation across a broad frequency spectrum and long simulation time, combined with fine mesh and large computational domains. Simulation of cabling and electronic devices must address increased complexity of subsystems and their impact on electromagnetic interference/compatibility. New material models need to be developed and validated for composites and alloys. SIMLIGHT aims to make a step forward, introducing new tools and techniques to address these challenges and support the move towards Model Based Engineering and the generation of a CEM Digital Twin. New pre-processing capabilities will be developed including: a lightning attachment zone prediction tool; a robust automatic mid-surface generator to reduce thin-walled structures to shells for faster meshing and simulation; tools for the identification and treatment of critical EMC information in CAD; a new shrink-wrap-based auto simplification tool for complex geometries. The electromagnetic simulation tool will be based on the novel time-domain hybrid solver for integrated antennas and sensors developed in the EMSCAT project, with new development focusing on capabilities for EMC and lightning effects. New parameterised models for small geometrical features such as thin slots and apertures will be developed and linked with pre-processing capabilities. Cable bundle modelling will be addressed by direct inclusion in the time-domain solver as well as by coupling with a full transmission line solution accounting for individual cables. New models for dielectric and conductive sheets will consider field diffusion through composites. Improved parallelisation schemes, combined with high- to low-frequency extrapolation techniques, will mitigate the exceedingly long computations required for whole aircraft simulation at the necessary resolution. The tools and techniques developed will benefit from the expertise of the industrial aerospace partner, ensuring a focus on key requirements and validation within an industrial environment.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GE AVIATION SYSTEMS LIMITED	Open Terrain and Synthetic Vision Systems Application - OpenVISTA-3D	£463,061	£231,530

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
OpenVISTA-3D is a collaboration between SAAB and GE Aviation Systems under the UK-Sweden Call for Proposals for Joint R&D Projects in Aerospace 2020\. The project will evaluate the Integration of SAAB's 3-D Terrain database and 3-D Synthetic Vision System into GE's Open Flight Deck Architecture for the Commercial and Military Aerospace Market. The design of a high resolution Terrain database and Synthetic vision systems and their associated databases is a highly attractive solution for Commercial and Military Aviation over existing visual terrain databases. The emergence of this technology solution is important because it has been in demand for a long time. Aircraft manufacturers and operators have been relying on databases that are known to have shortfalls that lead to fatal accidents and unsafe operations. This project will begin to address those shortfalls. A key distinguishing feature of OpenVista-3D will be the capability to provide high resolution photorealism and open interfaces for 3rd parties to add additional information to their flight deck displays. The OpenVISTA-3D project will build upon complimentary technical advances made by both SAAB and GE in current R&D programmes such as Clean Sky 2 and Open Flight Deck by jointly developing an open architecture for hosting 3D terrain and SVS applications. The team will also analyse, review and refine market conditions to develop a collaborative business model that maximises the exploitation potential to both SAAB and GE Aviation. The proposed work will bring GE's advanced open flight deck platform together with SAAB's unique database solution to set the new standard for advanced avionics systems and flight decks, including applications for Synthetic Vision Systems (SVS), Terrain Awareness Warning Systems (TAWS), digital moving maps, and more.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
RENISHAW P L C	Additive MAnufacturing Solution & Industrialisation for Next Generation InterMediate Case (AMASING IMC)	£621,140	£310,570

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
Develop efficient technologies to build large structures in a laser powder bed fusion machine. Identified technologies to be developed will make it possible to produce larger components at higher deposition rate.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ELECTROFLIGHT LTD	High Energy Propulsion Battery System (HEPBAS)	£627,548	£313,774
BAINES SIMMONS LIMITED		£78,465	£39,232

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Project description - provided by applicants
Aviation is a significant contributor to climate change, responsible for 2% of global CO2 emissions. The aim of the project is to place the Swedish and UK aerospace industries on a pathway to the multi-billion dollar opportunity to accelerate the transition of short-haul air travel to electric propulsion. This aligns with the focus of Sweden (Innovair) and the UK's (ATI) national aerospace strategies of supporting leadership in green aviation, R&D, international partnerships, SMEs to drive industry competitiveness and increasing exports and skilled employment for both countries. The project scope consists of five major work packages: 1\. Stakeholder requirements; 2\. R&D framework aligned to aviation safety standards; 3\. Technology requirements; 4\. Design and manufacture battery pack prototype; and 5\. Validate and verify in laboratory and ground testing. The Eureka collaborative innovation grant creates the arena for a post-Brexit international collaboration between Sweden and the UK electric aerospace ecosystems to support the nascent technology development of electric aircraft, with strategic relevance based on three key themes: 1\. Synergistic technical capabilities of Swedish Heart Aerospace developing electric drivetrain (motor & controllers) and UK Electroflight developing propulsion battery systems to address the challenging requirements of the aviation environment. 2\. Mutual commitment of Swedish and UK governments and national aerospace strategies to decarbonise aviation. 3\. Sweden and the UK share coastal, island and mountain geography requiring regional airline and airport operations as a critical transport link, which are uniquely suited to the early adoption of electric aircraft.

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