Innovate UK

Results of Competition: UKART: Collaborative R&D Round 1 Full Stage

Competition Code: 1809_CRD_UKART_R1

Total available funding is £8,000,000

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
SIGMA PRECISION COMPONENTS LIMITED	High Volume Manufacture and Inspection Processes for Composite Pipes	£935,293	£448,941
LASER OPTICAL ENGINEERING LIMITED		£176,216	£82,822
PULTREX LIMITED		£254,887	£122,346
The University of Manchester		£55,430	£55,430

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
Thermoplastic composites are gaining favour in place of traditional thermoset versions for their toughness, ease of recycling and ability to be manufactured in high volume without autoclaves. The _High Volume Manufacture and Inspection Processes for Composite Pipes_ project aims to develop novel manufacturing and inspection processes for production of cost-effective thermoplastic composite tube, and to fully qualify the material. The consortium comprises Sigma Precision Components (lead), Pultrex, Laser Optical Engineering and University of Manchester. The project will develop a pultrusion process to make high-quality thermoplastic composite tube and a semi-automatic laser shearography inspection system to check for flaws. The carbon /thermoplastic material will also be one of the first to be fully characterised for aerospace use. The partners will need to ensure the processes are capable of achieving cost and productivity targets while maintaining product quality. Sigma is a manufacturer of metallic aerospace pipe assemblies and has developed thermoplastic composite tube technology that can be used for lightweight pipe assemblies and torque shafts. To fully capitalise on market opportunities, Sigma will perform a work package to fully qualify the thermoplastic composite material (overseen and published by NCAMP) through a series of coupon tests. Currently there are very few thermoplastic composites published in the industry's Composite Materials Handbook 17\. In addition, the manufacturing costs for the tube need to be reduced, addressed by the two other work packages Although pultrusion is an established technology for making various thermoset composite sections, Pultrex (a UK based manufacturer of pultrusion equipment) will develop innovative solutions to adapt the process for thermoplastic tubes, in particular the heating and cooling systems and consolidation die design. University of Manchester will assist by transferring knowledge from their laboratory pilot process, and maintain close academic interest for teaching purposes. Pultrex also anticipates potential sales of this equipment in other sectors such as automotive. For the third work package, Laser Optical Engineering will adapt one of their existing laser shearography systems to inspect composite tubes for flaws such as inclusions, porosity and delamination. The system will use special lasers, cameras and semi automatic image analysis to inspect the tube more quickly than traditional C scanning techniques. Their innovation will focus on miniaturising a rugged system for both industrial use and for inspecting composite structures on aircraft during maintenance, or even wind turbine blades.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BAE SYSTEMS (OPERATIONS) LIMITED	Pilot Auto Runway Taxi System (PARTS)	£425,777	£212,888
Coventry University		£244,505	£244,505
HORIBA MIRA LIMITED		£421,369	£210,684

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Project description - provided by applicants
Taxiing of aircraft to and from runways is an important operational function necessary for the safe and efficient functioning of any airport. However, errors in routing may occur, for example where there is low visibility or the pilot is unfamiliar with the destination airport; these can have significant impacts in terms of both operational efficiency and added environment impacts. Assisted or fully autonomous taxiing will lead to fuel savings as a result of better power management and time-based taxiing targets, simplify operational procedures and enhance safety. It will also enhance airlines' ability to use secondary airports in all conditions (important for low cost operators). This UK based consortium brings together a team from BAE Systems, HORIBA-MIRA and Coventry University, with the objective of demonstrating proof of concept for an autonomous taxiing system for commercial aircraft, based upon the transfer of technology from autonomous road vehicles. Using a pilot-centric design approach the intention is to develop a technology-demonstrator based upon the HORIBA-MIRA autonomous test vehicle to establish the viability of an autonomous taxiing system. A series of trials will be undertaken in simulators and using a ground vehicle to demonstrate performance and safety benefits of such a system. This will inform discussions with appropriate authorities on the route to regulatory approval.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AIRBUS OPERATIONS LIMITED	High Aspect Ratio Tools (HART)	£298,000	£149,000
University of Bristol		£127,478	£127,478

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Funders Panel Date: 01/04/2019

Project description - provided by applicants
There is a continuing need to improve cash operating costs to remain competitive. Improving aircraft fuel-efficiency and reducing environmental impact is key. One way of achieving these goals is to use higher aspect ratio wing designs that lead to reductions in aerodynamic drag. Such a design approach does however tend to produce more flexible wings, where the internal structural sizing and design is dominated by complex nonlinear aero-elastic (fluid-structure interaction) effects. Airport gate sizes do however constrain the maximum allowable wing span of commercial aircraft. This can be mitigated with the use of Folding Wing-tips so that aircraft with longer wings can fit within the airport gate limits. It is therefore becoming essential to be able to model nonlinear effects and new devices such as Folding Wing-tips at an earlier stage in the design process to inform design decisions. Airbus and the University of Bristol (UoB) will establish a two-year Collaborative Research and Development project that will develop a range of aerodynamic and aeroelastic technologies that were identified (for further development) during the recently completed Innovate UK funded Agile Wing Integration (AWI) project. These developments will be applied in conjunction with existing Airbus processes for wing sizing and performance purposes, to enable industrial level preliminary design and trade-off studies to be made for any flight vehicle with high aspect ratio wings. This could be commercial aircraft or other vehicles such as Unmanned Aerial Vehicles (UAVs). Significant innovation is required in this area to allow design teams access to a new design space beyond what has been classically used in the last 40 years. In particular, the proposed toolset will enable nonlinear dynamic assessment of novel aircraft wing designs with very high span, taking into account the shape of the wings in flight, the response to turbulence and gusts, and any inherent aeroelastic instabilities such as flutter. Based upon this improved modelling capability it will be possible to evaluate the benefits of different technology enablers, including composite wings, Strut-braced wings and Folding Wing-tips to exploit the inherent advantages of higher aspect ratio wings. Close interaction between the industrial and academic partners will be key to the success of the project and the academic researchers will spend a significant amount of time based at Airbus UK. The application of these technologies at Airbus will enhance future collaboration and knowledge exchange across the Airbus business groups for unconventional aircraft wing designs.

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SAFRAN NACELLES LIMITED	IMLET	£434,350	£217,175
ICHROME LTD		£190,062	£95,031
QINETIQ LIMITED		£285,689	£142,844
STELLAR ADVANCED CONCEPTS LTD		£85,000	£42,500
University of Bristol		£249,017	£249,017

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Funders Panel Date: 01/04/2019

Project description - provided by applicants
IMLET is a collaborative research project aimed at developing integrated disruptive technologies that includes classes of multifunctional graded materials with shape adaptive and self-healing capabilities for the benefit of aerodynamic performance.

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