

QUB - Mechanical and Aerospace Engineering PhD Project Description

Title: Simulation tools for the design of bespoke nacelle lightning strike protection solutions	
Theme: Simulation technologies & Advanced Manufacturing	
<p>Project description: Increasingly composite materials are used in the design of aircraft structures to reduce weight and maintenance requirements. However, lightning strike frequently occur to the global aircraft fleet and due to the insulating nature of the polymer resin found in composite materials additional protection from lightning is necessary. Today that protection is in the form of an additional metal foil layer at the surface of the exposed structure. Currently the design and verification of the protection layer is reliant on experimental testing. Simulation methods are only now maturing such that they might support in the design and tailoring of such protection. The state of the art simulation methods, developed at Queen's, represent the composite structure and the surface foil, but also include the lightning arc plasma. Such modelling is required to determine the magnitude and distribution of current, pressure and temperature loading which is applied, during a strike, to the combined foil and composite structure.</p> <p>The recent developments in direct effect simulations offers a clear opportunity to, in the first instance, support with the selection from a list of available candidate foils and minimise the required volume of physical testing. However, more significant, is the new potential to use the simulation technology to develop bespoke foil solutions for specific designs. This is timely given recent advances in additive layer manufacturing technology for metal materials and the potential for the effective manufacture of non-uniform foils. This could be particularly valuable in the designing of solutions in the vicinity of nacelle surface and sub-surface features (e.g. inlets, joints, ...).</p> <p>Aims and Objectives: <i>It is proposed to undertake a research project to mature the developed simulation tools for the design of bespoke nacelle lightning strike protection solutions. The project is envisaged to comprise four major tasks:</i></p> <ol style="list-style-type: none"> 1) <i>Simulation and selection of baseline foils for a generic nacelle design, including constituent material characterisation under lightning strike thermal conditions;</i> 2) <i>Experimental coupon testing of the baseline foil solutions and validation of simulation prediction against the experimental results;</i> 3) <i>Simulation driven foil design (employing additive layer manufacturing technology) considering representative nacelle local features;</i> 4) <i>Experimental coupon testing of the bespoke local feature foil solutions.</i> 	
Key skills required for the post:	
Key transferable skills that will be developed during the PhD:	
Lead supervisor:	Prof Adrian Murphy
Other supervisor(s):	TBC
Funding mechanism:	Under review
Application closing date:	Until suitable candidate appointed
Guaranteed stipend:	Standard stipend for 19/20 is £15,009
Conditional available:	top-up TBC

PhD students in the School may have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.