



**QUEEN'S
UNIVERSITY
BELFAST**



Towards certification by simulation of bird-strike event on composite wing leading edges



Project Aim:

Bird strike impact on the leading edge of wings tends to occur at stages of the flight cycle when an aircraft is arguably more vulnerable, i.e. at low altitude, during take-off and landing (approximately under 500 feet). Collisions at higher altitudes (over 3500 feet and up to approximately 20,000 feet) have been known to occur with a range of bird sizes causing considerable damage. The increased use of composite materials in the latest generation of large passenger aircraft, their associated complex damage mechanisms and relative brittleness compared to their metallic counterparts, necessitates extensive physical testing for certification. This is very costly and time consuming. To date, the leading edges on SA Belfast wings (e.g. for the Airbus A220) have been metallic but future wing programmes may transition to the use of composite leading edges.

The aim of this project is to develop a high-fidelity usable design tool for the virtual testing of a bird strike on a composite wing which will be transferred to SA Belfast and embedded as a core capability.

Objectives:

- Select candidate materials which have been extensively characterised and are representative of those used on current and future wings
- Develop constitutive models incorporating damage mechanics
- Develop bird model using SPH
- Develop simple FEA/SPH models for preliminary model verification
- Develop a high-fidelity model of representative wing section for model validation
- Develop a multiscale modelling strategy to enable efficient full wing modelling
- Transfer computation tool to SA's Strategic Technology group

Advanced Composites Research Group



Key skills required for the post:

Candidate should demonstrate knowledge/experience/skills in at least one of the following areas:

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| <ul style="list-style-type: none"> • Computational modelling • Basic material characterisation/testing | <ul style="list-style-type: none"> • Basic material selection |
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Key transferable skills that will be developed during the PhD:

These will include an ability to effectively communicate research outcomes to academic peers and industry, independent analytical thinking and problem solving, time management, and leadership.

Lead supervisor:

Prof Brian G. Falzon CEng FRAeS
 Professor of Composite Materials and Aerostructures
 Head of School, b.falzon@qub.ac.uk

Other supervisors:

Dr Zafer Kazanci
z.kazanci@qub.ac.uk

Funding mechanism:

UK nationals only.

Application closing date:

31st July 2021

Guaranteed stipend

£15,285 tax free.

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.