

QUB - Mechanical and Aerospace Engineering PhD Project

Title: Rapid approaches to assess power-plant loading for novel aircraft concepts under extreme events

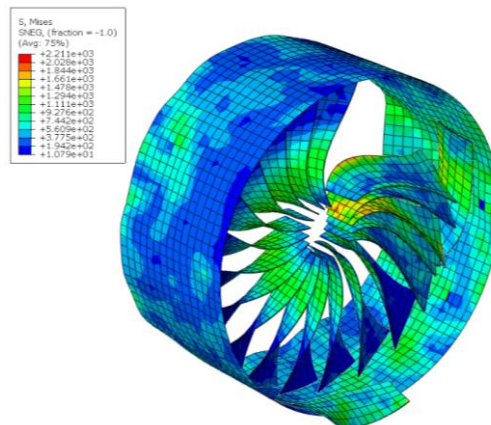
Project description:

This project will investigate novel computational methods for modelling and assessing the impact of extreme events on current and future power-plant and aircraft design concepts. The project will be linked with Rolls-Royce Plc and the successful applicant will join an existing research group consisting of PhDs, Postdoctoral Researchers and Academics, tackling a range of future aircraft design challenges.

When designing aerospace systems, a significant amount of effort is often expended in assessing designs against extreme events (such as blade loss or edge of envelope scenarios), often resulting in significant changes to concepts or in some cases rendering them unrealisable. These events are often extremely challenging to assess, requiring a large amount of background information and the use of complex analysis techniques which are unsuited to early design timescales. As a result, empirical data or “know-how” is often relied upon with respect to these events during conceptual design stages.

However, such empirical data and knowledge is greatly lacking for novel aircraft concepts, which often vary significantly from the conventional Tube and Wing configuration, already optimised close to its architectural design limit regarding aerodynamic efficiency. Stringent environmental requirements and sustainability demands, means new aircraft need a step change in performance over their predecessors.

This project looks to firstly develop understanding of the implications of extreme events on conventional configurations, particularly with respect to Power-Plant design. To this end, a thorough literature review along with simulation-based sensitivity studies will be utilised. Once findings are validated, they will be studied and utilised to inform development of novel simulation methods suitable for evaluating the effects of extreme events on novel aircraft configurations at conceptual design stages. Emphasis will be placed on the implications for the Power-Plant and neighbouring structural components. The development of new methods such as these, are essential in achieving demanding performance objectives in required timeframes and budgets.



Aims and Objectives:

The aim is to understand the influence of extreme aircraft events on the design of current and future engine and aircraft design concepts. This will be met through the following objectives:

1. Understand aircraft and power-plant extreme event design requirements, and the methodologies used to meet them.
2. Determine the influence of these events on existing designs.
3. Investigate and develop methods for evaluation of future designs suitable for concept design stages.
4. Use newly developed methods to evaluate performance of leading design options.

Key skills required for the post:

Key transferable skills that will be developed during the PhD: Structural Analysis, Computer Aided Engineering, Programming	
Lead supervisor:	Dr D Nolan (d.nolan@qub.ac.uk)
Other supervisor(s):	Dr Damian Quinn (d.quinn@qub.ac.uk)
Guaranteed stipend:	£18,500
Conditional top-up available:	
PhD students in the School 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.