

QUB - Mechanical and Aerospace Engineering PhD Project

Title: The use of “Ionic Wind” Technology to generate Thrust/Lift and reduce aircraft fuel consumption.	
Project description: Our research group Advanced Composites Research Group at School of Mechanical and Aerospace Engineering (QUB) is conducting research on impact of lightning strike on aircraft structures. Our research group uses Multiphysics codes to model the air plasma (lightning strike channel) using the magnetohydrodynamic equations. These equations have a force term called Lorentz-Force that couples the fluid and electromagnetic physics. This force will be investigated to produce Ionic wind. The Ionic wind technology is a novel technology that many researchers are currently investigating it. The current research is focused on generating an electric field (between two components, anode & cathode) to ionize the air molecules and accelerate them to produce a thrust force. The main idea of this project is to investigate the current aircraft technology and utilize the electromagnetic energy already generated by the aircraft movement in air to produce an extra lift-force or an extra thrust, which will reduce the aircraft fuel consumption. This investigation phase is necessary until the electric-propulsion technology is further developed and can produce thrust enough for a mid-to-large aircraft.	
Aims and Objectives: Project’s aim is to utilize the electromagnetic fields generated by the aircraft movements in air to reduce fuel consumption and to improve air transportation environmental impact. Objective-1: study electromagnetic fields that the current aircraft technology is generating through its movements into air and through their engines’ moving parts. Objective-2: To investigate the utilization of this electromagnetic energy to reduce fuel consumption. <i>The project will use multiphysics codes (COMSOL, OpenFoam) to conduct numerical studies. Then, conduct several experimental studies to validate the numerical results.</i>	
Key skills required for the post: Finite element method – finite volume method – computational fluid dynamics – basic plasma physics.	
Key transferable skills that will be developed during the PhD: Multiphysics modelling – Ionic wind technology	
Lead supervisor:	Name and contact details of person leading the research. Dr Gasser Abdelal – g.abdelal@qub.ac.uk
Other supervisor(s):	Name(s) of anticipated other supervisors on project Dr Yasser Mahmoudi, Prof. Brian Falzon
Guaranteed stipend:	This can include a basic stipend and any guaranteed top-up (if available). N.B. stipend for 20/21 is not yet known, but is likely to exceed £15,000.
Conditional available:	top-up Amount and condition N/A
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.