Title of studentship:	Fly-Away Consumable "Spray On" vacuum bag
Faculty/School/Department(s)	Faculty of Engineering (University of Bristol)
Location	Airbus Filton
Salary/stipend	£21,500 p.a.
Hours	Full time
Contract (temp/perm)	Contract/temporary
Closing date	March 31st

Project Outline:

Current manufacture by vacuum infusion of composite aircraft structures involves the use of consumables such as a vacuum bag, to allow for consolidation of the dry fibre preform and create a pressure differential needed to infuse the preform with resin.

Deposition of the vacuum bag over a complex shape requires very skilled manual labour which results in a very time-consuming process. This coupled with the fact that the consumable cannot be re-used for a second part contributes to global waste.

The project will investigate an alternative composite manufacturing process which removes the requirement for a vacuum bag by using a sprayed on polymer layer to create an impermeable membrane. This "spray on vacuum bag" cures prior to infusion and is then integral to the component. The spray allows the manufacture of the component without the use of a vacuum bag and will thus reduce wastage, manufacturing time and complexity.

The main aim of the project will be to understand the requirements of a spray on vacuum bag and investigate the most optimal chemistry of the bag, which can create an impermeable membrane of sufficient robustness to avoid degradation (e.g. during handling, cure-cycle of 180^{o}C over 4+ hours, preform movement during process prior to cure). Compatibility of the spray on material with both dry fibre performs and infusion resins will need to be considered.

The secondary aim is to investigate the weight penalty inherent in replacing the usual consumable vacuum bag with a permanent alternative while attempting to counteract this by improving the damage tolerance of the components. This improvement could be related both to damage visibility and damage resistance due to specific properties that may be inherent or integrate-able with the sprayed layer. Other possible advantages sought of the sprayed layer will be related to sealing and lightning strike resistance.

The third aim is to understand the effects of having a permanent "spray on" bag to the rest of the consumables needed for a vacuum resin infusion. Permeability mesh is usually required to aid the distribution of resin flow, and this consumable is removed and disposed of after cure. By not including the permeability mesh, resin flow will be hindered, and this may result in the preform not being fully infused. This can be combated using highly permeable preforms such as PvP or the use of fly-away mesh such as G-Flow.

A final aim is to assess the business case for switching to a fly away spray on vacuum bag in its effect on the manufacturing process. Demonstration of the technology via CoSinC WP6 prototypes (e.g. stiffened panel) should be targeted. The scope is mainly dry fibre infusion, however some investigations on pre-preg manufacturing process can be considered. Depending on the outcomes that start to emerge in terms of technical viability and business case assessment for the fly away consumable concept, a removable variant (e.g. Silicon vacuum bag) can be considered.

Company Profile

Airbus is a global leader in aeronautics, space and related services. In 2018, it generated revenues of € 64 billion and employed a workforce of around 134,000. Airbus offers the most comprehensive range of passenger airliners from 100

to more than 600 seats. Airbus is also a European leader providing tanker, combat, transport and mission aircraft, as well as Europe's number one space enterprise and the world's second largest space business. In helicopters, Airbus provides the most efficient civil and military rotorcraft solutions worldwide

How to apply

If you are interested in applying please send your CV, covering letter and academic transcripts to idc-composites@bristol.ac.uk

Candidate requirements:

PLEASE NOTE THAT THIS PROJECT IS NOT AVAILABLE TO INTERNATIONAL STUDENTS DUE TO TIER 4 VISA REQUIREMENTS.

Applicants with 'home student' status and holding or about to graduate with a first or 2.1 degree in structural or chemical engineering, materials science or physical sciences.

Funding:

Stipend: £21,500 p.a.

Standard EPSRC studentship eligibility criteria apply:

http://www.epsrc.ac.uk/skills/students/help/Pages/eligibility.aspx

Contacts:

For further information about the IDC and the EngD programme please visit:

http://www.cimcomp.ac.uk/idc

or contact **idc-composites@bristol.ac.uk**