Low cost aerostructures incorporating structural health monitoring

Supervisor: Prof Brian G. Falzon

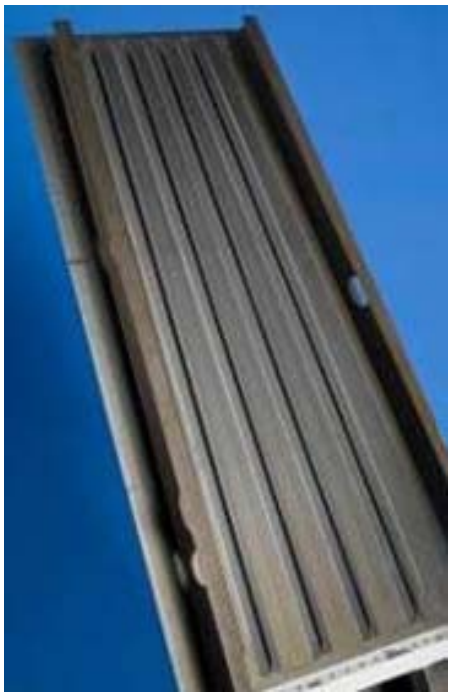
Background

The current generation of large passenger and military transport aircraft incorporate an unprecedented level of composite material in their primary structure. The production of these airframes is costly. The process is labour-intensive, it relies on the development of expensive tooling and the use of large autoclaves for curing the composite sections.

Industry is exploring ways of reducing the cost of manufacturing. One alternative, which shows promise, is Resin Infusion under Flexible Tooling (RIFT) which has been used by the marine industry for sometime. It involves the infusion of a dry composite fibre perform, placed on a suitably shaped tool, with resin under vacuum. A number of process controls need to be monitored and optimised to ensure the required structural integrity.

Proposed Reseach

This project will be undertaken in conjunction with the CRC-ACS (Cooperative Research Centre for Advanced Composite Structures) and JAXA (Japan Aerospace Exploration Agency). The aim is to produce an aerostructure with representative features including integrated stiffeners, thickness changes and ply drop-offs, using a low-cost manufacturing route instead of the conventional autoclave-type of process. A one metre section of the Boeing 737 wingtip has been chosen as a demonstrator. Resin infusion under flexible tooling (RIFT) will be explored and a study of suitable sensors undertaken for in-situ structural health monitoring. This research will involve numerical modelling of the infusion process using the finite element/control volume method, structural testing, material characterisation and the integration of structural health monitoring sensors.



Boeing 737 Wing Tip.