Fatigue studies on postbuckling composite aerostructures

Supervisor: Prof Brian G. Falzon

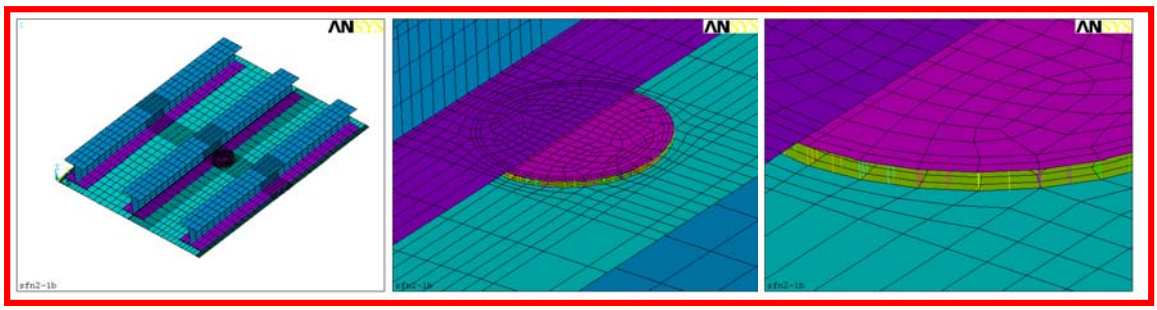
Background

The capability of stiffened composite structures to carry load in a postbuckled state is well established. Indeed, extensive work by the group has been shown that such designs lead to significantly lighter structures. Most experimental and numerical investigations, thus far, have only considered quasi-static loading. Whilst it has been shown that composites have superior fatigue characteristics over their metallic counterparts, this may not be the case in postbuckled structures with geometric discontinuities (giving rise to stress concentrations) or which may have incurred undetected in-service damage.

Proposed Reseach

A set of composite panels will be manufactured and tested under fatigue loading to assess the fatigue life when there exists internal damage in the skin-bays, damage at the skin-stiffener interface, cutouts, stiffener runouts and other structural features which may act as stress raisers. This comprehensive experimental programme will require the careful design of appropriate test specimens.

This data will be used to develop and validate life-cycle simulation using finite element analysis. These tools will build on previous damage models developed by the group. A primary objective of this project is to utilise this validated tool to improve the fatigue performance of postbuckling composite structures by the exploration of new design concepts.



Finite element model of stiffened panel with idealised delaminated region [courtesy of CIRA].