

DASSAULT Falcon 20 Underwing Pylon and ERU Corrosion Repair

Task Objectives

Airframe Designs was engaged by COBHAM (EASA Part21J DOA) to carry out an allowable damage assessment for Dassault Falcon 20 underwing pylon and associated Electronic Release Units (ERU) structures.

Operating in a maritime environment with low level flying operations over the sea, combined with the use of aluminium alloy materials highly susceptible to corrosion, led to excessive corrosion damage to the pylon and ERU structures that was outside of Structural Repair Manual (SRM) limits for repair



The purpose of the assessment was to define allowable damage limits and repair procedures in order to permit continued and extended use of the pylon and ERU structures.

This was to avoid a very expensive replacement scenario that would also interrupt on-going contracts for which the availability of serviceable pylons was paramount.

Allowable Damage Assessment

In order to determine the 'Allowable Damage' it was first necessary to establish the static strength of the baseline structure and the level of excess strength / material in the design for the loads experienced within the flight envelope.

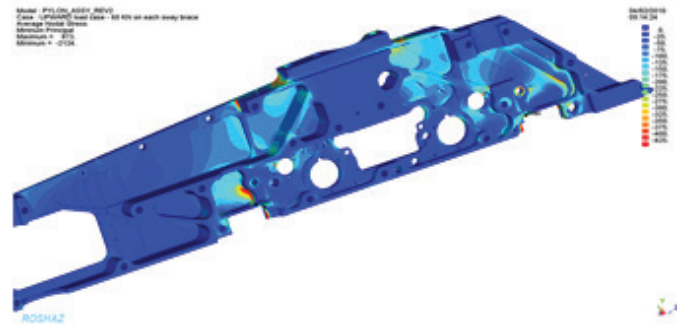
A Finite Element Model (FEM) was assembled to represent the structure, modelled with TET10 solid elements, and simulated within MSC NASTRAN, using solution sequence 101.

The ERU FEM Mesh is shown below:



The loads for the pylon and ERU had to be understood via historical 3rd party design reports that covered store clearances for various payloads.

The FEMs were then loaded and constrained appropriately, considering the actual degrees of freedom available at each structural interface.



The stress output from each model was then used to evaluate regions of high and low stress to determine areas where material loss was viable.

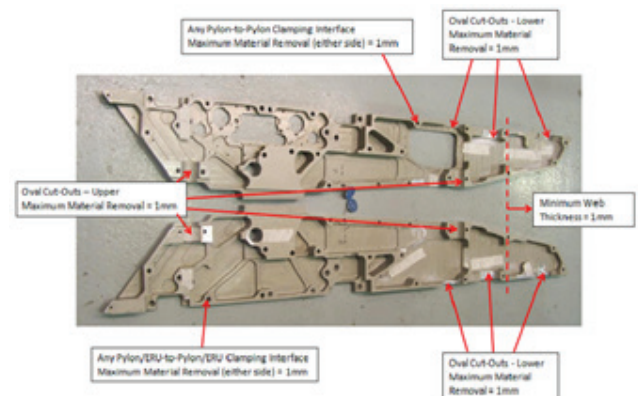
Allowable Damage Limits

Damage limits were derived by examining local stress fields in conjunction with the baseline material cross-section.

The objective was to ensure that after material removal / loss, the local regions still had the ability to react all necessary loads and that major load paths were not impacted by the loss.

It was also important to avoid introducing any undesirable features or stress raisers.

The Allowable Damage was articulated pictorially:



Testimonial (Pierpaolo Fracasso – Head of Stress)

"We decided to outsource this task to AFD because of their track record in simplifying potentially complex tasks into a series of simple steps and always delivered on-time with pragmatic and favourable outcomes".