CASCADE
ENGINEERING

DEPENDABLE ENGINEERING,
CERTIFIED SOLUTIONS

CASE STUDY
02

Client: E.I.S. AIRCRAFT NOW PART OF QINETIQ

DELIVERING YOUR CLIENT'S EXPECTATIONS

EIS Aircraft is a German aerospace company with a rich heritage of delivering product and design services for their clients. When their incumbent supplier couldn't meet the challenges of reworking a Pilatus PC-12 platform to introduce an equipment bay, jeopardising the project and their client relationship, they turned to Cascade Engineering for help.

Having agreed terms with their client, EIS Aircraft was under pressure to deliver a challenging project with rigorous EASA CS23 certification for an equipment bay in the forward fuselage to allow for the installation of surveillance equipment. We took the lead in the project due to our familiarity and experience of the Pilatus structural philosophy, so we were able to confirm the original designs would not work. We wasted no further time or resource on this route and set to work to find an alternative workable solution.

STRATEGY

Major modifications can have a significant impact on the original aircraft design and are not usually covered by OEM standard documentation. We therefore reverse engineered from the physical aircraft, using our engineering experience and knowledge to develop the necessary documents to help us advance the project.

In this case, making a large three frame bay penetration in the fuselage of an aircraft is not to be undertaken lightly. The issue was made more acute by the penetration being only one frame bay forward of the front spar carry through structure. We developed conservative versions of the aircraft loading to apply to a new forward fuselage FEM in order to design the structure on 'a return original strength' basis, preventing any loss of time while we were awaiting the OEM documentation.

Armed with the necessary insights and documents, we were able to take some bolder steps to optimise the design further, confident that the structure could be made to accommodate such a change without merely adding excessive reinforcing. For instance, it became clear from an overall engineering, manufacturing and installation cost/time perspective, that the entire lower fuselage skin panel should be replaced with a thicker un-etched version, rather than attempting to add a similarly large reinforcing plate on the outside.

EXPERTISE DELIVERED

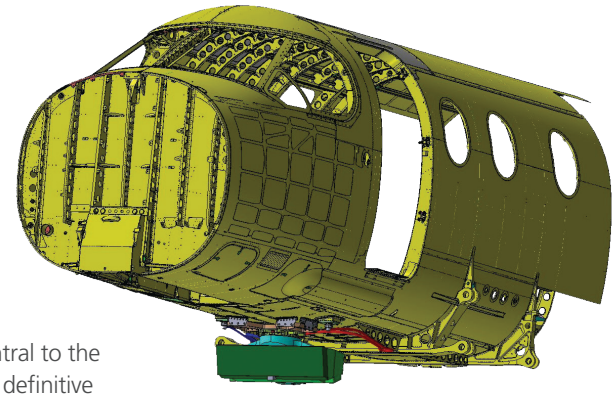
Working alongside the EIS Aircraft team, we were able to meet the necessary deadlines. We delivered the concept that was CDR ready within 4 months and within a further 3 months had all components delivered into manufacture. We subsequently provided manufacturing and installation support and delivered all required certification paperwork to allow the STC to be granted.

Finally, the route to certification was smooth with little or no concern received from the LBA, the German national airworthiness authority.

This project marked the start of a long-standing relationship which continues to this day. Following this project EIS asked us to work on other modifications to this and other aircraft, and now use us for all their major design activities too.

COMPREHENSIVE EXPERIENCE

- Demonstration of Cascade Engineering's bespoke service for one-off modifications to components that are critical to the overall structure of the aircraft.
- Focal point structural compliance verification engineer (CVE).
- Cascade's design input was central to the development process to secure definitive certification data that convinced the authorities the replaced structure and interface to the radar were unquestionably acceptable.
- A project that was one year behind schedule was rescued, re-evaluated and ultimately put back on track.
- Joint working has resulted in Cascade team becoming approvers for EIS internal projects.



CASCADE APPROACH

- Start with concept solutions – brainstorming, getting something on the blank sheet.
- Move to concept development – moving initial ideas into viable schemes for selection.
- Assess manufacturing capabilities, production rate issues, installation and assembly limitations.
- Preliminary & Critical Design Review preparation, presentation to OEM, managing actions to progress beyond review.
- Decide on clear route forward.

CASCADE ENGINEERING HALLMARKS

- Analysis of metallic semi-monocoque aluminium structure under current CS-23 requirements.
- Analysis of complete structural elements, such as the Rear Fuselage, Vertical Tail and Elevator.
- Analysis of specific fuselage elements, such as fuselage frames, skins and vertical tail discrete attachment fittings.
- Analysis of mechanical systems, such as the Elevator Control System.
- Large data manipulation for results taken from Finite Element models, to allow multiple load cases and structures to be analysed in an efficient, logical and repeatable manner.
- Development of design, optimisation and certification analysis and compilation of reports, presentations and certification stress reports.
- Act as delegated signatories and compliance verification engineers (CVE) to ensure Stress justification satisfying FAR or EASA regulations.
- Ability to apply OEM stress methods, partially automate them and understand where initial problematic issues can be mitigated and improved to acceptable levels.
- Ability to assess all types of structural analysis method and determine suitability or even develop methods to suit the circumstances, all in collaboration with the OEM.
- Ability to apply this efficiently when revisiting stress calculations performed by others, for new variants of an aircraft.

We subsequently provided manufacturing and installation support and delivered all required certification paperwork to allow the STC to be granted.

CASCADE ENGINEERING

DEPENDABLE ENGINEERING, CERTIFIED SOLUTIONS

Cascade Engineering
Building B
Riverside Way
Camberley, GU15 3YL

+44 1252 594121
info@cascade-engineering.co.uk

www.cascade-engineering.co.uk

Cascade Engineering is a trading name of Cascade Aerospace Engineering Limited. Reg. No. 05838778