Analysis of Helicopter Fuselage

Introduction:

A European helicopter OEM who displayed a prototype of its generation 'H' helicopter at the Heli Expo in 2015, faced one critical question from potential buyers. Is it possible to make a lighter version without making compromises on performance and safety standards?

The OEM took up the challenge and partnered with design expert service provider. The OEM decided to make use of composite materials for cutting-edge design and maximum efficiency in terms of performance and sustainability.

The company wanted to make design changes using composite material which would add value not only in performance, economic competitiveness, and safety but also comfort. Structural design changes were needed to be done on the structure like fuselage, tail boom, tail rotor, and main rotor blades – which would contribute to the lightweight fuel-saving design and performance optimization.

Here's a quick read on how complex design changes made the helicopter lighter and faster.

The Customer:

A European helicopter OEM is introducing a new age military helicopter.

Business Scenario:

Optimizing the structural weight of the component considering intricate features thereby maintaining all Reserve Factor (RF) in the range of 1.08-1.2. Non-availability of complete CAD data and interface (secondary structure) loads and assembly detail.

Maintaining on-time delivery due to several iterations for optimization.

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Solution:

With our expertise in design methodology, we were involved in the analysis of monolithic machined components of multi-purpose military helicopter and also redesigned the helicopter components for weight optimization. Some of the components which were considered for optimization were the front module, center module, rear module, tail module, undercarriage module and tail rotor.

Key Highlights:

Executed FE analysis of fuselage structure for different loads like Flight, Landing, Maneuvering, Jacking and Lashing load cases.

113 structural components were considered for analysis. Many tool based iterative approaches were adopted inline with design principles, in order to bring down the excess weight so as to maintain all RF's in the range of 1.08-1.2.

Optimization and feasibility study were conducted for minimum weight and redesign suggestions were provided.

Developed 'Fastener Calculation Excel Templates' which could be used across several similar components in calculating Tension, Shear & Combined RF's (Reserve Factors) thereby reducing the inherent calculation time. Automated 'Excel Macros' to extract the Buckling RF's (Eigen Value) automatically from over 100 load cases.

Why AXISCADES

AXISCADES offer end-to-end software and hardware development services for the aviation industry.

Our capability in developing safetycritical systems span requirement specifications, design, implementation, testing, software integration, system integration, verification & validation, and sustenance needs.

Deep aerospace domain expertise and vast technical knowledge in handling complex programs.

Best practices and processes knowledge acquired working with multiple global OEMs.

Flexible business models including Risk Reward partnership.

Certifications and key design signatory approvals from OEMs and industry regulatory authorities.