

Design to Build of Composite Horizontal and Vertical Tail

Introduction:

When it comes to airliners, weight is money. The heavier a plane is, the more fuel it takes to keep it in the air. The more fuel it takes, the more it costs. OEMs are constantly looking for ways to increase fuel efficiency and improve the aerodynamic performance of aircraft.

This is directing OEMs to move away from using aluminum in airframes to lightweight carbon fiber composites - woven mats of carbon which are embedded in plastic.

The key to a composite material is that it is incredibly strong for its weight. Design changes and use of composite material, significantly improve a plane's lift-to-drag ratio - making it much more aerodynamically efficient, and also reduce its overall weight – leading to cost savings. Using composite materials is also opening up other potential savings. A super-jumbo aircraft, for instance, has about six million parts - but in future, this could be cut considerably.

Importantly for aircraft OEMs, composite fiber components are lighter than similar parts made of aluminum. For instance, if we can take a kilogram of weight out, that's got a huge saving over the life of an aircraft. Each kilogram cut means a saving of roughly \$1M in costs over the lifetime of an aircraft, and the use of such composites reduces the weight of an aircraft by up to 20%.

The Customer

India's largest aerospace firm who were developing a multi-purpose civilian aircraft.

Business scenario

The Indian OEM wanted to design, development and optimization of horizontal tail (HT) and vertical tail (VT). To provide engineering design solutions to convert existing metallic design to composite design, selection of suitable composite material, design specifications to meet airworthiness standards and Improvement of Structural Efficiency.



Solution

- Using AXISCADES design thinking expertise provided design and manufacturing support of horizontal tail & vertical tail of the aircraft using composite material.
- Selection of the right kind of composite material to suit the OEMs aircraft weight specification.
- The existing metallic design was optimized using Carbon Fibre Composites. Reconfiguration of Structural Arrangements was done and Structural efficiency was improved. The HT and VT were designed to meet the FAR25 standards and Bird strike requirements. Kinematic study of Rudder & Horizontal Tail were performed. Aero Elasticity Analysis and F&DT were also carried out. Repair schemes were provided.
- The use of composite fiber allowed the creation of sweeping HT VT, which cut fuel consumption by up to 5%.
- Executed end to end activities from conceptual and preliminary design to manufacturing drawing release, performing detailed design, stress analysis and generating relevant reports and dossiers for certification support.

Key Highlights

AXISCADES expertise in understating aero-structures and the know-how of composites material ensured that the customer attains improved design solutions.

More than 30% weight reduction was achieved through the reduction in the number of parts and by usage of Co-Cured, Co-Bonded Carbon Fibre Composites.

COD from Airworthiness authority was obtained.

AXISCADES team provided the advantage of a shorter development cycle and increased production rates.

Why AXISCADES

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.

Reliable ecosystem to deliver turnkey projects.

Ability to meet Offset obligations of OEMs and Tier 1 suppliers both from commercial and defense programs.