CASE STUDY

OptiStruct Drives Weight Reduction in Commercial Aircraft: Door Support Arm Design Optimization

Overview

Using OptiStruct topology and shape optimization tools, Eurocopter created an innovative new design of a door support arm for the Fairchild Dornier 728 aircraft. The company achieved a weight reduction of approximately 20 percent, using structural optimization techniques as an integral part of the design process.

Business Profile

The Eurocopter Group is a 100 percent owned subsidiary of EADS (European Aeronautic, Defense and Space Company), one of the three largest aerospace groups in the world. The company develops commercial and military helicopters, and is involved in all European Airbus programs through the development of aircraft doors and fairings.

Challenge

Due to strong consumer and competitive pressures in the industry, aircraft manufacturers are actively pursuing opportunities to increase the performance and efficiency of aircraft structures. To meet program timing and complex, aggressive product objectives, Eurocopter required a new simulation-driven design process centered on product optimization. This study focuses on the application of this process to develop a more mass-efficient passenger door support arm.

"We used OptiStruct on different parts of the aircraft passenger door system. The software helped us to achieve substantial weight savings."

Peter Haensch
Optimization Specialist
Eurocopter GmbH, Germany

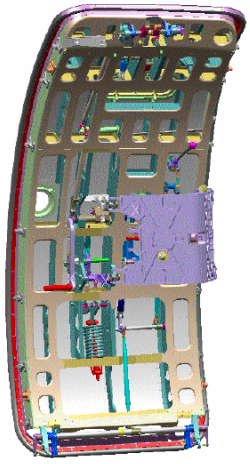

Fig. 1
Fairchild Dornier 728 passenger door with the support arm

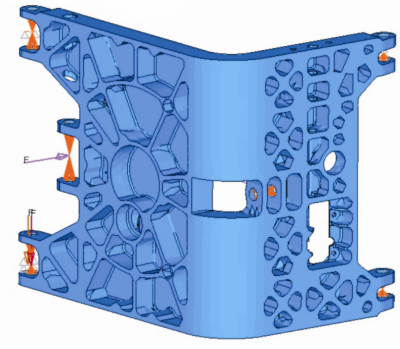

Fig. 2
Initial design of the door support arm

Solution

Altair OptiStruct topology optimization technology was deployed within Eurocopter's design process. This technology allowed Eurocopter to develop engineered design concepts – taking into account performance and product objectives – without having to develop, evaluate and iterate on multiple CAD design proposals. The initial door hinge design, provided by OptiStruct, maximized the stiffness for three load cases: door blocking, emergency opening and damper hit. In addition, draw direction constraints were included as part of the optimization, yielding a design tailored to the specific method of manufacture. Secondary analyses further reduced the part mass by optimizing shapes and sizes of ribs for all load cases and a maximum allowable stress level.

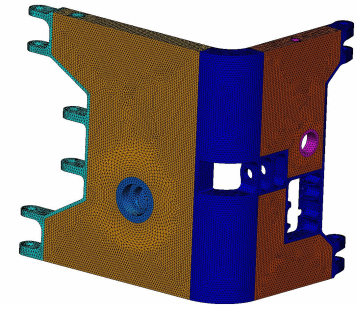

Fig. 3
Design space model

Results

Using OptiStruct, Eurocopter was able to reduce the door support arm weight by approximately 20 percent without compromising the stiffness of the part. In addition, the turnaround time to develop and validate the new door support arm design was reduced from three months to three weeks, using the new simulation-driven design process.

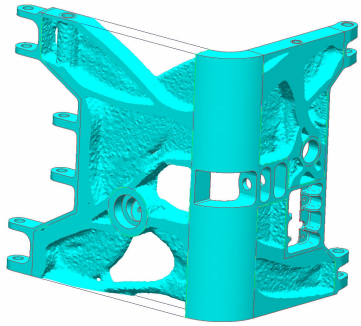

Fig. 4
OptiStruct design proposal

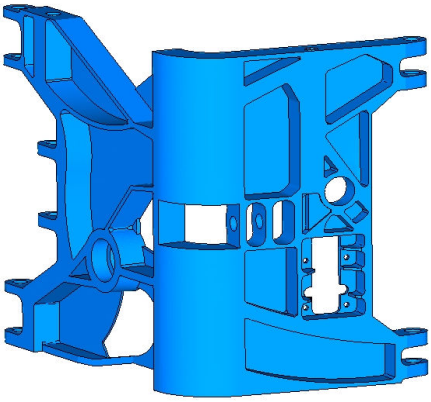

Fig. 5
Final design after topology and shape optimization

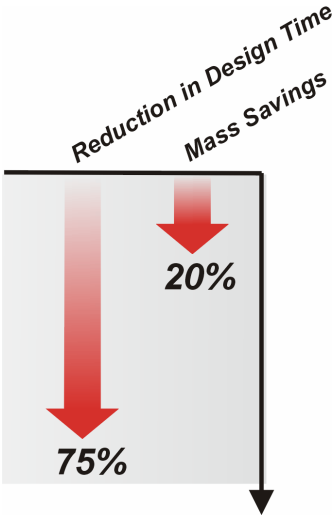

Fig. 6
Benefits of the new design process

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