

Project MAAXIMUS

Innovative aircraft door surround structure made of CFRP

At the DLR Institute of Composite Structures and Adaptive Systems an innovative aircraft door surround structure is developed in the project MAAXIMUS (More Affordable Aircraft structure through eXtended, Integrated, & Mature nUmerical Sizing). MAAXIMUS is a level 2 project funded by the European Union through the Seventh Framework Programme Aeronautics and Air Transport (FP7). Its objective is to demonstrate the fast development and right-first-time validation of a highly-optimised composite airframe. The MAAXIMUS objectives related to the highly-optimised composite airframe are: 50% reduction of the assembly time of large composite sections; 10% reduction of manufacturing & assembly recurring costs; 10% reduction of the structural weight. The MAAXIMUS objective related to a faster development is to reduce by 20% the current development timeframe of aircraft structures and by 10% the corresponding cost. The MAAXIMUS objective related to the right-first-time structure is to additionally reduce the airframe development costs by 5% through the delivery of a predictive virtual test capability for large composite structures with a quantified level of confidence, to avoid late and costly changes. This will be achieved through coordinated developments on a physical platform, to develop and validate the appropriate composite technologies for low weight aircraft and a virtual structure development platform, to identify faster and validate earlier the best solutions through major improvements in airframe Simulation-based design.

The door surround structure is a highly complex structural part of the airframe and is getting developed within the physical platform of MAAXIMUS. A door surround structure has multiple functions in the fuselage: providing the interface to the aircraft door and carrying the loads exerting from it, guiding loads from the fuselage around the large cut out and lastly providing enough stiffness to ensure unconditional opening of the door in any scenario, even up to crash. The design of the structure is highly adapted to the requirements of carbon fibre reinforced plastics (CFRP), yet it completely fulfils all of today's requirements for an aircraft. The largest segments of the door surround structure is a fully integral part with no need for additional joints like bolts. Furthermore, many additional feature developed at the DLR Institute of Composite Structures and Adaptive Systems shall get integrated into the structure, for example CFRP-metal-hybrid materials. One of the largest benefits of developing such a complex structure in one institute is the ability to apply a complete tool chain. The tool chain begins on design level with seamless transfer of all data to sizing specialist. After sizing the structure, the whole design is fed into a draping simulation to gain the exact fibre angles of the CFRP material upon production. Additionally, the design data is used to develop all necessary tools for an efficient production of the door surround structure. Therefore we are confident to reach the ambitious goals of the MAAXIMUS project.

Rendered illustration of the door surround structure



Sizing result of the structure for one load case

