SIEMENS
Ingenuity for life

Aircelle

Smoothening out actuation in engine nacelles using LMS Imagine.Lab Amesim

Product

Simcenter

Business challenges

Improve ability to meet and exceed customer performance requirements

Design a robust engine nacelle actuation system

Keys to success

Simulate actuation architectures under several working conditions

Study the interaction between the actuation system and the thrust reverser door structure

Easily import FEM door structure data into the simulated actuation system

Results

Carried out performance analyses on the electrical and hydraulic components of the actuation system

Optimized nacelle design to withstand difficult stress factors and critical environmental conditions

Aircelle optimizes the highly complex nacelle with solver technology from Siemens PLM Software

Leadership

Aircelle, part of the SAFRAN group, is one of the European leaders in design, integration and manufacturing of nacelles for aircraft engines as well as a leading nacelle integrator across markets, from business jets to wide-body airliners like the A380.

Thrust reverser door

Within its simple shape and smoothness, the nacelle, the cover housing that encloses the engine, hides great complexity. It reduces noise and embeds deicing capabilities, all in an aerodynamic shell to minimize drag. Last but not least, it also

contains thrust reversing mechanisms that, together with the aircraft spoilers and landing gear braking system, contribute to the braking process of the aircraft. Indeed, when the aircraft touches the ground, an actuation system inside the nacelle forces a door in the nacelle case, the so-called "thrust reverser door" to gape open; the air that rushes through the engine is thereby forced through this escape path in a contra-thrust direction, generating a force that helps the aircraft come to a halt.

The aircraft's components' design must be robust enough to withstand difficult stress factors and critical environmental conditions (temperature, vibrations, etc.). That is why, during design, engineers at Aircelle carry out specific system and performance analyses on the actuating system using Simcenter™ solutions.

Hydraulic and electrical simulation
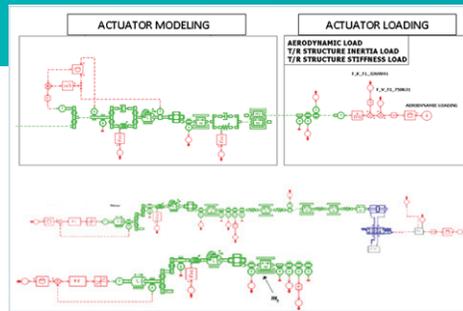
The Nacelle Actuating Systems team at Aircelle employs LMS Imagine.Lab Amesim™ software, part of the Simcenter portfolio from Siemens PLM Software, to simulate actuation architectures and concepts under several working conditions, so as to better respond to customer performance requirements. However, the actuation system's performance is strongly dependent on its integration with the door structure. "This is why it was important for us to have a tool that can easily import finite element modeling

(FEM) door-structure data into the simulated actuation system," explains Rodolphe

Denis, head of Actuation System Mechanics and Simulation on the Nacelle Actuating Systems team at Aircelle.

"The actuation systems we need to simulate are both electrical and hydraulic, and one has to recognize LMS Amesim is really strong in the field of hydraulic system simulation," says Denis. "This convinced us to test out Simcenter solutions, which was when we realized LMS Amesim performed really well in the electrical system simulation domain, too. We soon discovered technical support from Siemens PLM Software is really good."

Denis concludes: "What we appreciate in LMS Amesim are its multi-domain capabilities, the solver's robustness and the simple 'block-by-block' interface that still remains open to customization with LMS Amesim, and to integration of other modeling languages, like Modelica – an aspect that shouldn't be underestimated."

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Rodolphe Denis
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