industry **FOCUS**

Harnessing the power of design optimization in the aerospace industry

Improve aircraft fuel efficiency, structural performance, aerodynamics and many other aspects of aircraft design with ESTECO technology, used by major organizations such as Embraer, Leonardo, Gulfstream, EADS and ONERA.

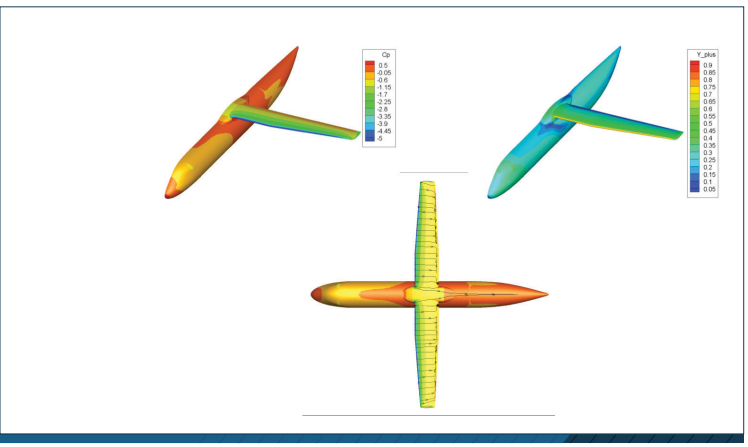
Today's aerospace and defense industry faces many challenges. Due to the projected growth of air traffic, **commercial airplane manufacturers** see a strong need to minimize fuel consumption, emissions and noise, in order to satisfy consumer and regulatory constraints. Since these requirements typically lead to **conflicting design objectives across several domains**, employing Multidisciplinary Design Optimization (MDO) in the design process is crucial.

Military airplane manufacturers on the other hand have an entire different set of challenges to solve, mostly involving aircraft performance, power and thermal management requirements and energy efficiency.

The aerospace industry has traditionally often used conservative design methods with a **siloed approach** between different disciplines. To meet future challenges however, more innovative technologies are needed, and **collaboration is key**, not just among different design departments, but also between OEM and suppliers. **ESTECO technology is designed to do just that.**

State-of-the-art Applications in Aerospace Design

Leonardo chose modeFRONTIER to achieve ambitious goals like lowering aircraft drag and structure weight while enhancing the overall environmental performance measured by fuel consumption and noise generation.



The optimization project at Leonardo also focused on aircraft thermal efficiency: modeFRONTIER automation and integration capabilities enabled the Environmental Control System department to find the best possible configurations for the air nozzle shape in order to reduce pressure loss and noise levels.

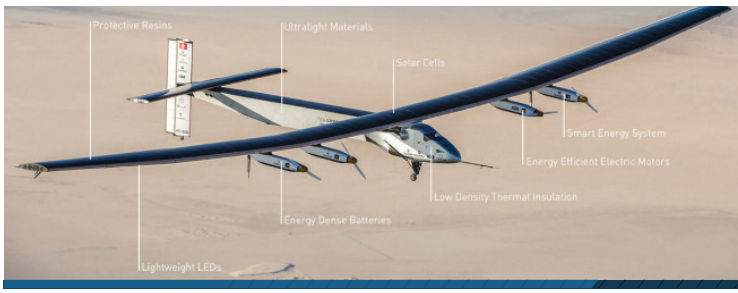
modeFRONTIER has proved to help effectively the design team in identifying feasible solutions and achieving a 2.5% enhancement of aerodynamic performance and a 4% wing weight reduction.

Enrica Marentino - LEONARDO

ESTECO technology has been successfully used by the **German Aerospace Centre (DLR)** since 2004 to solve a wide range of aeronautical problems: from wing drag reduction for the cruise configuration and aerodynamic improvement during take-off, to the design of environmentally compliant small size supersonic aircrafts and the development of optimal noise abatement flight procedures.

Aerodynamic optimizations carried out at **Airbus Defence and Space** using modeFRONTIER aimed at designing a large external aircraft fuel tank that ensured a maximum range and endurance while minimizing cost within a given time frame.

Another outstanding example is the flagship project of the Ecole Polytechnique Fédérale of Lausanne, where modeFRONTIER was used to optimize the design of the solar powered plane **Solar Impulse 2**, which in 2016 completed the first flight around the world with no fuel nor polluting emissions.

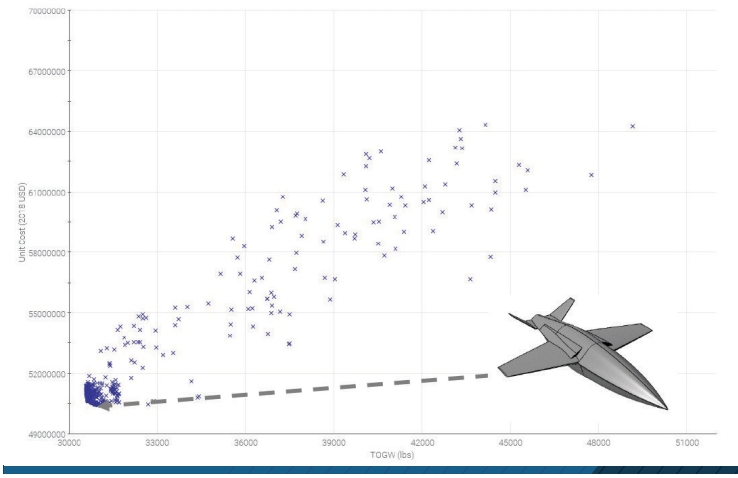


DEMA - Design Manufacturing SpA employed modeFRONTIER to automate the smart analysis of the windshield structural behavior by using a Finite Element model for a new Canadian business jet.

Embraer and **Stanford** engineers benefited from modeFRONTIER capabilities to optimize the early stage design of a 180 passenger single-aisle aircraft for reducing external noise and fuel consumption.

Lockheed Martin and **Air Force Research Laboratory (AFRL)** used VOLTA and modeFRONTIER in the framework of the EXPEDITE (EXPanded MDO for Effectiveness Based DesIgn TEchnologies) program. ESTECO technology was essential in addressing challenges in the modern aircraft design conceptual design process by expanding methodologies and techniques to make informed, data driven design decisions earlier in the process.

These are just a few examples of how our clients have been using ESTECO technology in their multidisciplinary aerospace design projects.



ESTECO Technology for the Aerospace Industry

SUPPORTING DESIGNERS IN INTEGRATING DISCIPLINES AND BALANCING MULTIPLE, OPPOSING OBJECTIVES.

modeFRONTIER supports design teams in building a multidisciplinary design framework, which allows for design space exploration, optimization (direct and RSM based), trade studies and sensitivity analysis, robust design and reliability, visualization and multi-criteria decision making. The proprietary algorithms included in modeFRONTIER deliver reliable methods for identifying the best solutions possible when dealing with complex multidisciplinary aerospace design problems.

AERODYNAMICS

WING DESIGN

AEROELASTIC SYSTEMS

STRUCTURES

FUSELAGE SHAPE

AIRCRAFT STRUCTURAL COMPONENTS

COMPOSITE MATERIALS

METAL SHEET THERMAL FORMING

PROPULSION

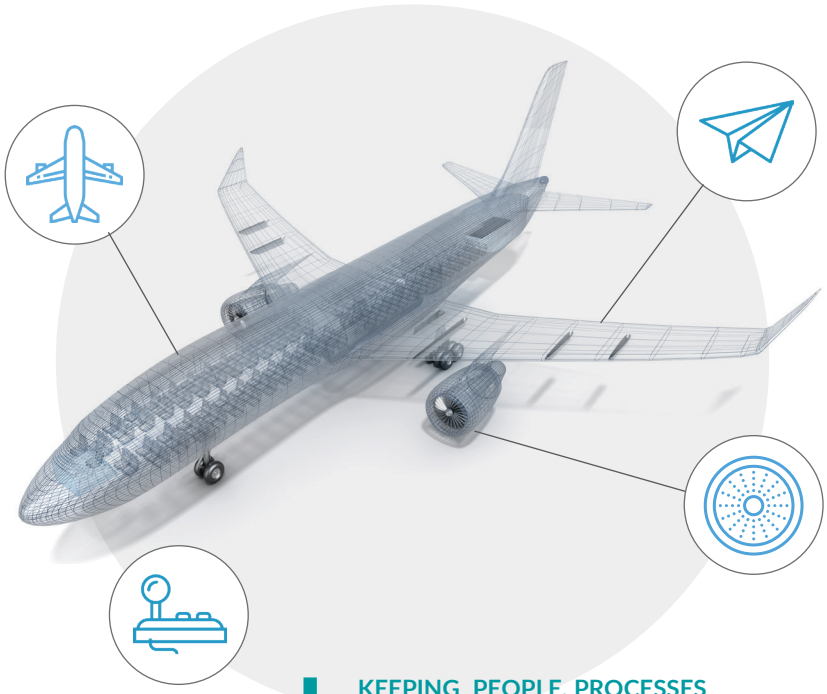
TURBINE BLADES

ACOUSTIC EMISSIONS

FLIGHT CONTROL

MISSION DESIGN

IMPACT DAMAGE PREDICTION



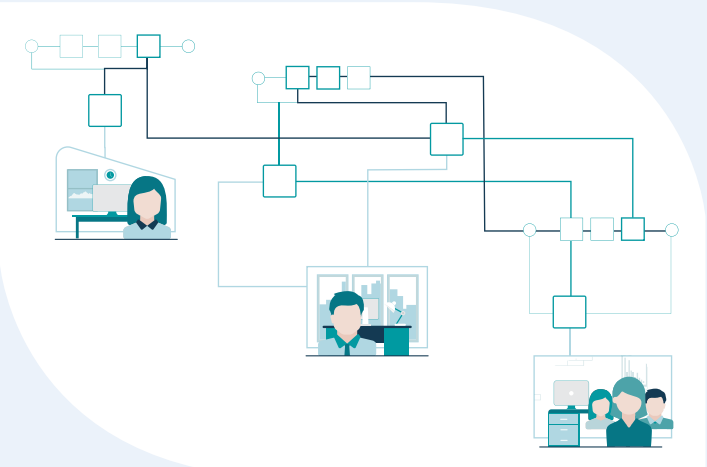
KEEPING PEOPLE, PROCESSES AND TECHNOLOGIES TOGETHER

VOLTA, the web-based design optimization environment, enables engineers to collaborate on the design of all aircraft components and subsystems at once and speed up the decision-making process.

VOLTA

Redefine Product Development

Aircraft design is a complex task involving many disciplines. Aerospace architects make high-level decisions and provide specifications for a concept design, while engineers share domain-specific knowledge and prepare single-discipline models that are combined in the multi-discipline, optimization-driven process to analyze performance.
VOLTA helps manage all cross-functional concurrent design steps by integrating multiple modeling formats. Its service-oriented architecture facilitates the execution, sharing and re-use of the enterprise engineering knowledge.



modeFRONTIER

The complete solution
for process automation and optimization
in the engineering design process

VOLTA

The collaborative web platform
for Simulation Process and Data Management
(SPDM) and design optimization

OPTIMIZATION DRIVEN DESIGN

INTEGRATION AND PROCESS AUTOMATION

ENGINEERING DATA INTELLIGENCE

DISTRIBUTED EXECUTION

SIMULATION DATA MANAGEMENT

ESTECO

EXPLORE DESIGN PERFECTION

Do you want to see the ESTECO technology in action
and find out how you can apply it to your engineering process?

Contact our experts today and request a demo.

ASK FOR A DEMO

ESTECO is an independent software provider, highly specialized in numerical optimization and simulation data management with a sound scientific foundation and a flexible approach to customer needs.

With 20 years' experience, the company supports leading organizations in designing the products of the future, today.

esteco.com