



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 will be key**, not just among different design departments, but also between OEM and suppliers. **ESTECO's technology is designed to do just that.**

modeFRONTIER

The **leading optimization platform** developed by ESTECO enables aerospace engineers to **speed up** the engineering process by **automating design cycles** and rapidly identifying the optimum solutions, based on constraints and performance requirements.

VOLTA

The next generation of ESTECO web-based collaboration solution **breaks down silos** by orchestrating the **high level, simulation-driven workflows** that bring together engineers, designers, discipline experts and managers from different departments and disparate locations.



With more than 15 years' experience, ESTECO supports leading organizations in designing the products of the future, today.

modeFRONTIER and VOLTA are products of ESTECO SpA





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.

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 de 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.

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

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

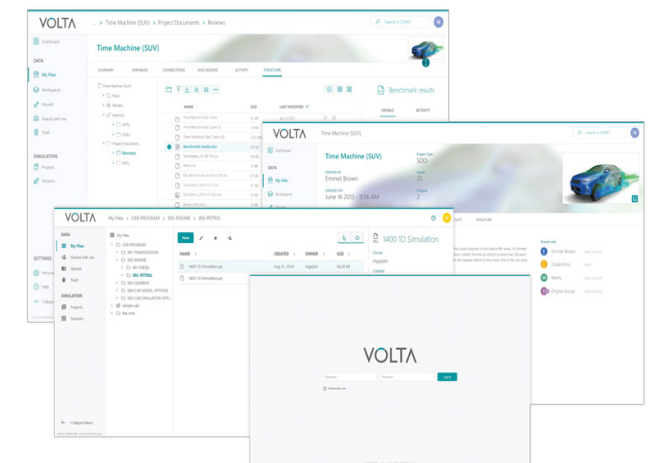
VOLTA, the web-based design optimization environment, enables engineers to collaborate on the design of all aircraft components and subsystems at once and speed up the decision-making process.

VOLTA

ENABLING INNOVATIVE 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.



VOLTA keeps teams on track by allowing them to concurrently compare, validate and decide on design solutions.



Photo @ Leonardo Company Media Center

“ 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
Aerodynamics Engineer
LEONARDO

EXPLORE DESIGN PERFECTION

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ESTECO is an independent technology provider delivering first-class software solutions aimed at perfecting the simulation-driven design process. With more than 15 years' experience, the company supports leading organizations in designing the products of the future, today.

Our smart engineering suite brings enterprise-wide solutions for design optimization, simulation data management and process integration and automation.



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