

MULTIDISCIPLINARY DESIGN OPTIMIZATION

MDO FORMULATION ENGINE PLATFORM

EXPLORE NEW DESIGN CAPABILITIES WITH SMART MDO SOLUTIONS



- Fully reconfigurable MDO processes
- Multiple levels of fidelity simulations
- Handling strongly coupled disciplines
- Methodologies and platform both taking into account industrial constraints and open to research

MARKET & NEEDS

- Reduced product development lead-time:
weekly trade-off (vs months) : optimum of 20 designs in 1-2 months.
- Deep design space exploration before configuration selection:
several design options in parallel to de-risk decision making.
- Adaptable design process for answering market changes:
cheaper and quicker new aircraft and/or new engine option development.

TECHNOLOGICAL OFFERS

A scalable tool-assisted methodology proposed to aircraft designers and architects to quickly assess multi-disciplinary compromises and determine smart global solutions.

- Automatic MDO processes
- MDO platform architectures
- MDO formulations
- Gradient-based and derivative-free optimization algorithms
- Uncertainty management
- Multi-physics simulation

IRT Saint Exupéry

B612 Building - 3 Rue Tarfaya
31405 Toulouse Cedex 4 (France)
Tel. +33 (0) 5 61 00 67 50
Email: contact@irt-saintexupery.com

Arts et Métiers
Campus de Bordeaux-Talence
Esplanade des Arts et Métiers
33405 Talence (France)

Sophia Antipolis Site:
Inria - 2004 route des Lucioles
BP 93 - 06902 Sophia Antipolis
Cedex (france)

@irtSaintEx
www.irt-saintexupery.com

ANNE GAZAIX

Head of MDO competence centre
Email: anne.gazaix@irt-saintexupery.com
Tel. 05 61 00 05 59



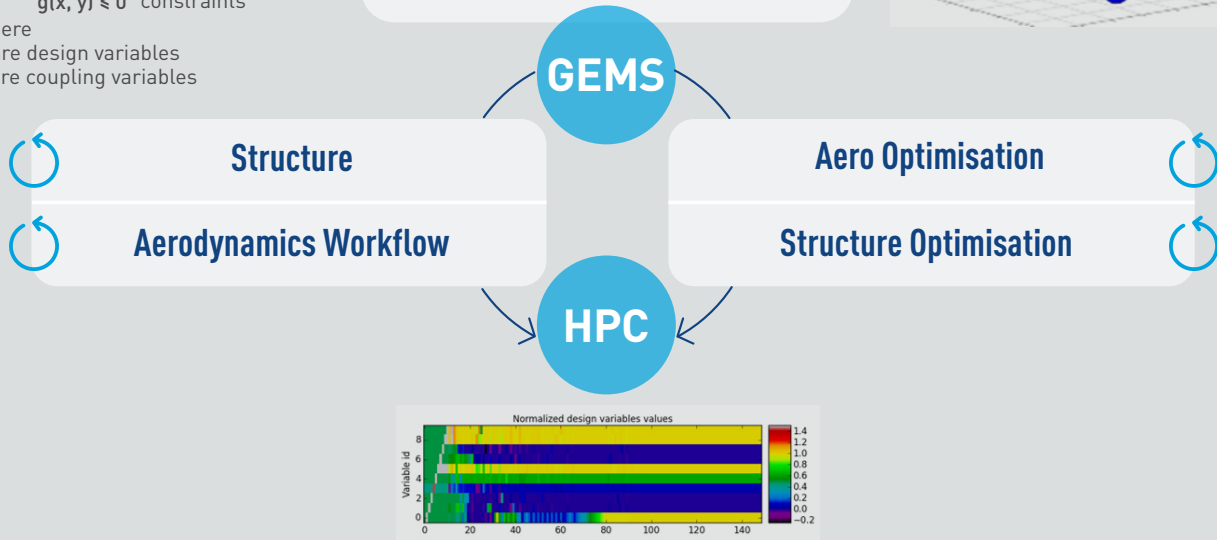
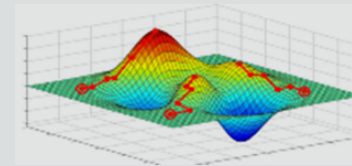
OUR PLATFORM : GENERIC ENGINE FOR MDO SCENARIOS

ORIGINAL DESIGN PROBLEM

TO BE SOLVED :

$\min_{x, y} f(x, y)$ objective function
 $s.t. R(x, y) = 0$ governing equations
 $g(x, y) \leq 0$ constraints
 where
 x are design variables
 y are coupling variables

design objectives, constrain coupling strategies, optimisation algorithms...



GEMS : SOFTWARE PLATFORM FOR INDUSTRIAL AND RESEARCH OPTIMIZATION

For a given set of disciplines, design objective and constraints the MDO formulation defines one or multiple optimization problems.

To define the objective and constraints, sub-processes may be needed, such as MDAs, which can be implemented in a workflow driven paradigm.

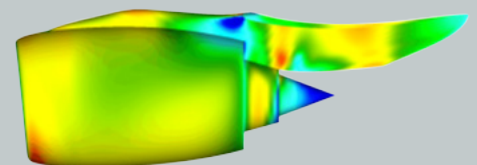
In GEMS, the MDO formulations offer a range of process definitions instead of a predefined execution sequence.

Compared to classical approaches in industry such as processes integrated in workflow engines (iSight, ModelCenter), this enables the full automation of the process creation !

TECHNOLOGICAL TRANSFERS

Industrial Applications

Engine pylon high-fidelity aero-structural optimization



Transfers

GEMS kernel (Generic Engine for MDO Scenarios)

Versions v0.1, v1.0, v1.1 delivered to project members.

IRT Saint Exupéry

B612 Building - 3 Rue Tarfaya
 31405 Toulouse Cedex 4 (France)
 Tel. +33 (0) 5 61 00 67 50
 Email: contact@irt-saintexupery.com

Arts et Métiers
 Campus de Bordeaux-Talence
 Esplanade des Arts et Métiers
 33405 Talence (France)

Sophia Antipolis Site:
 Inria - 2004 route des Lucioles
 BP 93 - 06902 Sophia Antipolis
 Cedex (france)

@irtSaintEx
www.irt-saintexupery.com

ANNE GAZAIX

Head of MDO competence centre
 Email: anne.gazaix@irt-saintexupery.com
 Tel. 05 61 00 05 59