MADELEINE PROJECT CLOSING PRESS RELEASE

On the 30th of November 2021, the consortium partners brought the curtain down on the MADELEINE project, an innovative undertaking focused on the development and validation of multidisciplinary design tools for optimisation.

15 organisations from across Europe cooperated in the project since it began in 2018.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769025.

MADELEINE demonstrated the benefits of adjoint-based multidisciplinary optimisation (MDO) for airframe and engine design in 5 test cases:

- Aero-structure wing design
- Aero-structure-manufacturing fan blade design
- Aero-thermal-manufacturing high-pressure turbine blade design
- Aero-acoustic air inlet and fan blade design
- And aero-acoustic isolated propeller blade design

The adjoint method is a key enabling technology for efficient gradient-based optimisation with a large number of design variables. It can also contribute, outside of the optimisation loop, to identify crucial areas in a design which have the largest impact on performance. In this way, the adjoint approach enables the designer to focus on the most critical area for design optimisation, significantly shortening the design process. At the same time, the presence of excessively large sensitivities in candidate designs can be reduced, leading to more robust designs with smaller real-life performance degradations.

Within MADELEINE, rather than employing cheaper low-fidelity methodologies that have very limited potential to deliver enhanced designs, the consortium deployed efficiently the MDO optimisation process on next-generation High Performance Computing (HPC) infrastructure.

In this context, MADELEINE achieved two particular goals:

- Reduced the barriers to set-up an efficient MDO process by developing re-usable modules and standardising the interfaces between the disciplines;
- Shortened the simulation run-time by exploiting heterogeneous HPC architectures through optimised libraries and efficient job orchestration.

So much has been achieved through the delivery of this innovative project, which has not only benefited the participants, but the wider MDO community. The MADELEINE developments proved the effectiveness of the multidisciplinary design tools and methods for optimisation. We invite you to watch the final video of MADELEINE for more details on the achievements (https://www.madeleine-project.eu/).

Meanwhile, the Coordinator of MADELEINE, Michaël Méheut from the French Aerospace Lab (ONERA) would like to convey his congratulations and thanks to all the participants for their dedication and commitment throughout this project.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769025.

MADELEINE in a nutshell

Project acronym: MADELEINE

Project title: Multidisciplinary ADjoint-based Enablers for LargE-scale Industrial desigN in aEronautics

Project duration: 42 months (June 2018 – November 2021)

Coordinator: The French Aerospace Lab (ONERA)

EU contribution: 5.9M EUR

EU Grant Agreement N°: 769025

Project public website: https://www.madeleine-project.eu/

Project Linkedin company page: https://www.linkedin.com/company/madeleine-project/

Project public profile on Cordis: https://cordis.europa.eu/project/id/769025

Consortium: 15 European partners

- FRENCH AEROSPACE LAB (ONERA)
- ROLLS-ROYCE
- AIRBUS OPERATIONS
- ESI GROUP
- DASSAULT AVIATION
- OPTIMAD
- GERMAN AEROSPACE CENTER (DLR)
- NETHERLANDS AEROSPACE CENTRE (NLR)
- NATIONAL TECHNICAL UNIVERSITY OF ATHENS
- UNIVERSTY OF SHEFFIELD
- UNIVERSITY OF CAGLIARI
- TECHNICAL UNIVERSITY OF MUNICH
- IRT ANTOINE DE SAINT EXUPERY
- UNIVERSITY OF SOUTHAMPTON
- L-UP

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769025.