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STS-02

EU-Funded Research on Advanced Computational Methods for Fluid Dynamics and Aero-Acoustics

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Session Abstract

Keywords: *Computational fluid dynamics, computational aeroacoustics, multidisciplinary optimisation, high-fidelity numerical methods, aircraft flight physics*

Europe's Vision for Aviation 'Flightpath 2020' sets ambitious goals for the aviation sector. Reducing environmental impact, as well as maintaining and extending industrial leadership will continue to be key drivers for aviation. To this end, streamlined design and manufacturing processes are required, in order to achieve reduced aircraft design costs and time.

Fast and accurate modelling of flight physics can significantly contribute to reducing the aircraft design-cycle, obviating the need for costly prototyping and testing during development stages. More importantly, advanced computational methods are key enablers for the development and design of future disruptive configurations.

In the high-level international setting of the WCCM-ECCOMAS Virtual Congress 2021, the European Commission and its Innovation and Networks Executive Agency (INEA) are organising a dedicated session on advanced numerical methods for flight-physics modelling.

The objectives of the STS are:

1. To present an overview of current EU-funded research on computational methods for flight-physics modelling and a snapshot of progress at European and international levels;
2. To identify gaps between needs and the current state of the art, and gather recommendations on specific topics, which should be addressed in the short, medium, and long term, including aspects such as:
   - Progress on research topics considered in the ACARE Strategic Research & Innovation Agenda (e.g. Challenges 1, 2, and 3);
   - high-fidelity computational fluid dynamics (CFD) capable of modelling turbulent and transitional flows, and the role of artificial intelligence and high-performance computing;
   - high-fidelity computational aeroacoustics (CAA) techniques for prediction of aerodynamic noise (e.g. engine, airframe, and interaction noise);
   - multi-disciplinary optimisation (MDO) methodologies, which can be integrated into the aircraft design-cycle to drastically reduce design cost and time;
3. To bring together relevant EU and international aviation research and innovation stakeholders.

List of session papers and authors:

On the Interaction between Fuel Sloshing and Flexible Aircraft Wings - Experiment Scalability
(EU-Project SLOWD)
Francesco Gambioli, Airbus Operations Ltd, Bristol, United Kingdom, francesco.gambioli@airbus.com , Leo M. González, UPM, Madrid, Spain, Francesco Saltari, Univ. La Sapienza, Rome, Italy, Michael Wright, University of Cape Town, South Africa, Philipp Behruzi, Ariane Group, Bremen, Germany, J. Martinez, UPM, Madrid, Spain, Lucian Constantin, Univ. of Bristol, U.K.

Aerodynamic Performance Increase for a High-lift Two-element Configuration of a morphing A3xx Wing by Means of Numerical Simulation
(EU-Project SMS)
Abderahmane Marouf, Nikolaos Simiriotis, Yannick Bmegaptche-Tekap, IMFT, Toulouse, France, Yannick Hoarau, Univ. of Strasbourg, France, Jean-François Rouchon, LAPLACE, Toulouse, France, G. Harran, Marianna Braza, IMFT, Toulouse, France, marianna.braza@imft.fr

Direct Comparison of Radial Basis Functions and Artificial Neural Networks for the Dynamic Metamodelling in Multidisciplinary Optimization Frameworks
Francesco Centracchio, Monica Rossetti and Umberto Iemma, Universita Roma Tre, Rome, Italy, umberto.iemma@uniroma3.it