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Computational Experiment in Aeroacoustics and Associated Aerodynamics for Aerospace Industries

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Session Abstract

Keywords: *Turbulent flow, scale-resolving simulation, unsteady loads, far-field acoustics, airframe noise, aircrafts, helicopter, aviation engines, space vehicles*

The goal of this STS is to assess the state-of-the-art of computational experiment in aeroacoustics and associated aerodynamics as a research tool used in engineering design of modern aircrafts including airframes, helicopters, space vehicles and aviation engines. We focus on reducing the noise generated by aircrafts since nowadays it is a mandatory requirement, to protect the environment. We treat the associated aerodynamics as dynamics of unsteady turbulent flows over airframes since it underlies the formation of distributed acoustic sources.

At the STS, we discuss several CFD/CAA predictions oriented towards different aerospace industries. The simulations of relevant turbulent flows using the advanced RANS-LES scale-resolving methods are of particular interest. Among the issues under consideration, there are unsteady flow characteristics, aerodynamic and acoustic loads, near-field and far-field acoustics.

We pay a special attention to the validation of the developed numerical algorithms and the CFD/CAA codes providing computational experiments. The set-ups of experimental cases and validation results are also within the scope.

The STS follows the ideas of regular international workshops “Computational Experiment in Aeroacoustics and associated Aerodynamics” http://ceaa-w.imamod.ru/ and, in particular, the Sixth forum taking place in September 2020.

Figure 1: *Instantaneous flow fields: dual-stream jet (left), acoustic radiation by 30P30N HLD configuration (middle), vortical flow generated by helicopter rotor at hover mode (right).*

List of paper titles and authors:

An Acoustic/Viscous Splitting Method with Feedback for Efficient Direct Noise Computation of Subsonic Flow
Roland Ewert, roland.ewert@dlr.de, and K. Kreuzinger,
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Simulation of Helmholtz Resonator Using Immersed Boundary Method
Xin Zhang, aexzhang@ust.hk, and Siyang Zhong,
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Adaptive Metamodelling Techniques for Acoustics and Aerodynamics
Umberto Iemma, u.iemma@uniroma3.it, Lorenzo Burghignoli, Francesco Centracchio,
Giorgio Palma, and Monica Rossetti,
Roma Tre University, Rome, Italy

Two Validation Cases for Essentially Unsteady Turbulent Flows
Alexey Duben and Tatiana Kozubskaya, tatiana.kozubskaya@gmail.com,
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Analysis and Modelling of the Flow and Far-Field Noise of a Turbulent Subsonic Jet from Experimental and Numerical Data
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Numerical Simulation of Ducted Fan Aerodynamics and Aeroacoustics
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