**STS 13**

# Integration challenges of new disruptive and innovative aircraft design solutions: A multi-fidelity paradigm for computationally efficient prediction of complex physics

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## Session Abstract

**Key Words:** *Distributed propulsion, boundary layer ingestion, flow laminarity, morphing concepts, load alleviation, active flow control*

Commercial air traffic has shown a continuous growth ever since, despite major conflicts with global impact and volatility of oil prices. The amount of travel by air is forecasted to double by 2030 with more than six billion passengers. This shows that significant efforts are required to cope with challenges like airport congestion and capacity limitations, climate change and community noise. The next generation aircraft has to be much more environmentally friendly, burn less fuel with fewer emissions, and will be less noisy. To achieve a step change, new technologies like distributed propulsion, boundary layer ingestion, flow laminarity, morphing concepts and load alleviation through active flow control have to be considered. They all bring not only new aircraft integration challenges, but also pose major challenges to predictive capabilities.

Existing methods for aeronautical engineering analysis used for conceptual design optimization are biased towards conventional 'wing-tube' aircraft configurations. The subject STS aims at presenting the integration of new capabilities into Multi-Disciplinary Optimization (MDO) frameworks with treatment of aerodynamic, structural and acoustics analysis methods, uncertainty analysis and multi-fidelity approaches. The STS will deal with development of design frameworks providing flexibility to accommodate insertion of high fidelity knowledge of physics (dealing with new disruptive and innovative aircraft design solutions) without jeopardizing the efficiency of the numerical processes.

**Paper titles and speakers:**

**Disciplinary Implications of a System Architecting Approach to Collaborative Aircraft Design**
Jan-Niclas Walther, Pier D. Ciampa, Björn Nagel, DLR - German Aerospace Center, Hamburg, Germany, Jan-Niclas.Walther@dlr.de

**An Overview of ONERA Research at Aircraft Level towards Greener Aviation**
Peter Schmollgruber, ONERA, Peter.Schmollgruber@onera.fr, Eric Coustols, ONERA, Toulouse, France, Eric.Coustols@onera.fr

**Multidisciplinary Modelling, Analysis and Optimisation for Aircraft and System Level Design and Validation**
Johan Kos, Jos Vankan, NLR - Royal Netherlands Aerospace Center, Amsterdam, The Netherlands, jos.vankan@nlr.nl

**Automated approach for aerodynamic design**
Jesus Matesanz Garcia, Cranfield University, Cranfield, United Kingdom, Jesus.Matesanz-Garcia@cranfield.ac.uk