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STS 17

Smart Morphing and Sensing for the Wings of the Future

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Session Abstract

Keywords: *Smart Morphing and Sensing, wing design, high-fidelity numerical simulations, aerodynamic performance*

This session aims at presenting main results from the European Research project N° 723402 “Smart Morphing and Sensing for Aeronautical Configurations” within Horizon 2020 [1] concerning the design disruptive wing configurations able to considerably increase the aerodynamic performances comparing conventional designs. This is achieved thanks to novel smart actuators electrically actuated and embedded under the “skin” of the lifting structure and new generation of sensors based on Bragg grating. Therefore, optimal deformations and vibrations are produced in multiple time and length scales, able to manipulate the surrounding turbulence structure in order to increase lift and simultaneously decrease drag and aerodynamic noise in all flight phases, take-off, landing and cruise.

Results from High-Fidelity numerical simulations accompanied by experiments with the morphing wing configurations of A3xx type are discussed regarding the increase of the aerodynamic performances.

References:

[1] www.smartwing.org/SMS/EU

The session will include six papers in the following topics:

Numerical Simulation of a Large-Scale High-Lift Morphing Wing of A320 Type, Based on Electro-Mechanical Actuators and Shape Memory Alloys
Abderahmane Marouf, Alexandre Giraud, Bertrand Nogarede, Yannick Bmegaptche-Tekap, Mateus Carvalho, Dominique Harribey, Clément Nadal, Jean-François Rouchon, Marianna Braza, abderahmane.marouf@imft.fr, alexandre.giraud@novatem-sas.com

Numerical Simulation of the Aerodynamic Performance of an A320 Type Morphing Wing in the Transonic Regime
Jean-Baptiste Tô, Pawel Flaszynski, Richard Szwaba, Piotr Doerffer, Nikolaos Simiriotis, Abderahmane Marouf, Yannick Hoarau, Jean-François Rouchon, Marianna Braza
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Electroactive Morphing Effects in the Aerodynamic Performance of a Cambered A320 Wing by Means of Numerical Simulation, TRPIV and Controller Design
Mateus Carvalho, Cédric Raibaudo, Carsten Döll, Philippe Mouyon, Clément Nadal, Dominique Harribey, Jean-François Rouchon, Marianna Braza, mateus.carvalho@imft.fr, Cedric.Raibaudo@onera.fr

Numerical Simulation of a Morphing A320 Wing in Subsonic Speeds and Sensitivity Evaluation
Nikolaos Simiriotis, Abderahmane Marouf, Konstantinos Diakakis, George Tzabiras, Felix Kramer, Frank Thiele, Yannick Hoarau, Marianna Braza, nikolaos.simiriotis@imft.fr

Aerodynamic Performance Increase of a Morphing A320 Wing with High-Lift Flap by Means of Hi-Fi CFD Approaches
Abderahmane Marouf, Nikolaos Simiriotis, Jean-Baptiste Tô, Dominique Charbonnier, Jan Vos, Yannick Hoarau, Marianna Braza, abderahmane.marouf@imft.fr

Numerical Simulation of Multi-Point Sensing Compared with Dynamic Pressure Measurements through Bragg Grating
Amaury Kitouni, Jean-Baptiste Paris, Vincent Lamour, Abderahmane Marouf, Nikolaos Simiriotis, Yannick Bmegaptche, Marianna Braza, amaurykitouni@cementys.com