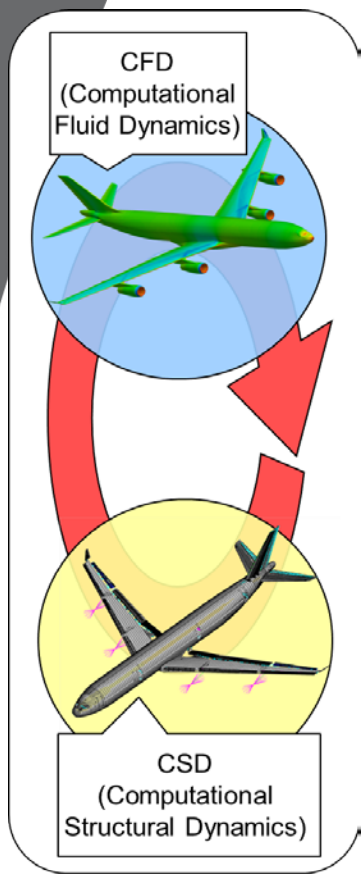

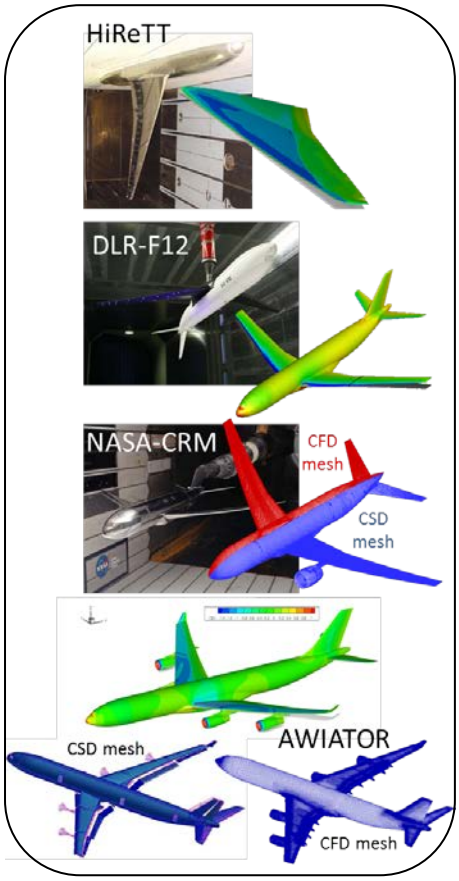

Master Thesis / Bachelor Thesis / Project Thesis / Internship

Validation of a FlowSimulator-Based CFD-CSD Coupling Method based on Static Aeroelastic Experiments

Background:

Civil aircraft are highly flexible objects that require a multi-disciplinary design process that allows taking into account the existing mutual interaction between aerodynamic loads and structural deformations already in early stages of design.

In the light of this, the FlowSimulator (FS) simulation environment is being jointly developed by Airbus, Cassidian, Onera, DLR, and universities as their core tool for parallel high-performance multi-disciplinary analyses. Among many other things, the FS includes interfaces to DLR's flow solver TAU and MSC's structural solver NASTRAN, as well as the required algorithms for aerodynamic load and structural deformation interpolation between usually non-matching meshes at the coupling interface between structure and fluid. Since the FS-based CFD-CSD coupling process is still ongoing development, its accompanying validation against aeroelastic experiments, flight tests or against already existing and well-validated coupling chains is absolutely required.

Work content:

In this work you will apply a FS-based CFD-CSD coupling chain to several test cases that have been investigated in aeroelastic wind tunnel experiments or flight tests. (Some of the test cases are shown in the image on the left.) You will evaluate your simulation results, compare them with the recorded wind tunnel data and assess the agreement between numerical predictions and measurements. You will identify potential weak points of the developed FS coupling chain, suggest improvements and assist in implementing them. Depending on type and expected extent of the work (master thesis, bachelor thesis or internship) the number of test cases for which simulations are to be conducted can be reduced or increased. Depending on your preferences the emphasis of the work can be put either on the analyses of the simulations or on the implementation of improvements of the coupling chain.

Requirements:

Valid candidates should have or are willing to fastly acquire the following skills

- Profound understanding of aerodynamics and structural dynamics
- Programming skills in Python, (C++)
- Experience with Unix/Linux OS

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November 14th, 2012