Semesterarbeit / Master Thesis

Institute of Helicopter Technology

Coupling and Mapping approach of a DLR Free-Wake Aerodynamic Code to an inhouse Structural Solver

(Simulation/Programming)

Keywords: Fluid-Structure Interaction, Programming, Helicopter Design

Background:

In the design of helicopters, the considerations of dynamic loads and vibrations are of great importance. This also affects the helicopter tail, which is dynamically excited by the Rotor Wake in forward-flight. Unfortunately, the decisive loads are difficult to predict in early design. As a result, problems with the tail boom are often only discovered in the flight test phase on the prototype, which results in expensive changes and lengthy delays in the development process, as the previous design processes from TUM Partners showed.
The objectives of the Institute of Helicopter Technology fit into the aeromechanical helicopter design and specifically in the risk minimization of T-tail arrangements and new configurations by building aeroelastic computational tools on a mid-fidelity level. The primary goal is to build a strongly coupled, aeroelastic simulation chain to calculate interaction loads in early design and safeguard the design against aeroelastic instability phenomena (flutter) on aerodynamic surfaces (tails, wings) under the influence of rotor wake.

Goal: The thesis aims to enable a data (Force and Displacement) exchange between the two different solvers. For aerodynamic loadings, the Free-Wake Code UPM by DLR will be used and coupled bi-directional to the FEM solver Nastran or an in-house Code. Therefore, a mapping approach must be determined and implemented in the already existing uni-directional (Force to the structural solver) Tool-Chain. Afterward, the data transfer must be extended to a bi-directional simulation (Displacement to the aerodynamic solver).

About us: We are looking for an independent and highly motivated student in his Master's who wants to improve his knowledge in helicopter-related design, programming, and fluid-structure Interaction. This thesis offers an excellent opportunity to participate in applied and industry-related research. When interested, please feel free to contact us in person. We are happy to discuss all possibilities! We also offer a great range of thesis and Hiwi opportunities at the moment.

Skills: High motivation and the ability to independently familiarize with new topics. Experience in Python or other programming languages is mandatory.

Tools: Nastran(FEM)/Hypermesh/Python
Language: English/German
Start: 10/11.2021 or later
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