June 2024

Chair of Aerodynamics and Fluid Mechanics
TUM School of Engineering and Design
Technical University of Munich

Aerodynamic Investigation of Propeller Wing Interaction for eVTOL Aircraft

Student Thesis at eRC-System GmbH: Aerodynamics and Thermodynamics Team

We are looking for a motivated student to carry out a student thesis project on the topic of "Aerodynamic Investigation of Propeller Wing Interaction for eVTOL Aircraft". The aim of the project is to investigate the aerodynamic effects of propellers interacting with lift generating surfaces. In addition to the effects on the main wing, we want to focus on high-lift devices located downstream of the propeller.

The successful candidate will be responsible for conducting CFD (Computational Fluid Dynamics) simulations, post-processing and discussing of the results. The simulations will mainly be based on a reduced fidelity implementation for modeling propeller flows (actuator disk/line) and interaction with lifting surfaces. Fully-resolved/high-fidelity simulation data will be generated for validation and interpretation.

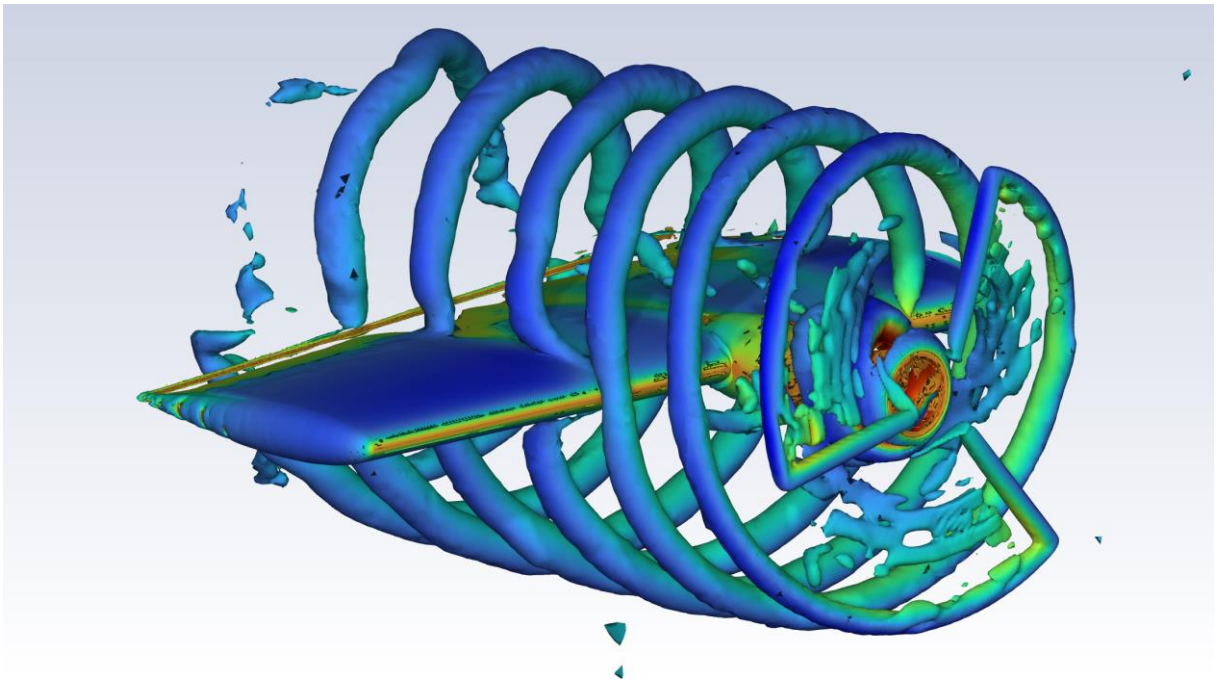

Figure 1: Example of Actuator Line Propeller Modeling on NASA W/T case.

Requirements:

- Student in a relevant field such as aerospace engineering, mechanical engineering, or physics.
- Familiarity with CFD and CAD software (preferably Ansys Fluent and Siemens NX).
- Basic knowledge of aerodynamics and structural mechanics.
- Ability to work independently and collaborate with a team.
- Good written and verbal communication skills in english or german.
- The study project is expected to take approximately 6 months and will be carried out at eRC-System GmbH in the aerodynamics team. The successful candidate will receive guidance and support from experienced researchers.

Work packages:

1. Literature review and familiarization
   Conduct a review of existing literature on propeller wing interaction and effects on high-lift devices for eVTOL aircraft. Familiarize with CFD simulations in Ansys Fluent and on the application of an actuator disk implementation.
2. Application Case 1: Data generation for NASA W/T Study
   Based on results in the literature, generate a data set and validate the numerical findings.
3. Application Case 2: Data generation for eVTOL wing
   Transfer the knowledge of application case 1 towards a more realistic eVTOL wing case. Analyze (and optimize) the interaction for enhanced aerodynamics on the wing and high-lift devices.
4. Analysis and interpretation
   Analyze and interpret the numerical data using the results of the CFD simulations and findings in the literature.
5. Report writing
   Write a detailed report documenting the research findings, including the CFD simulation procedures, data analysis, and result interpretation.

If you are interested in this opportunity, please send your application including a CV, a brief statement of motivation, and a transcript of records to Dr.-Ing. Florian Heckmeier (heckmeier@erc-system.com).