Chair of Test and Simulation for Gas Turbines
TUM School of Engineering and Design
Department of Aerospace and Geodesy
Technical University of Munich

Bachelor Thesis

Investigation of the Influence of Turbulence and Transition Modelling on Flow in Rotor-Stator-Cavities in Aircraft Engine Secondary Air Systems

Thesis Description

Secondary air systems in modern aircraft engines are used for cooling, sealing, and thermal management of rotating components. Rotor–stator cavities are a key element within these systems and exhibit complex flow behavior influenced by rotation, pressure gradients, and turbulence–transition effects.

The aim of this bachelor thesis is to study the impact of different turbulence and transition models on the predicted flow field in a rotor–stator cavity using CFD. Simulations will be conducted for different operating conditions and the results will be compared with respect to flow structure, velocity distributions in particular. The work seeks to evaluate the suitability of common modeling approaches and to improve the understanding of secondary air flows in rotating cavities.

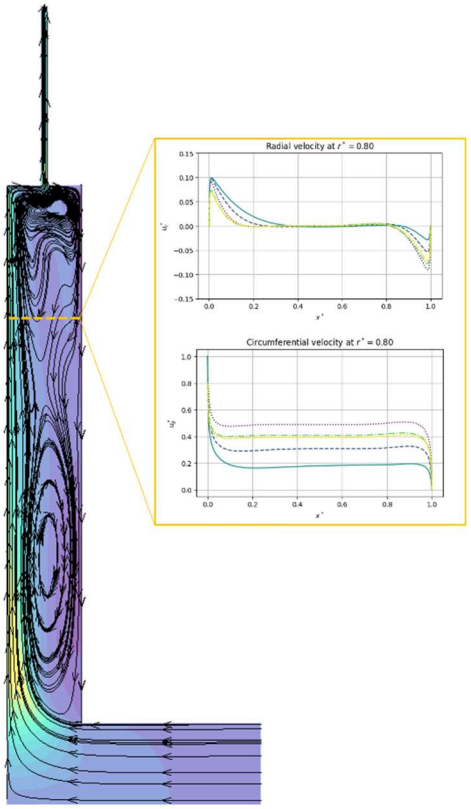

Figure 1: *Normalized velocity profiles in a rotor-stator cavity for different throughflow rates*

Main Tasks

- Literature Review on the influence of turbulence and laminar-turbulent transition on the flow in rotor-stator cavities and on numerical modelling approaches for these effects
- Performance of a grid convergence study
- Numerical investigation of the influence of turbulence and transition models, geometric features and boundary conditions on the flow within a rotor-stator cavity
- Comparison of CFD results to experimental results from literature
- Discussion and documentation of simulation results

Requirements

- Studying Aerospace Engineering, Mechanical Engineering, Energy Engineering or comparable
- Fundamental knowledge of fluid mechanics
- First experience in computational fluid dynamics (preferably)
- Proposed start date: 01.05.2026 (maybe 01.04.2026)

If you are interested in the above Bachelor-Thesis, please send your meaningful application containing CV and transcript of records to

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