Master Thesis - “Investigation of particle extraction in an intermediate compressor duct – CFD study and inhouse tool integration” (30 credits/20 weeks)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 33 manufacturing locations in 12 countries, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

Project Background

Aero engines operate in a wide range of environmental conditions and may ingest particles such as water, sand, dust, and ice during both flight and ground operation. Managing these particles is important for maintaining engine performance and protecting downstream engine components.

One of the systems involved in particle management is the bleed system located in the **Intermediate Compressor Duct (ICD)** between the intermediate-pressure and high-pressure compressors. In addition to its primary air-management functions, the bleed system can remove a portion of ingested particles from the main gas path before they reach the high-pressure compressor, combustor, and turbine.

The effectiveness of particle extraction depends strongly on the design of the bleed offtake. Improved designs have the potential to increase particle removal while maintaining good aerodynamic performance and acceptable pressure losses.

Assignment Description

The primary objective of this thesis is to investigate the design space of ICD bleed offtakes and develop a methodology for evaluating and generating improved bleed geometries.

The work will include CFD-based assessment of multiple bleed offtake concepts using both single-phase and multiphase simulations. The designs will be evaluated with respect to particle extraction efficiency, pressure loss within the ICD, and overall aerodynamic performance.

A second objective is to further develop an existing in-house geometry-generation tool to support efficient creation and evaluation of bleed offtake concepts.

Key activities and deliverables include:

- Review of ICD flow physics, particle extraction mechanisms, and existing bleed concepts
- Definition of design parameters, performance metrics, and candidate bleed offtake concepts
- Development and enhancement of an in-house geometry-generation tool

- Single-phase and multiphase CFD analyses of candidate designs
- Comparison of design concepts and development of a documented methodology for bleed offtake design and evaluation
- Final thesis report and presentation of results

Qualifications

We are looking for a Master's student with an interest in:

- Fluid mechanics and aerodynamics
- Computational Fluid Dynamics (CFD)
- Turbomachinery and aero engines
- Programming and engineering tool development

Experience with CFD software, multiphase flow simulations, Python, or geometry-generation tools is considered beneficial but is not required.

The ideal candidate is analytical, self-driven, and motivated to work on a combination of engineering analysis and software/tool development.

Apply by

Send your resume and cover letter to Blanka Tonsic, blanka.tonsic@gknaerospace.com.

Last date for application: 15th of November.

Location: Trollhättan, Sweden
Duration: 20 weeks (30 ECTS)
Start date: According to agreement