Assistant Professorship of Sustainable Future Mobility
TUM School of Engineering and Design
Technical University of Munich

Design of a Simulated Turbine Inlet for the Investigation of Flame Dynamics in a Sequential H_2 Aero Engine Combustor (RQL)

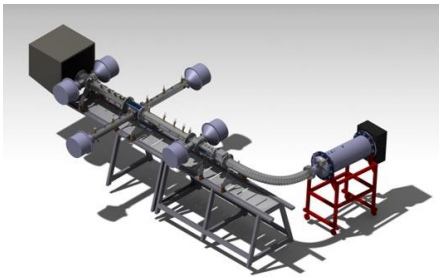

Figure 1. RQL Test Rig at TUM

Type: Semester Thesis / Master's Thesis
Content: Analytical/numerical
Possible start: now

Job Description

The "Flightpath 2050" report documents Europe's vision for aviation to reduce pollutant emissions of NO_x drastically.
Rich-Quench-Lean combustors (RQL) are chamber designs with lower NO_x emissions and are currently in operation with kerosene. The fuel change from kerosene to hydrogen in RQL combustion chambers is considered a step closer to decarbonization. With this change, combustion instabilities, such as the Growl/Rumble phenomenon, might occur. This phenomenon describes a low-frequency noise that can damage the engines. Entropy and equivalence ratio waves are suspected as possible causes for this phenomenon.

This student thesis is the first step toward investigating the interaction of entropy waves and combustion instabilities in an H_2-RQL combustion chamber. Entropy waves are converted into sound at the turbine inlet. Therefore, a nozzle to simulate the turbine inlet at the test rig needs to be designed. A first draft from analytical models shall be further developed and investigated in CFD simulations.

Your Tasks

- Development of a Converging Nozzle
- Investigation of the design with analytical and empirical models
- Flow and Thermal design using CFD and FEM
- Design Components in CATIA for production.

Our Requirements

- Basic knowledge of fluid mechanics and thermodynamics
- Ability to work independently
- Experience with CAD-Tools
- Optional: Experience with ANSYS Fluent

Our Offer

- Gain insight to the fascinating research field of combustion instabilities/thermoacoustics
- Working on highly relevant topics within an international research team

Contact

If you have any questions or are interested in working with our team, please send your application to Angel Brito Gadeschi (angel.brito-gadeschi@tum.de).

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