Master Thesis - “Simulation of failure – a correlation study comparing numerical simulation methods and failure criteria to experimental burst tests” (30 credits/20 weeks – 1 student)

Project Background

GKN Aerospace Sweden develops and manufactures turbine modules for the Ariane launcher engines. The structural load of these components during a launcher lift-off is extreme regarding as well the internal loads such as temperature, pressure and rotational speeds as the external loads of acceleration and vehicle surrounding turbulences. The design of the components to fulfill launcher missions under these extreme loads comprise analytical verification towards a handful of failure modes whereof one is dimensioning against static overload. Physical burst tests are commonly an inherent ingredient in the design process, thus the analysis methods addressing burst are continuously being compared to test results. It is also a strong desire to track - and implement in the GKN design practices - the research advances made worldwide in academia and by software enhancements. It is acknowledged that, in recent years, ever more sophisticated tools for analyzing stress conditions under complex structural loading are available in terms of material plasticity models and theories involving influences of material defects.

Overpressure/burst test of a turbine manifold and overspeed/burst test of a turbine rotor designed for the new Prometheus demonstrator has been performed in 2019. Data from these tests contributes an excellent opportunity for review/revision of the analysis/design methods for failure prediction.

Assignment Description

The task is outlined as examination of recent overload and burst tests of pressure vessel type and rotor type components by application of alternative analysis tools, the most promising material models and trying alternative failure criteria. The aim is to increase the understanding of the ultimate failure mechanisms and to establish more precise methods for designing future rotors and manifold containments. We also encourage the student to bring forward hers/his ideas on the matter.

Qualifications

Mechanical/physical engineering with interest in strength of materials (on macro- and/or microstructural level) and numerical simulations by FEM. Commitment to perform modeling-theory correlation and literature survey of state-of-the-art methods for the suggested theme is appreciated.

Apply by

Send your resume and cover letter to Per Ekedahl, per.ekedahl@gknaerospace.com

Last date for application: 2019-12-01. Interviews will be held continuously and the position could be filled prior to the last application date.