Master Thesis - “Development of a Margin-Based Method for Robust Design Optimization” (30 credits/20 weeks – 1-2 students)

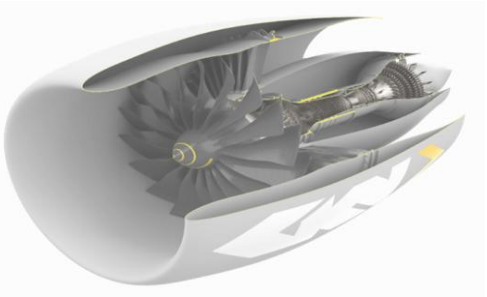
About us

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

Future generations of jet engines will place increasingly stringent requirements on component performance, weight and robustness. Aerospace components must maintain their required performance despite variations in geometry, material properties, manufacturing processes and operating conditions. These variations are commonly addressed through safety factors, tolerances and design margins. However, margins are not always explicitly linked to the uncertainties considered during design or systematically incorporated into optimization and verification.

A previous thesis project investigated the potential of combining probabilistic analysis, sensitivity analysis and optimization within a margin-based design workflow. The study provided preliminary results and established useful groundwork but did not develop a complete and generally applicable method. This thesis will build on that work to develop and evaluate a new margin-based robust design method. The method will investigate how uncertainty and robustness requirements can be translated into margins and how these margins can guide design-space definition, optimization and verification. It will be developed and evaluated using a representative aerospace component with interacting geometric, material, manufacturing and loading variations.



Assignment Description

The following activities have been identified for carrying out the project:

- Conduct a literature review on robust design methods, margin-based design and relevant aerospace applications.
- Review the previous thesis work and learn relevant robust simulation techniques using ANSYS and optiSLang.
- Set up and model a representative aerospace component for robustness simulations.
- Develop and implement a margin-based robust design approach, building on the preliminary work from the previous thesis.
- Apply the approach in a case study and compare the results with a suitable baseline, considering robustness, functionality and manufacturability.
- Assess the usefulness and computational effort of the approach and propose practical recommendations for its further development and use in aerospace component design.

The thesis work will be supported by experts in structural analysis, design optimization, manufacturing, and software tools.

Qualifications

One or two final-year master's students in mechanical engineering, engineering physics or a related field, with an interest in structural mechanics, simulation, optimization and statistics.

Apply by

Send your resume and cover letter to soren.knuts@gknaerospace.com.

Last date for application: 2026-11-30 (interviews will be held continuously and the position could be filled prior to the last application date).

Start Date: January 2027 Thesis Duration: 20 Weeks (i.e. finished by June 2027)