

## Master Thesis - “Effect of Tool-Part Interaction in Composite Manufacturing Simulations and DoE Analysis ” (30 ECTS credits/20 weeks – 1 student)

### Background

Carbon fibre reinforced polymers (CFRP) are increasingly used in the aerospace industry for their lightweight attributes and high specific stiffness and strength. Due to the inherently anisotropic nature of composite materials, manufacturing of large and complex shapes are a challenge and it is not uncommon to have manufacturing induced shape distortions and residual stress developing within the manufactured parts. Besides material anisotropy, factors like tool-part interaction also play a significant role in the development of these aforementioned effects. Thus, it is vital within the aerospace industry that these manufacturing induced defects be predicted so as to avoid expensive trial and error based manufacturing methods. Finite Element (FE) based simulation methods and material models developed for the purpose can be used to predict the outcomes of the manufacturing methods in a “virtual” manufacturing environment. This master thesis offers the possibility to develop process simulation methodologies and validation using manufactured components together with a sensitivity analysis using Design of Experiments (DoE) methods.

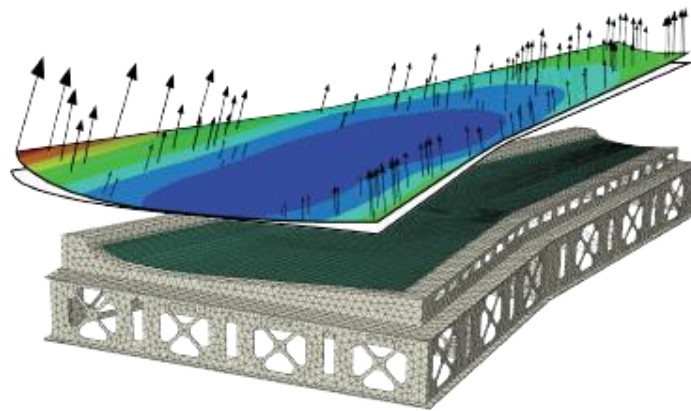


Figure 1: Residual stress induced shape distortions in aerospace components

### Assignment Description

- Literature review on process simulation methods for residual stress analysis.
- Investigation of suitable material properties.
- Planning and performing of simulations and modelling using the FE code LS-Dyna and user material subroutines.
- Validation of simulation results with measurements made on manufactured components.
- Perform sensitivity analysis using DoE methods on simulation results.
- Documentation and presentation of results.

### Qualifications

Students in the final year of their M.Sc. studies in the field of Mechanical Engineering, Applied Mechanics and Materials Science. Previous experience with simulation tools such as LS-Dyna and ANSYS is desirable. A basic course in composite mechanics and/or manufacturing is beneficial. We are looking for a student with a strong interest in FE simulations and composite manufacturing.

### Apply by

Send your resume and cover letter to Sibin Saseendran [sibin.saseendran@gknaerospace.com](mailto:sibin.saseendran@gknaerospace.com), +46 700873926. Interviews will be held continuously.