Master Thesis, spring 2022 - "Development of strength models for adhesive hybrid joints" (30 ECTS credits/20 weeks – 1 student)

Project Background

Carbon fibre reinforced polymers (CFRP) are increasingly used in the aerospace industry for their high specific strength and stiffness. When CFRP parts are joined to form a larger component, adhesive joining has some advantages over bolts, in particular further weight reduction. Currently, a hybrid CFRP/metal full scale demonstrator is under development at GKN Aerospace in Trollhättan. Its structural performance will be evaluated in a full scale test in the end of 2022. One area of technology development within this project is related to strength modelling of the hybrid joints between metal and composite. Accurate material data input is essential for such activities. Therefore, in-house testing will be performed of these adhesive joints on coupon and feature level. Models will then be developed and calibrated on the coupon level and validated on feature level. This master thesis offers the possibility to develop advanced numerical models with close connection to physical reality.
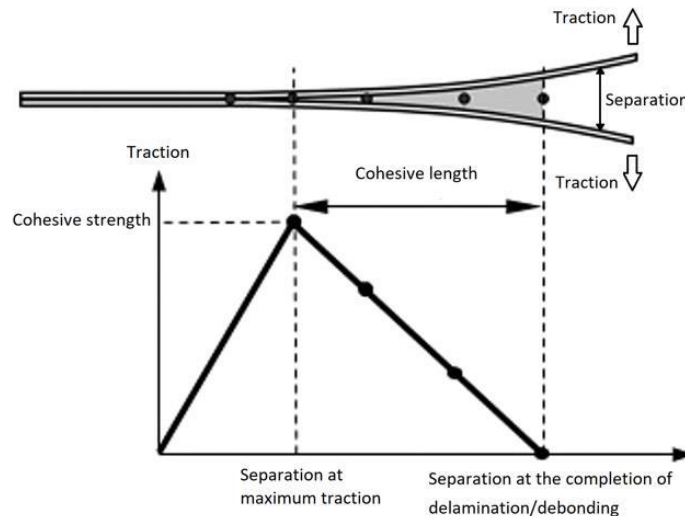

Figure 1: Characteristic parameters of a bilinear cohesive law related to a mode 1 test.

Assignment Description

- Familiarize with the topic.
- Actively participate in planning and conducting mode 1(DCB test, ASTM D5528), mode 2 (ENF test, ASTM D7905) and mixed mode (MMB test, ASTM D6671) fracture toughness testing.
- Model the above stated tests with the finite element (FE) solver LS-DYNA and a cohesive zone modelling (CZM) technique.
- Actively participate in design of the feature test based on global FE simulations of the full component.
- Validate developed CZM.

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 Ansys and LS-DYNA is desirable. A basic course in composite mechanics is a prerequisite. We are looking for a student with a strong interest in numerical modelling and composite mechanics.

Apply by

Send your resume and cover letter to Dennis Wilhelmsson dennis.wilhelmsson@gknaerospace.com, +46 700873174. Interviews will be held continuously.