

OFFER FOR INTERNSHIP

Degree of Master of Science in Mechanical Engineering

Title

Simplified stress analysis of graded adhesively bonded lap joints

Context

Adhesive bonding is one of the most efficient joining technologies in terms of strength-to-mass ratio. This technology is then suitable for most of lightweight structures. On the contrary to the discrete load transfer of the mechanical fastening, the load transfer between structural components is continuous all along the overlap. Nevertheless, a classical structural bonded joint exhibits large stress gradients at both overlaps. The load transfer takes then place on very restricted lengths, due to the relative deformability of the adhesive layer wrt the adherends. Graded adhesive joints are adhesively bonded joints, the mechanical properties of which vary along the overlap. The idea is then to homogenize the adhesive stress distribution as well as the load transfer along the overlap while retaining the ability to participate in the strength of the joint. This work will be performed in coordination with Prof Lucas da Silva from the Faculty of Engineering of the University of Porto (FEUP).

Objective and expected works

The main objective is to develop a dedicated simplified stress analysis of graded adhesively bonded lap joints, at the lab specimen scale, within the framework of macro-element approach developed at the Institut Clément Ader (ICA), in order to predict the stress and load transfer distribution. The consideration of damage evolution adhesive constitutive laws will help in the strength prediction. Comparisons with numerical predictions and experimental results from FEUP will be performed to assess the simplified stress analysis.

Requested profile

This offer aims at fulfilling the partial requirements of the degree of Master of Science in Mechanical Engineering. The expected skills are:

- to control the Strength of Materials
- to know the Fundamentals of Fracture Mechanics and Damage Mechanics
- to know the Fundamentals of the Finite Element (FE) Method

The scientific software MATLAB and SCILAB will be used (beginners accepted). The FE code SAMCEF and/or ABAQUS could be used (beginners accepted).

Laboratory : ICA CNRS UMR 5312 / ISAE-SUPAERO (in Toulouse, France)

Duration : 6 months in 2018

Gratification : around 554 € neat per month

Contact : motivated applications must be sent to eric.paroissien@isae-supaero.fr