

Research project offer

Location : ISAE SUPAERO, Toulouse, France

Department : DMSM

Research group : “Joining” transversal axis [MS2M and MSC]

Supervisor : Minh Nhat TO, Éric PAROISSIEN, Frédéric LACHAUD, Valérie NASSIET

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OFFER DESCRIPTION

Title: Numerical modelling and simulation of adhesively bonded and hybrid (bolted/bonded) joints using rubber-like adhesives

Proposed duration and period: 6/7 months ASAP

Context

On aircraft, the mechanical fastening is the joining technology which is the most used. In particular, an interfacial layer of sealant is mainly applied within the bolted joints, to ensure the sealing of the cabin for example. A sealant is a rubber-like material exhibiting a complex mechanical behavior depending on time and temperature. In order to reduce the number of fasteners, an idea is to transfer a part of the load by the sealant layer. To transfer a part of the load, the sealant has to be functionalized to provide a sufficient stiffness and adherence along the time.

The present topic is included in a project developed in collaboration between Institut Clément Ader (ICA, Toulouse), Laboratoire de Génie des Procédés (LGP, Tarbes) and Centre Inter-universitaire de Recherche et d'Ingénierie des Matériaux (CIRIMAT, Toulouse). In particular the present topic aims at supporting the numerical works developed by the PhD student.

Objectives and work

Two types of specimen will be considered: three point bending specimen and double-lap bonded or bonded/bolted joints. Several types of loading will be considered: static, fatigue, creeping / recovering. The numerical tests will be performed by using analytical model, semi-analytical models, based on the macro-element modelling (developed at ICA since 2004) as well as Finite Element Method.

The general objective is to assess the fidelity level of numerical tests w.r.t. the experimental ones, as a function of model types. This assessment will be performed through the various loading conditions as well as the cohesion of the sealant and adherence at the interface between the sealant and the plates.

Based on the works of the PhD student as well as on the work done within the present topic, the writing of a scientific paper would be considered.

Possibility to continue with a PhD (Yes/No) : TBD

REQUIRED APPLICANT PROFILE AND SKILLS

Study level
(tick possible choices)

- Undergraduate students (3rd or 4th year)
- Master students (1st or 2nd year)
- PhD students

<p>Required profile and skills</p>	<p>This offer is suitable to students in last year of MSc, MEng in Solids Mechanics, Structures Mechanics.</p> <p>The expected specific skills are :</p> <ul style="list-style-type: none"> • Fundamentals of strength of materials • Basics on the FE method
<p>Other useful information</p>	<p>Feel free to take contact</p> <p>Gratification (around 550 € per month depending on worked days)</p>