

Subject Title: Parachute and ram-air wing modelling: effect of fabric porosity

Speciality: aeronautics/space transportation energy
 mechanics/metallurgy engineering SSI other :

Kind of Work: R&D theoretical work / numerical modelling
 R&D theoretical work and experimental work
 R&D experimental work
 Other

Length: **5 to 6 months starting from September 2010**

Person responsible of the project Campus ENSICA Campus SUPAERO

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Lab: Department of Mechanics of Structures and Materials (DMSM)

Person co-responsible of the project Campus ENSICA Other

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Lab: DGA Aeronautical Systems - Airmobility Division- simulation

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Confidentiality: no yes kind of confidentiality: industrial

Number of students : 1 students students

Subject

Subject: In order to simulate the inflation of a parachute canopy and to analyse the steady state descent of a parachute or a ram-air wing, FSI (Fluid Structure Interaction) techniques are used using the explicit Finite Element Analysis (FEA) tool LS-DYNA. The static and dynamic fabric problems are important points for these applications. In particular, the material porosity modeling has a considerable impact upon the simulations. In this study, the mechanical behaviour study of fabric structures is applied to parachutes but is widely of concern for other textile and inflatable structures applications. The internship will start with an analysis of the state of the art. Fabrics samples could be tested at the textile laboratory of DGA

Aeronautical Systems in Toulouse. The airmobility division of this center is specialized in airdrop and airtransport problems. A material modeling improvement could be proposed, simulated using LS Dyna software on existing parachute models and compared with flight test data.

Pre-requisites or Bibliography:

The applicant must have a previous experience in Finite Element computation and theory, and must have already used a computation code (LS-DYNA, SAMCEF, ANSYS, RADIOSS, NASTRAN, other...).

The applicant will be given a bibliography support, and some references to consult books available at the documentation centre.

Precise objectives fixed to the student:

The first aim of the internship is to evaluate the ability and the limits of the current models. Results of the simulations will be compared with experimental results lead during the internship or already available in the Department or at DGA.

Implemented ressources:

- Methodology: the applicant will follow a reduced class on FSI coupling in LS-DYNA usage and will be helped all the internship long, to build up the models, run the simulations and analyse the results.
- Facilities: testing resources, numerical resources: software (LS-DYNA), computers will be lead at the disposal of the applicant with some help.
- Human: engineers, technicians, and the associate professor in charge of this subject will help the applicant if needed.

Special aspects: -

This work is part of research collaboration between the DGA Aeronautical Systems-Airmobility Division-simulation and the Department of Mechanics of Structures and Materials of ISAE.