

Proposition de sujet de thèse / *PhD thesis proposal* - 12/12/08

DIRECTEUR de THESE / *Thesis director* : M. Castaings (Professor, University Bordeaux 1, Talence, France)

CO-ENCADRANT / *Co-supervisor* : P. Cawley (Professor, Imperial College, London, GB)

E-mail : m.castaings@imp.u-bordeaux1.fr / p.cawley@imperial.ac.uk

LABORATOIRES D'ACCUEIL / *Laboratories* : *Laboratoire de Mécanique Physique*, UMR CNRS 5469, University Bordeaux 1 and *Non-Destructive Testing Laboratory*, Imperial College, London.

TELEPHONE / *Phone* : +33 (0)5 4000 2463 (M. Castaings)

TITRE / *Title* : Suivi de santé de structures appliqué à des composites de grandes dimensions.
Structural Health Monitoring (SHM) of large composite material structures.

DESCRIPTIF / *Description*:

The use of ultrasonic waves for structural health monitoring of composite structures has many applications in Aeronautics and Aerospace. In these high-technology industries, any defects such as, for example, delaminations, disbonds or micro-cracking may cause severe problems. To avoid this, permanently attached transducers are proposed to detect the appearance of defects during the in-service life of critical elements. Various techniques have been proposed so far, but many improvements need to be achieved before they are appropriate for in-situ use. For instance, the stability of signals monitored during the structure life is of major importance, especially for composite materials, which are subject to ageing when exposed to typical operational environments e.g. humidity, high temperature or mechanical loads. Indeed, changes in material properties due to ageing may cause changes in ultrasonic signals that could be larger than the ultrasonic response of a delamination or crack-like defect. It is therefore crucial to carefully investigate the possible ultrasonic propagation changes for various composite materials exposed to different severe environments, and to compare these to ultrasonic signals coming from defects to be detected. This is the purpose of the PhD proposed here, with both numerical and experimental approaches, including signal processing, finite element modelling,... This work will be co-supervised by Prof. P. Cawley from Imperial College of London, GB and Prof. M. Castaings from University Bordeaux 1, France. Half-time in each laboratory is planned. Very good and strongly motivated candidates are welcome to contact either co-supervisor. Good levels in Sciences and in English are required, and knowledge about wave propagation in solids will be a positive point. Any preselected candidate will be interviewed.

FINANCEMENT / *Financing* : Cofinancement (50% from University Bordeaux 1 and 50% from Imperial College)

DATES / *Dates* : The thesis can start whenever between January and October 2009, and should last 3 years.