Avis de Soutenance

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Soutiendra publiquement ses travaux de thèse intitulés

Detection of weak bonds in composite materials using symmetrical laser impacts.

dirigés par Monsieur Laurent BERTHE

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Salle : Amphi A

Composition du jury proposé

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Mots-clés : Composite,Choc laser,joints faibles,,

Résumé :

The limitation of carbon dioxide emissions is one of today's greatest challenges for the aerospace industry. Weight reduction is seen as one of the most promising lead for that matter and a first step has already been made toward this goal through the use of composite materials. Lighter and more mechanically efficient than their metallic counterparts, their use helped optimising the weight of several aircrafts such as the

A350 XWB or A380. Nevertheless, if the material has changed, the assembly process did not evolve along with it. Hence, techniques such as riveting or bolting previously used for metallic structure are still used for composite parts assembly, but they are not suitable anymore for this type of material (creation of local constraints, corrosion …). Instead, bonding composite parts using adhesives would be a better solution and could help further reducing the overall weight of the aircraft. However, with this new assembly method also come new problems, such as weak bonding. A weak bond is characterised by a loss of mechanical adherence that cannot be spotted using conventional Non-Destructive Tests (NDTs) such as ultrasound scanning. Since the industry currently lacks these NDTs to assess the mechanical integrity of bonded structures, the use of adhesives for composite assembly is limited.

The LAser Shock Adhesion Test (LASAT), has already demonstrated its capacity to evaluate bonded composite assembly but also proved to be limited in terms of assembly configuration and weak bond detection capability. This work focuses on one of its optimisations, the Symmetrical LASAT (S-LASAT). Both experimental and numerical studies are realised to better understand the prerequisites of the technique as well as the level of mastery required for the technology to best detect weak bonds within Carbon Fibre Reinforce Polymer (CFRP) structures. This manuscript concludes with a one of a kind experimental campaign realised on real bonded CFRP aircraft parts.