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Development of a shock wave adhesion test for composite bonds by laser pulsed and mechanical impacts ROMAIN ECAULT, MICHEL BOUSTIE, FABIENNE TOUCHARD, Institut PPRIME, MICHEL ARRIGONI, ENSTA - Bretagne, LAURENT BERTHE, PIMM, CNRS COLLABORATION —
Evaluating the bonding quality of composite material is becoming one of the main challenges faced by aeronautic industries. This work aims the development of a technique using shock wave, which would enable to quantify the bonding mechanical quality. Laser shock experiments were carried out. This technique enables high tensile stress generation in the thickness of composite bond without any mechanical contact. The resulting damage has been quantified using different method such as confocal microscopy, ultrasound and cross section observation. The discrimination between a correct bond and a weak bond was possible thanks to these experiments. Nevertheless, laser sources are not well adapted for optimization of such a test since it has often fixed parameters. That is why mechanical impacts bonded composites were also performed in this work. By changing the thickness of aluminum projectiles, the tensile stresses generated by the shock wave propagation were moved toward the composite/bond interface. The observations made prove that the optimization of the technique is possible. The key parameters for the development of a bonding test using shock wave have been identified.

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