

Multi-domain NDT on full-scale composite components

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In-service damage on full-scale composite components can be caused by, for example erosion, hail damage, Foreign Object Damage (FOD) and lightning. Regardless of their origin, impacts on aircraft must be inspected to ensure conformity with manufacturer requirements. Manual visual inspection and tapping techniques are still being used to approximate impacts maximum depth, dimensions and position, although they prove to be highly dependent on the inspector skills. These inspections are tedious extensive operations and have a tremendous impact on the maintenance capacity in time and money. This research project aims to automate and improve the speed and quality of (sub) surface damage detection on full-scale composite components and simultaneously reduce the recurring costs involved drastically. This will be achieved by using a multi-domain NDT approach using 3D optical scanning techniques, Optical Lock-in Thermography and Optical Laser Shearography. Each optical technique is focused for detecting a certain defect type; 3D optical for detecting surface dents/pitting, thermography for detecting delaminations in solid laminates and shearography for detecting skin-to-core disbonds in a sandwich structure. Recently, NLR is working towards a 3D oriented mesh environment of an object, enhanced with thermography and shearography data, providing sub-surface damage information. Simultaneous performance of the 3 inspection methods on full-scale composite components and merged individual test results in a 3D data set are the ingredients making the NDT inspections fit for the future.