THU.3.C.1

Author: Julien Walter – Centre technologique en aérospatial, Canada

Co-Authors: Julien Walter, Louis-Daniel Théroux, Loïc Séguin-Charbonneau, Laurent Scheed, Benoît Masson

TITLE: AUTOMATIC ANALYSIS OF ULTRASONIC DATA FOR LARGE AND COMPLEX CFRP AIRCRAFT COMPONENTS

ABSTRACTS

Automated analysis is increasingly used in the aerospace industry to efficiently process the tremendous amount of data generated by automated or robotized UT inspections. Major time savings and reliability improvements can be expected from these automated approaches. However, their application on large and complex CFRP structures in a context of production still faces numerous challenges: defect detection in steep thickness variations, in the complex geometric features' vicinity or close to the interfaces; analysis of 3D parts with 2D tools and results interpretation. This paper describes the deployment of an automated analysis method on various CFRP parts of the aft fuselage of Airbus A220 aircraft. The method was designed to overcome the obstacles encountered in the automated analysis of such large and complex structures. A program based on the commercial software ULTIS was complemented by a novel defect detection algorithm developed by the Centre technologique en aérospatial. An initial program using ULTIS native tools was created and optimized to achieve a fully automated process (thickness measurement, porosity assessment, defect detection, report generation) on the entire part without operator intervention. Different new preprocessing tools were developed, such as C-scan projection optimizer that enables the computing of optimal projection directions in order to minimize defects distortion during the 3D to 2D transition.

A novel defect detection algorithm capable of automatically extracting relevant indications from a collection of pulse-echo signals was also developed. This algorithm is adaptive and takes local thickness or signal variations into account. The overall automated method was tested on CFRP reference panels containing a variety of artificial defects (various sizes, depths, materials) as well as on real complex structures of the Airbus A220: aft pressure bulkhead and fuselage skins. A probability of detection approach was conducted and detection performance was discussed, including number of false positives and analysis time. Results suggest that the developed method meets the detection requirements, even for challenging defects and areas, while significantly reducing the analysis time.

KEYWORDS

Ultrasonics | Automated data analysis | CFRP composites | Aerospace |