European Aeronautics Science Network

DUETCOM
DUal-**E**nergy and advanced **T**omographic techniques for **COM**posites

Abstract

The aim of the project is to investigate **innovative digital X-Ray technologies** for the inspection of light weight components used in aerospace industry, which are essential for green aircraft development. The application range includes advanced light-weight metallic, fibre composite materials (CFRP and GFRP) and metal laminate, and considers parts of various size and shape. The increasing shape complexity of these components – due to the fact that structures integration is easier with composites - makes sometimes the control by conventional NDT tool insufficient or problematic. The idea of the project is to develop and validate new investigation methods, based on advanced X-ray technologies, and optimized for the examination of aeronautic parts.

This will be explored through the development of innovative X-ray techniques, using **digital radiography**. Different X-ray imaging promising techniques will be investigated, around two main aspects: **advanced tomographic techniques**, and **dual-energy approaches**. Theses techniques allow to get volumetric and material specific information, thus to control the internal or subsurface structures of the part. Optimization of the techniques will be considered for different materials and geometries. This technological advance will take benefit of the new opportunities and performances offered by digital detector arrays, eventually used in a dual-energy or spectroscopic mode.

The aim is to develop a technology basis which could allow a reliable examination of complex shape aeronautic parts made of composite materials. The project will provide new tools and methodologies for such inspection with high rate and at low cost. The outcome of the project will consist in the definition of inspection protocols, the specification of convenient hardware, corresponding tools for calibration steps, and innovative tools for data processing, including reconstruction algorithms, dual-energy processing, and 3D fast visualization.

For targeted components, an experimental full scale set-up will assure the validation and the demonstration of exploitation potential. This demonstrator will not be interfaced to a continuous production line, but will allow an industrial validation on various true defective parts. By the combination of different innovative X-ray techniques, and the optimization for aeronautical parts, this demonstrator will illustrate a breakthrough compared to existing inspection systems.

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