Novel Infrared Thermography Approach for Rapid Assessment of Damage in Aerospace Structures

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ABSTRACT

This work deals with the development of a prototype infrared sensor and infrared thermography (IRT) approach for nondestructive testing of aerospace materials and components. Thermography offers noncontact, wide area detection of subsurface defects, and can be used as an alternative or complement to conventional inspection technologies. The novel approach is based on the combination of Pulsed Phase Thermography (PPT) and Lock-in Thermography (LT). The technique provides with initial fast qualitative information of defects by the PPT technique such as location, approximate dimensions and depth of the defect, as well as an indication of the frequency range over which the LT technique would subsequently be applied for obtaining accurate quantitative characterization of the damage. The new IR approach enables fast inspection as well as qualitative and quantitative results such as the size, type and depth of defects.

Keywords: InfraRed Thermography (IRT), Lock-in Thermography (LT), Pulsed Phase Thermography (PPT)Damage assessment, aerospace applications,

INTRODUCTION

In aircraft maintenance, inspection and quantification of damage by non-destructive testing (NDT) techniques, is currently the most reliable and economical way towards discovering otherwise invisible defects in the airframe structure, assessing the extent of repair work and extending the operational lifetime of these structures. Federal Administration Aviation (FAA) and European Aviation Safety Agency (EASA) regulations require aerospace industries to inspect, by reliable and efficient NDT techniques, all aircraft components for possible defects and flaws, before and during their service life at regular intervals. While aircraft maintenance expenditure typically accounts for 20% of the total operating costs, ineffective inspection can hinder the ability to plan, schedule and can reduce labour productivity by at least 50%,[1,2].

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