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Interested parties, companies, institutes and applicants to join the AERONEWS user-group should address the coordinator.
More information on :
www.kuleuven-kortrijk.be/AERONEWS

HEALTH MONITORING OF AIRCRAFT

BY NONLINEAR ELASTIC WAVE SPECTROSCOPY

AERONEWS

EC SIXTH FRAMEWORK PROGRAMME
PRIORITY 4: AERONAUTICS AND SPACE
SPECIFIC TARGETED RESEARCH: FP6-502927

Coordinator:

Katholieke Universiteit Leuven
Prof. VAN DEN ABEELE Koen

Interdisciplinary Research Center
Nonlinear Ultrasonic Spectroscopy Laboratory
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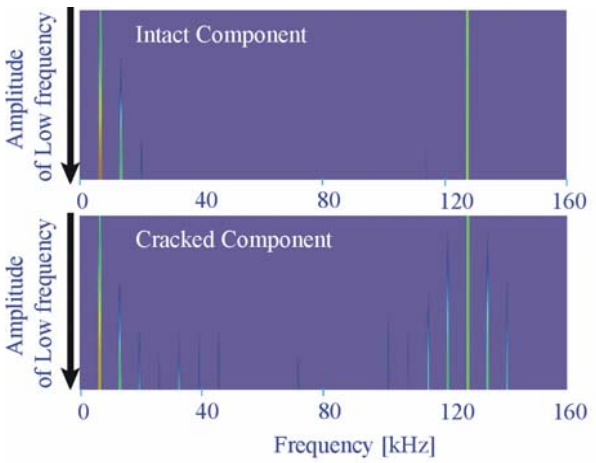
HEALTH MONITORING OF AIRCRAFT BY NONLINEAR ELASTIC WAVE SPECTROSCOPY

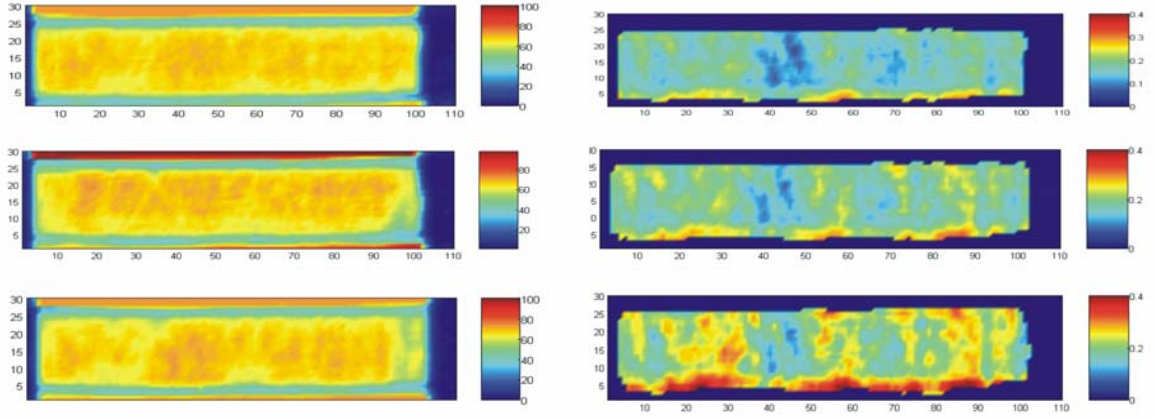
Nonlinear Elastic Wave Spectroscopy (NEWS) and related acoustic and ultrasonic methods comprise a new class of innovative non-destructive techniques that provide extreme sensitivity in detecting and imaging incipient damage in the form of microcracks or delaminations, weakening of adhesive bonds, thermal and chemical damage, etc. The sensitivity and applicability of nonlinear methods to damage are superior to those obtained by currently used technologies. NEWS methods are in various stages of development and have not yet been applied to aircraft health monitoring. The project's goal is to examine, confirm and exploit the successful results of these techniques, using fundamental materials research on fatigue loading, and to apply them to the particular field of aeronautics. The project includes progressive microdamage and fatigue monitoring of aircraft components and structures, sensor engineering, development of NEWS-based imaging methods, and fundamental research on the modelling of meso-scale damage phenomena. We aim to investigate the relation of these studies to the macroscopic behaviour of progressively fatiguing materials, and formulate the design of a unique system for microdamage inspection, including remote control and communication tools, and the completion of a full-scale model validation. The long-term goal of the project (5-10 years) is to monitor while in operation, the integrity of airframes and aircraft engines, and helicopter rotor systems. The development of this innovative NEWS-based technology and its engineering applications to aeronautics, will result in an enhanced, reliable and integrated measurement system and protocol for microcrack diagnostics of aircraft components and structures. We expect this development to result in a significant increase in aircraft and passenger safety while contributing to a substantial cost savings through a decrease in maintenance and operating times.



Intensity plots of intermodulation response spectra of intact and cracked components as a result of low and high frequency excitation (K. Van Den Abeele, P.A. Johnson, A. Sutin)

Classical Ultrasonic C-scan Imaging Technique

Harmonic Imaging



Traditional Amplitude C-scans (left side) and Harmonic Imaging (right side) of a CFRP sample after 0, 15000 and 17000 fatigue cycles (Christophe Mattei and Pierre Marty (CSM), Progress in QNDE, 2002)