

Stress Measurement System

As part of NASA's Aircraft Structural Integrity program (see page 68), Langley Research Center teamed with Stress Photonics Inc., Madison, Wisconsin to develop an infrared-based stress measurement system for use in nondestructive evaluation of materials and structures. Stress Photonics has commercialized the technology and incorporated it into the DeltaTherm 1000™ system.

Both the NASA system, intended for inspection of aircraft structures to detect cracks and disbonds, and the commercial unit make use of the fact that all materials change temperature when compressed or expanded. In solid materials, this effect is known as thermoelasticity. Thermoelectric Stress Analysis (TSA) employs special infrared detectors and signal processing equipment to image temperature changes that correspond to the dynamic stresses in a structure; modern TSA systems can measure temperature changes as small as one-thousandth of a degree Centigrade.

Stress Photonics' DeltaTherm 1000 is an infrared differential thermography system for TSA and thermal nondestructive evaluation. The system is used to verify mathematical models of a design, demonstrate the effects of loadings on the design, measure stress concentrations and stress intensity factors in load-bearing components, and survey a structure for potential problem sites. It combines digital signal processing technology with a special infrared camera to provide instantaneous thermal images and live TSA (differential) images. Data collected from the infrared camera is processed at 434 frames a second; processed images are sent to a computer and/or to a video monitor for immediate display.

™DeltaTherm 1000 is a trademark of Stress Photonics Inc.



The DeltaTherm 1000 stress measurement system combines digital signal processing technology with an infrared camera.



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