

NASA Facts



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New Inspection System Uses Heat to Detect Flaws

Recent advances in thermal-imaging technology have spawned new techniques that provide quantitative information about flaws in aircraft structures. The Thermal Bond Inspection System (TBIS) detects defects in, and determines the thickness of, metal and composite structures by using thermal energy and an infrared imaging system.

NASA Langley Research Center's thermal imaging inspection technique was developed to detect potential flaws in aircraft structures. The technique involves applying a heat to the outer surface of an aircraft. Images of fatigue cracking, bond integrity and material loss due to corrosion are generated from measurements of the surface temperature variations.

Benefits

This system is completely non-invasive and non-contacting, responds rapidly, can image a variety of different materials, and can be used to examine large surface areas of varying shapes. The TBIS can detect defects in bonded aluminum/composite structures and in laminated surfaces.

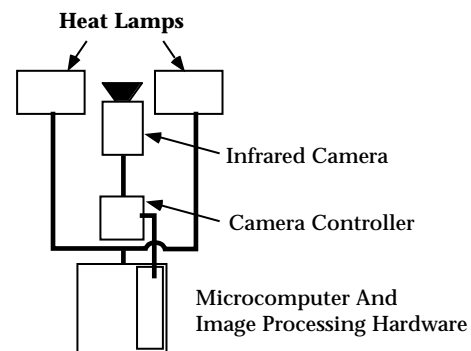
About the Technology

The figure shows a block diagram of a typical TBIS setup. During an inspection, heat is applied to the surface of a structure and the surface temperature is measured using an infrared camera and image processor. Temperature differentials indicate regions with differing heat capacities. In disbanded or corroded regions, the heat flow is reduced. This reduction is reflected in a temperature increase over the corroded region due to reduction in thickness relative to the uncorroded regions.

The infrared imager converts the thermal response from the surface of the sample to a video signal. A microcomputer synchronizes the data

acquisition with the application of heat. The images that result from this synchronization technique provide quantitative information.

Aircraft Fuselage



This diagram indicates the setup of the Thermal Bond Imaging Inspection System. The infrared imager converts the heat response from the surface of the sample to a video signal.

Options for Commercialization

A procedure for heat inspection has been developed and tested extensively. A patent has been issued and Langley is seeking licensees.