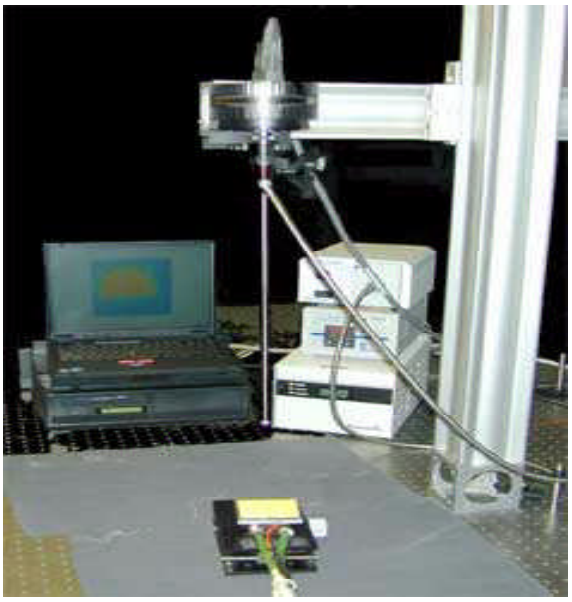
Borescope Imaging System Developed for Luminescent Paint Measurements



Borescope imaging system configured for making intensity-based pressure-sensitive paint measurements.

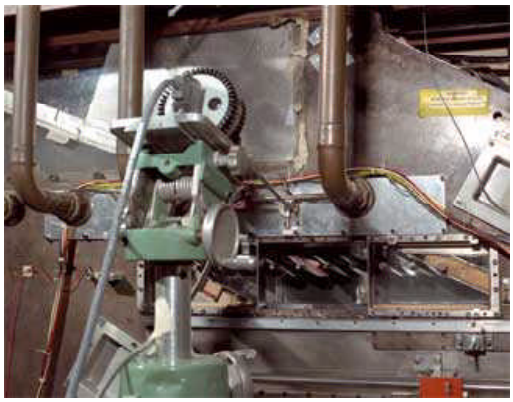
The luminescent paint measurement technique utilizes a coating that is applied to a test article, allowing the air pressure or temperature of a surface to be measured. These coatings are commonly referred to as pressure- or temperature-sensitive paints.

These paints are excited with short wavelength light and emit light at a longer wavelength. By measuring the change of intensity of the emitted light from a known reference condition, researchers can determine the pressure or temperature.

The technique of measuring full-field surface pressure and temperatures using luminescent coatings has required a direct line-of-sight from the camera to the surface under study. In most experiments that have used pressure- or temperature-sensitive paints, the test surfaces are mounted so it is straightforward to position the camera and excitation source. In other cases, the luxury of having optical access through a window is not available or even possible. We developed a borescope imaging system to gain optical access in these confined areas.

The commercially available 10-mm-diameter rigid borescope contains relay optics to transmit the detected light to a charge-coupled device (CCD) camera as well as an internal fiber-optic light guide to provide the excitation source for the luminescent coatings. The coupled light source can be continuous for the intensity method but also can be pulsed or have a variable intensity for a newer method of acquisition that measures the decay or phase lag of the emitted light. This type of borescope focuses the image directly on the CCD chip without using a fiber-optic relay, eliminating unwanted honeycomb patterns that

are typical of fiber-optic type borescopes. This produces images of much higher clarity and uniformity, which are critical for acquiring accurate measurements from the luminescent coatings.



Borescope imaging system being used to gain a full perpendicular view to the painted blade surface in a Glenn research rig.

Find out more about Glenn's work with pressure-sensitive paints at http://www.grc.nasa.gov/WWW/OptInstr/psp.html

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