

# STRUCTURES AND MATERIALS PERFORMANCE

## Non-Destructive Evaluation (NDE)

The Non-Destructive Evaluation (NDE) group of the NRC Institute for Aerospace Research (NRC Aerospace) performs NDE research and provides inspection services utilizing state-of-the-art facilities through collaborative, contract, and cost-recovery-based projects. Development and application of NDE techniques, related signal/image processing and statistical assessments are also part of the NDE Group activities.

### Areas of expertise

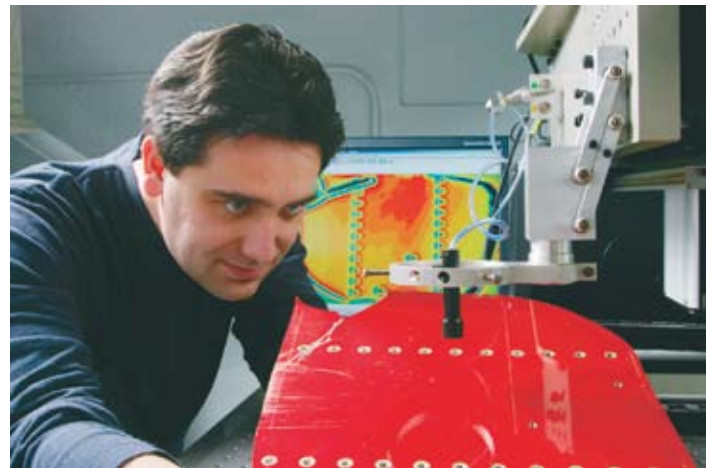
- Non-destructive detection and measurement of flaws or damage in metallic and composite materials, aerospace coatings, adhesively bonded joints and aerospace components
- Non-invasive characterization of materials (conductivity, elastic moduli, density, and thickness gauging)
- Signal/image processing, data fusion and pattern recognition for automation of inspections
- Surface scanning and topography for detection of deformation, perturbation, stress distribution, corrosion, cracks and forensic studies
- Full-field experimental stress/strain analysis
- Probability of detection (POD) and confidence analysis
- Damage tolerance-based life prediction, and
- Safe inspection interval calculation.

### Facilities

The state-of-the-art technological toolbox provided by NRC Aerospace is available to clients through collaborative research agreements or fee-for-service inspection contracts. All research and inspection services are supported



*The SMPL management system has been registered to ISO 9001:2000*



*NDE of aircraft fuselage using automated pulsed eddy current*

by advanced data acquisition systems, strong professional staff expertise and certified technicians.

- **Ultrasonics:** includes conventional and air-coupled techniques, guided-waves, leaky waves, acousto-ultrasonic and resonance methods. Among the major equipment available are a large automated immersion C-scan system as well as portable scanning devices and a variety of instruments and transducers.
- **Eddy current:** including conventional, multi-frequency, and pulsed eddy current techniques equipped with a fully automated system for inspection of airframe structures (lap joint corrosion and cracks). Several portable instruments, conductivity meters, a variety of probes, and a portable automated scanning device are available for in-situ inspections.

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- **Radiography:** includes conventional film, real-time micro-focus radiography and digital image processing.
- **Infrared thermal imaging:** a new pulsed thermography system is available for inspection of composite, honeycomb or foam core structures, bonded joints and aerospace components. Research in alternative thermal excitation such as vibro-thermography is underway.
- **Optical surface inspection techniques:** includes a portable D Sight Aircraft Inspection System for rapid large-area coverage, and a proprietary Edge-of-Light scanning technique for surface topography.
- **Liquid penetrant and magnetic particle inspections** for a variety of applications.
- **Boroscope, video microscope and replication apparatus** for viewing internal or external surfaces.

- **Optical deformation measurement** using classical shadow moire instruments, fringe projection as well as digital image correlation techniques.
- **Airframe sample library:** a comprehensive set of calibration specimens with simulated flaws, and the largest collection of fuselage skin sections from retired airframes. Most have been characterized using several NDE techniques and are available for loan.

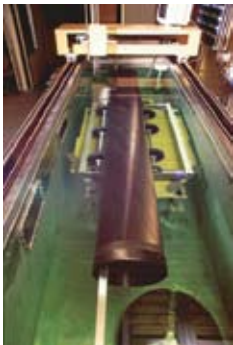
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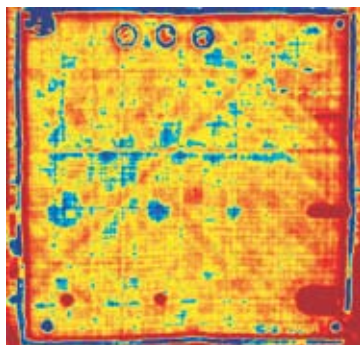
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*Space station composite arm boom undergoing ultrasonic inspection in the NRC Aerospace automated immersion system*



*Thermal image of a composite part with different implanted defects*