

National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER
WHITE SANDS TEST FACILITY



ADVANCED NONDESTRUCTIVE EVALUATION CAPABILITIES

SUMMARY

Advanced Nondestructive Evaluation (NDE) methods are used to nondestructively examine materials and components for discontinuities, structural integrity, proper assembly and actuation states. The advanced NDE methods generally create a visual representation of the test article. These methods include x-ray and neutron radiography coupled with other image-scanning methods such as ultrasonics, eddy current, infrared (IR) thermography, and shearography. Tomographic and data-fusion methods are used to reconstruct a three-dimensional image of the test article and its potential defects.

LABORATORY CAPABILITIES

The White Sands Test Facility (WSTF) has an advanced NDE laboratory and maintains a staff of scientists for supporting NDE research and development. The laboratory equipment and other facilities available to the scientific staff include:

- Acoustic emission analyzer
- Immersion ultrasonic scanner
- Eddy current scanner
- Holographic interferometers
- IR thermographic analyzer
- Microwave image scanner
- Computed and digital x-ray radiography
- White light profilometer
- X-ray computed tomography
- Imaging processing software

EXPERIENCE

WSTF's experience in advanced NDE has been developed on several projects. Advanced NDE methods including x-ray and neutron radiography, ultrasonic and eddy current scanning, IR thermography, and electronic speckle pattern interferometry have been investigated on two projects. The first project using multiple NDE methods and limited data-fusion processing was applied to the inspection of metallic pivots bonded into a fiberglass epoxy composite structure of Extravehicular Mobility Units. More recently, WSTF has been developing advanced NDE methods for application to carbon-composite materials. The U.S. Air Force program to test the impact-damage susceptibility of carbon overwrapped pressure vessels requires special NDE techniques to inspect and quantify the impact-damage mechanisms. Specifically, a new microwave-imaging NDE method is being investigated as a potential method for quantifying impact damage. Inspection of hypergolic propulsion components for nitrate contaminants has been demonstrated using neutron radiography. Acoustic emission analysis has also been successfully applied to leak detection, propulsion component actuation, and pressure vessel monitoring. A High Energy X-ray Laboratory features a computed tomography imaging system that has been used to investigate structural integrity of propulsion system components.

These advanced NDE methods compliment mature NDE techniques routinely performed by our Materials Technology Group, including liquid penetrant, magnetic particle, contact ultrasound, and conventional radiography.

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