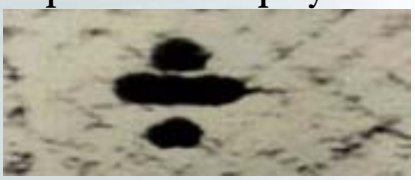
Science.

Technology.

Innovation.

*Composite Panel Image with Defect*

## Capabilities Employed to



## Meet Client Needs:

- Optical and ultrasonic holography
- Ultrasonic transducer design and fabrication technology
- Electronic control and signal processing electronics
- Non-destructive evaluation technology requirements

## Technical Contact:

Dr. Morris S. Good
Phone: 509-375-2529
E-mail: morris.good@pnl.gov

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

# Real-Time Ultrasonic Imaging System (RTUIS)

**Problem:** Need a rapid, real-time, non-destructive method to image composite components or to visualize dynamic fluidic systems.

**PNNL Solution**: PNNL developed a unique hybrid method using ultrasonic and optical technologies to provide a Real-Time Ultrasonic Imaging System (RTUIS) capable of instantaneous imaging a large area such as 100 $cm^2$. A prestigious R&D 100 Award provided special recognition.

**Composite Inspection Application:** RTUIS has been deployed to meet on-line inspection requirements for an aircraft application. PNNL staff worked with the client to fabricate a computer-controlled system and robot for rapid, high-speed inspection of diverse components. Several integrated systems were installed and validated on the production line increasing scanning speeds by a factor of six.

Large components can be inspected by systematically traversing the components past the imaging aperture of RTUIS. Additional benefits include the 3D effect provided by the real time image and the ability to image corners and curvatures difficult for conventional ultrasonic scanners.

**Imaging of Dynamic Fluidic Systems:** RTUIS has also been used to evaluate the characteristics of fluid mixtures passing through container boundaries and piping. One study imaged a mockup of a fluidized bed containing numerous micro-spheres. RTUIS permitted instant visual feedback showing the motion of the particles, the volume within the vessel that the particles resided and the general circulation patterns of particles within the vessel.

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