Terahertz (THz)

ET-133 Ice Frost Ramps

Corrosion Under Tile

Antenna Structure Under Orbiter Tile
Robotic Inspection Facility

Primary Capabilities:

- 11-axis gantry robot with collision avoidance
- Digital X-Ray imaging with solid flat panels, or flexible detector screens
- Robotic manipulator tracks part position and adjusts inspection routine accordingly
- 225 kV x-ray energy: Capable of penetrating 2" of steel and 5" of aluminum
- Flexibility to adapt a multitude of testing sensors to robotic masts
CAT-Scan & Laminography

Computed Tomography (CAT-Scan)
- Object is either secured on turntable, OR
- Robotic gantry can rotate around large stationary objects (up to 21 feet dia.)
- Result: Full 3D reconstruction of entire object volume and its internal geometry

Laminography (Planar CAT-Scan)
- Object remains stationary
- Robot automatically acquires 9 x-ray images around region of interest
- Volumetric reconstruction generates a slice image sequence through part thickness
- Result: Obtain feature depth information, and review indications at greater definition

United Space Alliance

Confirmed disbond

Traditional Film

Laminography movie sequence of slice images
Laser Surface Profilometry

Primary Capabilities:

- Robot used to manipulate laser scanner throughout working envelope
- Position coordinates are stored with each scan
- Software automatically stitches resulting scans together
- Highly accurate 3D surface profile $\pm 0.002''$ measurement tolerance
- Comparison against known “gold” standard (dimensional deviation mapping)

United Space Alliance

USAF C-5 Galaxy Wing Spoiler Scan

Orion Capsule Heat Shield Profilometry Scan
Remote Eddy Current

Goal: Inspection of Shuttle Main Engine Feedlines for Cracks

Feedline Flowliner Internal Design

Remotely Controlled Inspection System for Flowliner Slots

Flexible Multi-Element Eddy Current Sensor

Eddy Current Array Scan of Flowliner Slot

Image-Based Scan Representation
Ultrasonic Phased Array

Primary Capabilities:

- Software control of beam angle, focal distance, and spot size
- Multiple-angle inspection with a single, small, electronically-controlled multi-element probe
- Greater flexibility for the inspection of complex geometry
- High-speed scans with no moving parts

Phased Array scan of Space Shuttle crawler shoe
Infrared Flash Thermography

Primary Capabilities:
- Time lapsed thermal propagation movies
- Digital analysis of captured data
- Storage for acquired data
- 0 deg and 90 deg thermal imaging of metallic and composite structures
- Detects, disbands, cracks, liquid levels, etc.
Backscatter X-Ray (BSX)

Traditional X-Ray Imaging
- X-ray source
- Object
- Detector
- 99% Transmission

Backscatter X-Ray Imaging
- X-ray source
- Object
- Detector
- Compton Scatter (1%)

OV-104 Atlantis Nose Cap Chin Panel Repair

ET-133 Ice Frost Ramps

Orion TPS sample with RTV voids built into PICA block bond line:

Through Transmission

BSX