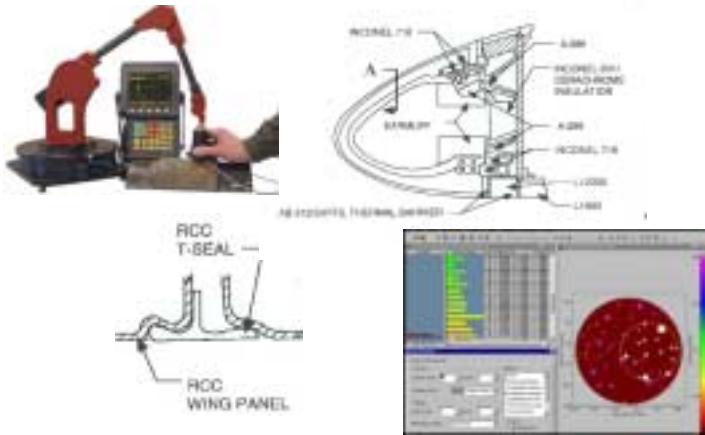


Elastic Wave Damping as a Measure of the Oxidation of Reinforced Carbon-Carbon (RCC) Composites

Test System Integration with GE/Panametrics



Damping & Modulus Measurements to Detect Oxidation

Physical Basis for Measurement

The matrix is the primary source of damping in reinforced carbon-carbon composites. During oxidation, the matrix bonding changes and the bonding from the matrix to the reinforcement is selectively degraded. The result is a measurable increase in the material damping that precedes significant loss of material mass. Measurements can be made on installed components

Engineering

Measurement of damping is possible by determining the absolute UT signal amplitude for a specimen with a given geometry. Unlike imaging, the acoustic impedance (product of the density and the wave speed) is not measured. Instead, the signal loss independent of large scattering is found.

Problem/Previous Support

Problem Being Addressed

The proposed inspection will enable the oxidation to be quantified to determine remaining life of system. In particular, accelerated fatigue due to excessive heat or contamination can be diagnosed. Problems can be identified prior to fracture toughness/strength loss or for QC of repair/replacement.

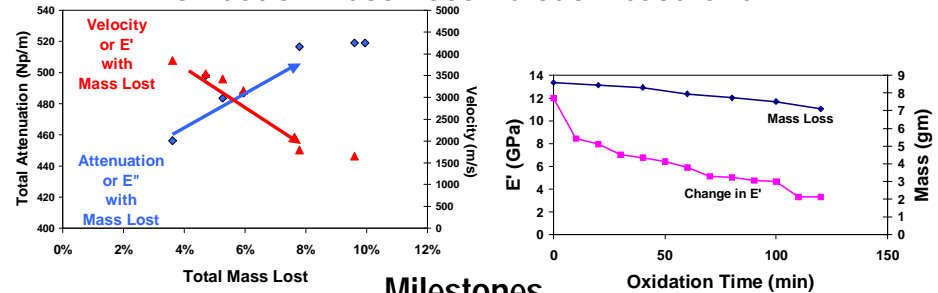
System Level

Inspection hardware and software is based on existing technology used in aerospace quality control. Qualification for orbiter RCC materials required.

Original Support

Development of the technology used DOD 6.1 Funding, Missile Defense Agency/Office of Naval Research 334 Composites.

Oxidation Mass Loss Versus Measurand



Milestones

Testing of oxidation level of RCC Reference Materials
 Incorporation into software
 Testing/training on orbiter

Milestones

Deliverable

Oxidation vs. damping for orbiter RCC
 NASA Specific Tools
 Demonstration on system

Time

12 weeks
 4 weeks
 4 weeks