NASA SBIR 2007 Phase I Solicitation

A1.06 Sensing and Diagnostic Capability

Lead Center: GRC

Participating Center(s): ARC, LaRC

One element in NASA's contribution to solving the problem of aging and damage processes in future vehicles is research to identify aging-related hazards before they become critical. In order to provide early detection of these processes and hazards, new sensing and diagnostic capabilities to support nondestructive evaluation (NDE) systems are needed, as well as associated computational techniques and maintenance methods. Proposals are sought that provide innovations in sensing technologies and diagnostic solutions for these specific structural, material, and systems problems:

- 'Virtual' inspections on both monolithic homogeneous materials (i.e., metals) and composite materials using computational NDE tools. 'Virtual' inspections would include determining the size of flaws detectable with a particular technique, the parameters needed for inspections on a particular structure, or determining if a technique is applicable for a particular inspection. Techniques modeled could include (but are not limited to) terahertz imaging, thermography, ultrasonics, eddy current or radiographics.

- Chafing of wiring insulation is the primary reason for wire failure in both military and commercial aircraft. Computational methods are being solicited for analyzing data from nondestructive inspection techniques to detect and characterize chafing as early as possible, thus enabling useful life predictions.

- Hard shell composite fan containment components that include sandwich structures. Of interest are practical large-area rapid inspection and/or health monitoring methods that can monitor the bulk interior as well as the surface of the component over significant distances as the component goes through its service life. Techniques could include (but are not limited to) ultrasonic guided waves that interrogate the bulk while traveling laterally along the component surface, acoustic emission systems, and robust pressure-sensitive film systems that can visually record impacts and impact paths while surviving the service and impact conditions.

- Increased use of composite structure and components in aircraft will create new challenges for visual inspection which still constitutes 80-90% of all inspections. Because surface indicators of damage or delamination may be subtle or barely visible, NASA is interested in technologies and techniques that can enhance visual detectibility in the operational environment. Such innovations could include (but are not limited to) treatments of the composite materials, enhancements to the work environment, or job aids for visual inspectors or maintenance technicians (outside the realm of NDE systems). Desireable features include ease of use and minimal change to the operational process.
Technology innovations may take the form of tools, models, algorithms, prototypes, and/or devices.