NASA SBIR 2009 Phase I Solicitation

A1.03   Prediction of Aging Effects

Lead Center: LaRC

Participating Center(s): ARC, GRC

In order to assess the long-term effects of potential hazards and aging-related degradation of new and emerging material systems/fabrication techniques, NASA is performing research to anticipate aging and to predict its effects on the designs of future aircraft. To support this predictive capability, structural integrity analytical tools, lifing methods, and material durability prediction tools are being developed. Physics-based and continuum-based models encapsulated as computational methods (software) are needed to provide the basis for these higher level (e.g., design) tools. Proposals are sought that apply innovative computational methods, models and analytic tools to the following specific applications:

- Probabilistic computational code is sought for improved structural analysis of complex metallic and composite airframe components. The methods used in these solutions need to detail the initiation and progression of damage to determine accurate estimates of residual life and/or strength of complex airframe structures.

- Software tools are needed to predict the onset and rates of type-II hot corrosion attack in nickel-based turbine disk superalloys that allow for prolonged disk operation at high temperatures. Typically hot corrosion of turbine alloys is a product of molten salt exposure and is manifested by a localized pitting corrosion attack. Prolonged high temperature exposures of turbine disk alloys to sulfur-rich low temperature melting eutectic salts can lead to an onset of Type II hot corrosion attack causing serious degradation to the durability of the turbine components.

- Computational software is sought to simulate of the response of advanced composite fan case/containment structures in aged conditions to jet engine fan blade-out events using impact mechanics and structural system dynamics modeling techniques.

The anticipated outcome of successful Phase 2 proposals would be analytic code (software) delivered to NASA suitable for use in material evaluation studies.