



NASA SBIR 2014 Phase I Solicitation

A1.04 Prognostics and Decision Making

Lead Center: ARC

Research should be conducted to demonstrate technical feasibility during Phase I and to show a path toward a Phase II technology demonstration. Proposals are solicited that address aspects of the following areas:

- Remaining Useful Life (RUL) prediction techniques that address a set of fault modes for a device or component, for example by modeling the physics of the most critical fault modes and using (typically less accurate) data-driven methods for the remainder.
- Physics-based damage propagation models for one or more relevant aircraft subsystems such as airframe structures, avionics, electrical power systems, and electronics. Methods for damage propagation in composite structures are of a particular interest. Proposals that focus on technologies envisioned for next generation aircraft are strongly encouraged.
- Uncertainty quantification and management for prognostics. Proposers are encouraged to quantify prognostic uncertainty by accounting for the effects of modeling uncertainty, measurement errors, algorithmic uncertainties, as well as uncertainties stemming from estimation of future loads and environmental conditions. Methods for reducing prognostic uncertainty estimates are of particular interest. Proposals can consider the fusion of different techniques for uncertainty quantification and management but must demonstrate (using the appropriate metrics) the direct benefits of using such an approach in improving uncertainty estimates.
- Aircraft-relevant test beds that can generate aging and degradation datasets for the development and validation of prognostic techniques.
- Verification and validation methods for prognostic algorithms.

If prognostic algorithms are being developed, performance needs to be measured on benchmark data sets using prognostic metrics for accuracy, precision, and robustness. Metrics should include prognostic horizon (PH), alpha-lambda, relative accuracy (RA), convergence, and R_delta.