



NASA SBIR 2011 Phase I Solicitation

X6.03 Integrated System Health Management for Flexible Exploration

Lead Center: ARC

Participating Center(s): JPL, JSC, KSC, MSFC

Novel integrated system health management technologies will enable NASA's pursuit of a more sustainable and affordable approach to spaceflight. New heavy lift launch systems will incorporate new engines, propellants, materials, and combustion processes and will increase NASA's capabilities and significantly lower operations costs. Health management is essential for the safe and reliable operation of these complex systems. Innovative health management technologies are also essential for long-duration robotic precursor missions. Projects may focus on one or more relevant subsystems such as rocket engines, liquid propulsion systems, structures and mechanisms, thermal protection systems, power, avionics, life support, communications, and software. Specific technical areas of interest are methods and tools for:

- Early-stage design of health management functionality during the development of space systems, including failure detection methods, sensor types and locations that enable fault detection to line replaceable units.
- Sensor validation and robust state estimation in the presence of inherently unreliable sensors. Focus on data analysis and interpretation using legacy sensors.
- Model-based fault detection and isolation based on existing sensor suites that enables fault detection within time ranges to allow mission abort.
- Automatic construction of models used in model-based diagnostic strategies, limiting model construction times to 60% of the time required using manual methods.
- Prognostic techniques able to anticipate system degradation before loss of critical functions and enable further improvements in mission success probability, operational effectiveness, and automated recovery of function.
- Techniques that address the particular constraints of maintaining long-duration systems health of structures, mechanical parts, electronics, and software systems are also of interest.

