



## NASA SBIR 2009 Phase I Solicitation

### X5.01 Composite Structures - Practical Monitoring and NDE for Composite Structures

Lead Center: JSC

Participating Center(s): ARC, LaRC

Orion backshell, Aries Payload fairing, and Lander struts and composite pressure vessel option, COPV and composite tankage and Habitat modules are only a few of the many weight-reducing applications for composites that need efficient and modular systems to accomplish monitoring and NDE for them to be practical.

This subtopic seeks the development of technologies to detect, locate and characterize indications of a failure far enough ahead that routine actions can be taken to rectify the situation. Perform monitoring such that models can be built of event behaviors and structural response condition can be determined. Monitoring and/or NDE changes can be made with minimum cost/operations.

Performance Goals/Metrics:

- Provide impending system failure indications with sufficient time to take action to reduce the risk of catastrophic failure;
- Increase the number of sensor locations per pound of monitoring weight by 50%;
- Decrease the system monitoring electronics weight by 50%;
- Decrease total wiring required for monitoring by 50%;
- Decrease the time to plan and install monitoring by 50%;
- Decrease the overall life-cycle cost per sensor by 50%;
- Decrease total data rate required from the sensor data acquisition location by 50%;
- Decrease time to perform NDE inspections by 50%;

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- Decrease the expected cost of instrumentation changes/upgrades by 50%.

Technologies sought include: smart sensors, wireless passive sensors, flexible sensors for highly curved surfaces, direct-write film sensors, real-time compact NDE imagers for damage inspection, highly accurate defect and tool position determination.

Applications include: Advanced composite structures such as cryo-tanks, large area composites such as launch vehicle fairings, habitable volumes, hard to access/inspect composite members, as well as metallic pressurized structures of all kinds. Interior as well as exterior measurements of the pressure vessel are needed.

This subtopic is also a subtopic for the "Low-Cost and Reliable Access to Space (LCRATS)" topic. Proposals to this subtopic may gain additional consideration to the extent that they effectively address the LCRATS topic (See topic O5 under the Space Operations Mission Directorate).