NASA SBIR 2011 Phase I Solicitation

A4.02 Flight Test Techniques and Measurement Technology

Lead Center: AFRC

Participating Center(s): ARC, GRC, LaRC

NASA's flight research and test facilities are reliant on a combination of both ground and flight research capabilities. By using state-of-the-art flight test techniques, measurement and data acquisition technologies, NASA will be able to operate its flight research facilities more effectively and also meet the challenges presented by NASA's cutting edge research and development programs. The Aeronautical Test Program pertains to a variety of flight regimes and vehicle types ranging from civil transports, low-speed, to high-altitude long-endurance to supersonic, to hypersonic and access-to-space.

The scope of this subtopic is broad. Flight research and test capabilities should address (but are not limited to) the following NASA aeronautical test facilities: Aeronautical Test Range, Aero-Structures Flight Loads Laboratory, Flight Research Simulation Laboratory, and Research Test Bed Aircraft. Proposals should address innovative methods and technologies to extend the health, maintainability and test capabilities of these flight research support facilities.

NASA is committed to improve the ATP effectiveness to support and conduct flight research. This includes developing test techniques that improve the control of both ground-based and in-flight test conditions, expanding measurement and analysis methodologies, and improving test data acquisition and management with sensors and systems that have fast response, low volume, minimal intrusion, and high accuracy and reliability.

NASA requires improved measurement and analysis techniques for acquisition of real-time, in-flight data used to determine aerodynamic, structural, flight control, and propulsion system performance characteristics. These data will also be used to provide test conductors the information to safely expand the flight and test envelopes of aerospace vehicles and components. This requirement includes the development of sensors to enhance the monitoring of test aircraft safety and atmospheric conditions during flight testing.

Areas of interest include:

- Multi-disciplinary nonlinear dynamic systems prediction, modeling, identification, simulation, and control of aerospace vehicles.
- Test techniques for conducting in-flight boundary layer flow visualization, shock wave propagation, Schlieren photography, near and far-field sonic boom determination, atmospheric modeling.
- Measurement technologies for steady & unsteady aerodynamic, aero-thermal dynamics, structural dynamics, stability & control, and propulsion system performance.
- Verification & Validation (V&V) of complex highly integrated flight systems including hardware-in-the-loop testing.
- Manufacturability, affordability, and performance of small upper-stage booster technologies for small- & nano-satellites.
- Innovative techniques that enable safer operations of aircraft (e.g., non destructive examination of composites through ultrasonic techniques).

Also of interest to NASA are innovative methods and analysis techniques to improve the correlation of data from ground test to flight test.