NASA SBIR 2015 Phase I Solicitation

A2.01 Flight Test and Measurements Technologies

Lead Center: AFRC

Participating Center(s): LaRC

NASA continues to see flight research as a critical element in the maturation of technology. This includes developing test techniques that improve the control of 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. By using state-of-the-art flight test techniques along with novel measurement and data acquisition technologies, NASA and the aerospace industry will be able to conduct flight research more effectively and also meet the challenges presented by NASA and industryâ€™s cutting edge research and development programs. NASA's Flight Demonstrations and Capabilities Project supports a variety of flight regimes and vehicle types ranging from low speed, sub-sonic electric propulsion, transonic civil transport, and supersonic civil transport. Therefore, this solicitation can cover a wide range of flight conditions and craft. NASA also 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 (both in-situ and remotely) to enhance the monitoring of test aircraft safety and atmospheric conditions during flight testing.

Flight test and measurement technologies proposals should significantly enhance the capabilities of major government and industry flight test facilities comparable to the following NASA aeronautical test facilities:Â

- Dryden Aeronautical Test Range.
- Aero-Structures Flight Loads Laboratory.
- Flight Research Simulation Laboratory.
- Research Test Bed Aircraft.

Proposals should address innovative methods and technologies to extend the health, maintainability and test capabilities of these types of flight research support facilities.

Areas of interest include:Â

- High performance, real time reconfigurable software techniques for data acquisition and processing associated with IP based commands and/or IP based data input/output streams.
- High efficiency digital telemetry technique and/or system to enable high data rate, high volume IP based telemetry for flight test.
- Improve time-constrained situational awareness and decision support via integrated secure cloud-based

web services for real-time decision making.

- Intelligent health monitoring for hybrid and/or all electric distributed propulsion systems.
- Methods for significantly extending the life of electric aircraft propulsion energy sources (e.g., batteries, fuel cells, etc.).
- Test techniques for conducting quantitative in-flight boundary layer flow visualization, global surface pressure, shock wave propagation, Schlieren photography, near and far-field sonic boom determination, atmospheric modeling.
- Measurement technologies for in-flight steady & unsteady aerodynamics, juncture flow measurements, propulsion airframe integration, structural dynamics, stability & control, and propulsion system performance.
- Remote optical-based measurement technologies enabling simultaneous spatial/spectral/temporal measurement capability in the infrared wavebands are desired to assess technology leaps in propulsion system efficiency and to evaluate impacts to the environment. Temporal acquisition rates greater than or equal to 1 kHz (full hyperspectral image cubes/sec) are desired to resolve performance information commensurate with the expected phenomenology. Miniaturized fiber optic fed measurement systems with low power requirements are desirable for migration to small business class jets or UAS platforms.
- Innovative techniques that enable safer operations of aircraft (e.g., non-destructive examination of composites through ultrasonic techniques).