



NASA SBIR 2011 Phase I Solicitation

A4 Aeronautics Test Technologies

The Aeronautics Test Program (ATP) ensures the long term availability and health of NASA's major wind tunnels/ground test facilities and flight operations/test infrastructure that support NASA, DoD and U.S. industry research and development (R&D) and test and evaluation (T&E) requirements. Furthermore, ATP provides rate stability to the aforementioned user community. The ATP facilities are located at four NASA Centers made up of the Ames Research Center, Dryden Flight Research Center, Glenn Research Center and Langley Research Center. Classes of facilities within the ATP include low speed, transonic, supersonic, and hypersonic wind tunnels, hypersonic propulsion integration test facilities, air-breathing engine test facilities, the Western Aeronautical Test Range (WATR), support & test bed aircraft, and the simulation and loads laboratories. A key component of ensuring a test facility's long-term viability is to implement and continually improve on the efficiency and effectiveness of that facility's operations along with developing new technologies to address the nation's future aerospace challenges. To operate a facility in this manner requires the use of state-of-the-art test technologies and test techniques, creative facility performance capability enhancements, and novel means of acquiring test data. NASA is soliciting proposals in the areas of instrumentation, test measurement technology, test techniques and facility development that apply to the ATP facilities to help in achieving the ATP goals of sustaining and improving our test capabilities. Proposals that describe products or processes that are transportable across multiple facility classes are of special interest. The proposals will also be assessed for their ability to develop products that can be implemented across government-owned, industry and academic institution test facilities. Additional information: <http://www.aeronautics.nasa.gov/atp/index.html>.

Subtopics

A4.01 Ground Test Techniques and Measurement Technology

Lead Center: LaRC

Participating Center(s): ARC, GRC

NASA is seeking highly innovative and commercially viable test measurement technologies, test techniques, and facility performance technologies that would increase efficiency, capability, productivity for ground test facilities. The types of technology solutions sought, but not limited to, are: skin friction measurement techniques; improved flow transition and quality detection methodologies; non-intrusive measurement technologies for velocity, pressure, temperature, and strain measurements; force balance measurement technology development; and improvement of current cutting edge technologies, such as Particle Based Velocimetry (LDV, PIV), Pressure Sensitive Paint (PSP), and focusing acoustic measurements that can be used more reliably in a production wind tunnel environment. Instrumentation solutions used to characterize ground test facility performance are being sought in the area of aerodynamics performance characterization (flow quality, turbulence intensity, mach number measurement, etc.).

Of interest are subsonic, transonic, supersonic, and hypersonic speed regimes. Specialized areas may include cryogenic conditions, icing conditions, and rotating turbo machinery. Proposals that are applicable specifically to the ATP facilities (see <http://www.aeronautics.nasa.gov/atp>) and across multiple facility classes are especially important. The proposals will also be assessed for their ability to develop products that can be used in other aerospace ground test facilities.

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.

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- 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.