NASA SBIR 2010 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 and 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 is available at http://www.aeronautics.nasa.gov/atp/index.html.

Subtopics

A4.01 Ground Test Techniques and Measurement Technology

Lead Center: GRC
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

NASA’s aeronautical flight test capabilities are reliant on a combination of both ground and flight research facilities.
By using state-of-the-art test techniques, measurement technologies, and data acquisition systems to enhance and
modernize these test facilities, NASA will be able to meet the needs of cutting-edge flight research and
development programs for the nation.

Proposals submitted to this subtopic should address innovative methods and advanced technologies that would
improve the health and test capabilities of NASA’s ground and flight facilities. Flight regimes of interest range from
atmospheric low-speed, to high-altitude long-endurance to supersonic, to hypersonic and access-to-space. Ground
support facilities include: the Western Aeronautical Test Range (WATR), Flight Loads Laboratory (FLL), and
laboratories that conduct simulation and verification & validation (V&V) of flight systems including hardware-in-the-
loop testing. Flight facilities include both piloted and unmanned test aircraft with various ranges of flight
performance and capable of operating over a broad span of flight regimes.

NASA is committed to improve the ATP facility 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.

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