Aeronautics Test Technologies

NASA has implemented the Aeronautics Test Program (ATP) within its Aeronautics Research Mission Directorate (ARMD). The purpose of the ATP is to ensure 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) needs. Furthermore, ATP provides rate stability to the aforementioned user community.

The ATP facilities are located at the NASA Research Centers, including at Ames Research Center, Dryden Flight Research Center, Glenn Research Center and Langley Research Center. Classes of facilities within the ATP include low speed wind tunnels, transonic wind tunnels, supersonic wind tunnels, hypersonic wind tunnels, hypersonic propulsion integration test facilities, air-breathing engine test facilities, the Western Aeronautical Test Range (WATR), support aircraft, 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. 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.
Subtopics

A4.01 Test Measurement Technology

Lead Center: GRC
Participating Center(s): ARC, LaRC

NASA is concerned with operating its ground test facilities with new and innovative methods for test measurement technology and with continually improving on the efficiency and effectiveness of operation of its ground test facilities. NASA’s aeronautics and space research and development pushes the limits of technology, including the ground test facilities that are used to confirm theory and provide validation and verification of new technologies. By using state-of-the-art test measurement technologies, novel means of acquiring test data, test techniques and creative facility performance capability enhancements, NASA will be able to operate its facilities more efficiently and effectively and also be able to meet the challenges presented by NASA’s cutting edge research and development programs. Therefore, NASA is seeking highly innovative and commercially viable test measurement technologies, test techniques, and facility performance technologies that would increase efficiency or overcome research and development technology barriers for ground test facilities.

The first emphasis for this subtopic is in the area of test measurement technology. Examples of the types of technology solutions sought, but not limited to, are: data acquisition system improvements; skin friction experimental measurement techniques; improved flow transition detection methodologies; new or novel, non-intrusive measurement technologies for pressure, temperature, and force measurements; and force measurement (balance) technology development. Solutions are also sought with regards to the instrumentation used to characterize ground test facility performance. This could be in the area of aerodynamics performance characterization (flow quality, turbulence intensity, etc.) or, for example, in the case of specialty facilities, the measurement of high ice water content conditions in an icing wind tunnel.

The second emphasis for this subtopic is in the area of test techniques and facility performance technologies. Examples of the types of technology solutions that are being sought, but not limited to, are expanded operating envelope, enhanced or rapid characterization of facility performance, improved dynamic (forced oscillation) test capability at transonic and supersonic speeds, and improved flow transition detection methodologies.

Proposals that lead to products or processes that are applicable specifically to the ATP facilities 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 government-owned, industry and academic institution aerospace ground test facilities.
NASA is concerned with operating its flight test aircraft with new and innovative flight test measurement methods. By using state-of-the-art test measurement technologies and novel means of acquiring test data, NASA will be able to operate its flight test aircraft and test-beds more effectively and also meet the challenges presented by NASA’s cutting edge research and development programs. NASA’s missions and programs push the limits of technology which places greater demands on its flight test-beds. These flight test-beds are often used in conjunction with ground test facilities to confirm theory and provide verification and validation of new technologies. Therefore, NASA is seeking highly innovative and commercially viable test measurement technologies that would increase efficiency or overcome test limitations for flight research.

Flight test vehicles operate over a wide range of environmental conditions including among others: variable ambient pressure (the result of altitude changes), variable temperature (the result of altitude and airspeed changes), and vibration and acceleration (the result of engine vibration and dynamic flight maneuvers). In addition, weight, volume, and power requirements are at a premium because of limited space, power, and weight carrying capacity.

The first emphasis for this subtopic is in the area of flight test techniques. Factors in flight test techniques include, but are not limited to: methods for achieving accurate and repeatable flight test conditions (e.g., altitude, airspeed, flow quality, or turbulence intensity). Reconfigurable systems, alternative power sources, and novel methods for onboard data processing, storage, real-time access and RF data transmission are of interest. Technologies are also being requested to aid in multi-aircraft co-operative test techniques to enable chase aircraft to probe flow fields and visualize shock patterns around target aircraft.

The second emphasis for this subtopic is in the area of flight test measurement technology. Examples of the types of technology solutions sought are: data acquisition system improvements and miniaturization, skin friction experimental measurement techniques, and improved flow transition measurement techniques. Special emphasis is placed on new or novel, non-intrusive measurement technologies for pressure, temperature, and force measurements, and force measurement (balance) technology. Also, techniques that could facilitate shortening test measurement installation and setup times would be of interest such as methodologies that minimize the wiring infrastructure and other aircraft installation requirements would be applicable. Another area of interest is in test data conversions to different domains or data compression to reduce the volume of information that must be transmitted over existing telemetry links. It should be understood that all of these technologies must be capable of operating under extremes of temperature, pressure, and vibration typical in the flight environment.

Proposals that lead to products or processes that are applicable specifically to the ATP facilities and across multiple flight test-beds are especially important. Test-beds can be broadly categorized throughout a range of flight regimes encompassing hypersonic (e.g., orbital, sub-orbital, Phoenix missile), supersonic (e.g., F-15, F-16, F-18), and subsonic Fixed-Wing aircraft (e.g., ER2, G3, Predator-B). All platforms have a variety of different Mach/Altitude flight envelopes.