**ASCENT COE Notice of Funding Opportunity (COE-2016-41)**

**Project Title:** Identification of noise acceptance onset for noise certification standards of supersonic airplanes

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**Nominal Funding Level:** $200,000

**Period of Performance:** 18 months

**Deadline for response to this NFO:** April 15, 2016

**Project Description**:

Over the past two decade, aviation companies continue to explore the design of new, small supersonic jets for civilian use. In the United States, the National Aeronautics and Space Administration (NASA) supports the research and development of aviation technologies that would enable such supersonic jets. With the expectations of achieving a "low-boom" aircraft, designers are challenged to meet numerous constraints on engine emissions, subsonic terminal area noise, and fuel efficiency. Yet, the most difficult environmental constraint to overcome is the noise heard at ground level during supersonic flight, known as "sonic boom" noise.

The FAA continues to participate in the International Civil Aviation Organization (ICAO) Committee on Aviation for Environmental Protection (CAEP) efforts to formulate new civil, supersonic airplane certification standard addressing sonic boom (noise). To achieve this, international research is directed at the sonic boom phenomenon, sensor signal acquisition and analysis of boom and vibro-acoustical measures for the correlations with human response. This effort relies on extensive and on-going research not only to define the aircraft design and its performance, but equally important, to define an understanding of the acoustical annoyance over a range of sonic boom responses that are unacceptable or imperceptible.

In order to support the standard setting process and the identification of noise acceptance onset, the following research is to be addressed:

* Establishing Confidence in Acoustic Signatures:
  + Base on available data, formulate signal processing approaches and/or prototype field test orientations/schemes to best process raw acoustical measurements which result in high confidence (statistically) and single flight condition signature repeatability;
  + Explore the primary influences (distortion factors) that impact sonic boom acoustical signatures and identify correction methods/techniques that would be useful in accounting for their contribution on the boom signature. Primary influences include: atmospheric turbulence, atmospheric absorption/dissipation and meteorological effects (such as relative humidity, temperature, atmospheric pressure) winds, and terrain.
  + Exploration of viable, practical, and cost effective sonic boom propagation methodologies.
* Metrics Sensitivity:
  + Demonstrate appropriate metrics for a wide range of measured sonic boom signatures and define their associated sensitivity/variability and rank their strengths and/or weaknesses in context of noise certification and human response.
  + Where possible, correlate vibro-acoustical evaluations with noise measurements and human response and include assessment of rattle (for indoor) and startle (for outdoor).
* Acoustical Acceptability:
* Support NASA in the collaborative planning and execution of human response studies that define the data structure to correlate human annoyance with sonic boom noise. The result should be a dataset that identifies the onset of acceptability of sonic boom that can be deemed consistent with public compatibility.
* Support NASA in the development of protocols, measurements and technical planning for Community Exposure Testing that improves the statistical fidelity and coverage of population. Explore the value of social media as an extension of useful data collection of test responses.
* Adjustment(s) for a Reference condition: Consider the analogy of the subsonic airplane noise correction scheme that adjusts the measured noise data for standard reference condition, that numerically levels the noise value to a common reference state. Because of non-linearities resulting from shockwave effects, adjustments for sonic boom noise data for the same standard reference condition is expected to be inaccurate. The research team should identify approaches that can be applied to correct for the shock induced inaccuracies. The research team should then select one approach as a preferred methodology and provide rationale for the choice.

The research team is encouraged to: a) collaborate among universities and stakeholders; b) maximize the use of cost share opportunities and resources available; c) focus on research gaps in the supersonic roadmap; d) avoid duplication of efforts; and e) prepare a final report summarizing the task analyses. It may include all of the data measured in both electronic and hard copy formats. The study team will need to have the capability to mobilize and deploy on short notice to support proposed Waveforms and Sonic Boom Perception and Response Risk Reduction (WSPRRR) testing and related trials.

Notices of intent received before COB April 15,2016 will be evaluated and one team will be requested to provide a full length proposal for further evaluation and possible funding to carry out the work.