NASA SBIR 2008 Phase I Solicitation

A1.04 Aviation External Hazard Sensor Technologies

Lead Center: LaRC

NASA is concerned with new and innovative methods for airborne detection, identification, evaluation, and monitoring of in-flight hazards to aviation. NASA seeks to foster research and development that leads to innovative new technologies and methods, or significant improvements in existing technologies, for in-flight hazard avoidance and mitigation. Technologies may take the form of tools, models, techniques, procedures, substantiated guidelines, prototypes, and devices.

A key objective of the NASA Aviation Safety Program is to support the research of technology, systems, and methods that will facilitate transformation of the National Airspace System to Next Generation Air Transportation System (NextGen) (information available at www.jpdo.gov). The general approach to the development of airborne sensors for NextGen is to encourage the development of multi-use, adaptable sensors. The greatest impact will result from improved sensing capability in the terminal area, where higher density and more reliable operations are needed.

Under this subtopic, proposals are invited that explore new and improved airborne sensors and sensor systems for the detection and monitoring of hazards to aircraft. This subtopic solicits technology that is focused on developing capabilities to detect and evaluate hazards. The development of human interfaces, including displays and alerts, is not within the scope of this subtopic. In some cases the development of ground-based sensor technology may be supported as a precursor to eventual airborne applications.

At this time, the following hazards are of particular interest: in-flight icing conditions and wake vortices. Proposals associated with sensor investigations addressing these hazards are encouraged, and some suggestions follow.

To enable remote detection and classification of in-flight icing hazards for the future airspace system and emerging aircraft, NASA is soliciting proposals for the development of sensor systems for the detection of icing conditions. Examples include the following practical remote sensing systems:

- Low-cost, ground-based, vertical-pointing with potential scanning capability X-band radar that can operate unattended 24/7/365 and provide calibrated reflectivity and velocity data with hydrometer/cloud particle classification (based upon the reflectivity and velocity data).

- Low-cost, high-frequency (> 89 GHz) microwave or infrared radiometer technology capable of providing air temperature, water vapor, and liquid water measurements for both ground-based and airborne applications.

Wake vortex detection in the terminal area is of particular interest, because closer spacing between aircraft is necessary to facilitate the high-density operations expected in NextGen. Airborne detection of wake vortices is considered challenging due to the fact that detection must be possible in nearly all weather conditions, in order to be practical, and because of the size and nature of the phenomena. Lidar systems have been used successfully for wake detection from off-axis viewing angles, and there is reason to believe that detection is possible from near-axial viewing angles. Other sensor technologies may have untapped potential for wake detection. NASA is soliciting new and innovative research toward the detection of wakes from aircraft, particularly in the terminal area. Specific areas suggested for investigation are sensor measurables (i.e. physical aspects of the hazard that are detectable or measurable by a sensor) associated with wake detection and wake strength; sensor capabilities for detection, tracking, and strength measurement; practical methods for wake hazard analysis, including hazard level evaluation and the bounding of hazardous airspace; and the removal of technical barriers to the use of sensors for airborne wake detection. Proposals may address any or all of the suggested areas. Additional wake vortex research topics are covered in Subtopic A3.02. Proposals may address any or all of the suggested areas.