NASA SBIR 2010 Phase I Solicitation

A3 Airspace Systems

NASA's Airspace Systems Program (ASP) is investing in the development, validation and transfer of advanced innovative concepts, technologies and procedures to support the development of the Next Generation Air Transportation System (NextGen). This investment includes partnerships with other government agencies represented in the Joint Planning and Development Office (JPDO), including the Federal Aviation Administration (FAA) and joint activities with the U.S. aeronautics industry and academia. As such, ASP will develop and demonstrate future concepts, capabilities, and technologies that will enable major increases in air traffic management effectiveness, flexibility, and efficiency, while maintaining safety, to meet capacity and mobility requirements of NextGen. ASP integrates the two projects NextGen Concepts and Technology Development (CTD) and NextGen Systems Analysis Integration and Evaluation (SAIE), to directly address the fundamental research needs of NextGen vision in partnership with the member agencies of the JPDO. The CTD develops and explores fundamental concepts, algorithms, and air-borne and ground-based technologies to increase capacity and throughput of the national airspace system, to address demand-capacity imbalances, and achieve high efficiency in the use of resources such as airports, en route and terminal airspace. The SAIE Project is responsible for facilitating the Research and Development maturation of integrated concepts through evaluation in relevant environments, providing integrated solutions, characterizing airspace system problem spaces, defining innovative approaches, and assessing the potential system impacts and design ramifications of the program's portfolio. Together, the projects will also focus NASA's technical expertise and world-class facilities to address the question of where, when, how and the extent to which automation can be applied to moving air traffic safely and efficiently through the NAS and technologies that address optimal allocation of ground and air technologies necessary for NextGen. Additionally, the roles and responsibilities of humans and automation influence in the ATM will be addressed by both projects. Key objectives of NASA's AS Program are to:

- Improve mobility, capacity, efficiency and access of the airspace system;
- Improve collaboration, predictability, and flexibility for the airspace users;
- Enable accurate modeling and simulation of air transportation systems;
- Accommodate operations of all classes of aircraft; and
- Maintain system safety and environmental protection.
Subtopics

A3.01 Concepts and Technology Development (CTD)
Lead Center: ARC
Participating Center(s): AFRC, LaRC

A3.02 Systems Analysis Integration Evaluation (SAIE)
Lead Center: LaRC
Participating Center(s): AFRC, ARC

Atmospheric Hazards

- Common situational awareness between flight deck and ground automation systems for weather avoidance
- Integrating weather products into decision support tools
- Airspace capacity estimation in presence of weather
- Development of wake vortex detection and hazard metric tools

System Level Concepts Development

- System safety assessment, graceful degradation and recovery

Trajectory Modeling and Uncertainty Prediction

- Analysis of growth of uncertainty as a function of look-ahead time on different phases of flight
- Development of methods to determine, for a target concept/system, the TP accuracy needed to be able to achieve the minimum acceptable system/concept performance as well as identify sources of errors
- Development of methods for managing/reducing trajectory uncertainty to meet specified performance requirements
- Identify critical aircraft behavior data for exchange for interoperability

Roles and Responsibilities in NextGen
• Means to measure controller and pilots workloads in order to optimize air-ground functional allocation

• Means to measure controller and pilots workloads in order to optimize human-automation functional allocation

**Modeling and Simulation**

• Developing probabilistic or dynamic methods of calculating airspace workload capacity