



NASA SBIR 2009 Phase I Solicitation

A3.01 NextGen Airspace

Lead Center: ARC

Participating Center(s): AFRC, LaRC

The primary goal of the Airspace project is to develop integrated solutions for a safe, efficient, and high-capacity airspace system. Of particular interest is the development of core capabilities, including:

- Trajectory-based operations, which manages traffic using 4-dimensional trajectories to achieve increases in capacity and efficiency;
- Super-density operations, which maximizes the use of limited runways at the busiest airports;
- Weather assimilated into decision making, with emphasis on probabilistic weather;
- Equivalent visual operations, which will allow the system to maintain visual flight rule capacities in instrument flight rule conditions.

These core capabilities are required to enable key Airspace project functions such as Dynamic Airspace Configuration, Traffic Flow Management, Separation Assurance, and the overarching Evaluator that integrates these ATM functions over multiple planning intervals.

In order to meet these challenges, innovative and technically feasible approaches are sought to advance technologies in research areas relevant to NASA's NextGen Airspace effort. The general areas of primary interest are Dynamic Airspace Configuration, Traffic Flow Management, and Separation Assurance. Specific research topics for the Airspace project include:

- Four-dimensional trajectory modeling in the presence of uncertainty;
- Air/air and air/ground trajectory exchange interoperability;

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- Trajectory uncertainty prediction and mitigation;
 - Intent information requirements for separation assurance and super density operations;
 - Airspace re-design techniques that improve capacity, including changing shape of current sectors and introducing new airspace classes;
 - Pilot and controller procedures and decision support systems needed to facilitate dynamic airspace changes;
 - Collaborative decision making techniques involving multiple agents;
 - Integrated solutions of ATM functions over multiple planning intervals and across domains;
 - Optimal allocation of separation assurance functions across humans and automation and air and ground systems;
 - Optimization techniques to address demand/capacity imbalances;
 - New safety assessment methods for safety-critical air and ground automation technologies;
 - Scheduling optimization for integrated arrival/departure/surface operations;
 - Displays and procedures for very closely-spaced parallel approaches;
 - Traffic complexity monitoring and prediction;
 - Trajectory design and conformance monitoring;
 - Weather assimilated into ATM decision-making;
 - Environmental metrics and assessments of new concepts and technologies;
 - The effect of new vehicles (including UAVs) on air traffic management;
 - Gate-to-Gate modeling for NextGen concepts;
 - Integration of UAVs into the NAS, including examination of the anticipated mix of UAV classes and capabilities (equipment, size, mission) in the next 20 years;
 - The effect of traffic congestion on integration of UAVs into the NAS;
 - Separation assurance responsibilities with regard to UAVs;
 - The requirements for, and the development of, a simulation environment to test UAV integration in the NAS.