



NASA Research Announcement

Integration of Advanced Concepts and Vehicles into the Next Generation Air Transportation System

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NASA Research Announcement (NRA) Description



Goal and Objectives

- Goal: Based on a user perspective, help inform future research related to NextGen by NASA and the broad aeronautics community
- Objectives: Research the issues associated with deploying new or advanced air vehicles within NextGen in order to:
 - Understand how advanced vehicles will operate within NextGen
 - Understand the tradeoffs involved for both vehicles and the ATM system
 - Indicate the most productive areas for future research, including further development of a modular analysis infrastructure



Approach

- The study will examine the interactions, impacts, safety concerns, and tradeoffs among the air traffic system, characteristics of advanced vehicles, and the operation and performance of NextGen
- The approach encompasses the following:
 - Select and describe a set of advanced vehicles that could be operating in the 2025 NextGen
 - Develop procedures describing the operation of these vehicles within the NextGen ConOps
 - Identify and address the safety issues associated with each set of procedures
 - Conduct modeling and analyses to determine the impact of the procedures and vehicles on the operation of NextGen and the tradeoffs involved



Procedures for Advanced Vehicles in NextGen

- The study will develop and analyze procedures to accommodate advanced aircraft in NextGen, describing how these vehicles will operate and constraints imposed by NextGen requirements and concepts
- Procedures will include a detailed description of how each type of vehicle will operate, including:
 - Air traffic management
 - Flight trajectories
 - Safety assurance
 - Terminal operations
 - How operation of NextGen and its performance will be affected by each type of vehicle
- Procedures should flow from the ConOps, attributes of the vehicles, and performance desired by the users
- Procedures should cover a broad range of weather, traffic density, and other conditions, and could vary according to these conditions



Advanced Vehicles

Examples of vehicles to be considered include:

- Very light jets
- Very large transports
- Uncrewed aerial systems
- Supersonic transports
- Rotorcraft
- Vertical and short landing and takeoff (V/STOL) aircraft
- Space launches
- Other unconventional aircraft

Examples of relevant vehicle attributes to be considered:

- Vehicle operational envelope
- Sensitivity to weather effects (turbulence, icing, temperature, winds)
- Maneuver limitations
- Sensitivity of performance and fuel efficiency to altitude and other factors
- Runway requirements
- Departure and approach constraints (e.g., climb and descent limitations)
- Environmental impacts (noise and emissions)



Safety Assessment

- Safety is an integral part of NASA aeronautics research and this NRA
- Study should include a safety assessment that addresses potential safety issues associated with the vehicles and procedures
 - Identification of potential risk
 - Relative likelihood
 - Potential severity
 - Mitigation strategies and their effectiveness
 - Potential impacts and tradeoffs versus performance
 - Additional insights into future operations or shortfalls in current practice



Analysis of Tradeoffs

- Intent is to gain insight into effective procedures and tradeoffs, not to downselect strategies or procedures
- Analysis of the procedures will focus on tradeoffs among:
 - Efficient operation of NextGen
 - Effective use of the advanced vehicles
 - Impact on other users of the airspace
 - Modifications to the vehicles to accommodate safe and efficient operation of NextGen
 - Modifications to the NextGen ConOps to accommodate safe and efficient employment of the vehicles
- Analysis should be informed by modeling results, quantitative analyses, and other methods
- Analysis should be linked to generic attributes, so that the results can be applied to other types of vehicles



Analytical Models

- Use or adapt existing models as much as possible
- When new or modified models are needed, they should be developed as part of the study
- Analysis structure should remain compatible with the key performance metrics and structure established for NextGen
- The metrics selected for the analysis should relate to JPDO-developed NextGen metrics, but could reflect a greater level of detail (JPDO “What?” versus NASA NRA “How?”)



NASA-sponsored Models

- A number of models are available, including
 - Airspace Concept Evaluation System (ACES)
 - Air Traffic Operations System (ATOS)
 - Future Airspace Concept Evaluation Tool (FACET)



Implications for Future Research

- Key issues for further research should flow from the conduct of the study
- These will include:
 - Topics for which further knowledge needs to be developed
 - Limitations on the study that resulted from the lack of additional knowledge or analysis tools
 - Recommendations and rationale for further development of models and other analytical techniques
 - How recommended models would support the development of a modular infrastructure to better understand the effects of technology on development of NextGen



Study Considerations (1)

- Broad viewpoints are desired
- Multiple aspects require a broad range of capabilities
 - Air traffic management/control
 - Advanced vehicle concepts and operations
 - Safety methodology
 - Systems analysis, modeling, and simulation
- Capture best candidate concepts and ideas
- Intent is to understand issues, not to downselect concepts and procedures



Study Considerations (2)

- Tasks include workshops to engage interested parties
 - Review study approach and results
 - Afford opportunities for interaction with stakeholders
 - Broaden the perspective and knowledge base of the study
 - Provide opportunity for coordination with parallel studies on critical NextGen trades
- Build on prior and ongoing research, including models that have been brought to bear
- Coordinate effort with other relevant studies, including JPDO-sponsored trade studies



Summary



Key Points

- Focus is on interactions among operating procedures, characteristics of advanced vehicles, and the NextGen ConOps
- Intent is to understand impacts and tradeoffs and their implications for NASA research, not to downselect specific procedures
- Safety is an essential consideration
- Study schedule necessitates use or adaptation of existing models as far as possible
- Knowledge dissemination and engagement of interested parties is an integral part of the effort
- Teaming is encouraged
- Desired outcomes are:
 - Improved understanding of operations under NextGen
 - Knowledge to help inform future research by NASA and the broader aeronautics community
 - A path to a modular analysis infrastructure for examining NextGen technologies



Key NRA Information

Expected budget	\$6M
Maximum duration of awards	18 months
Expected date for solicitation	Late Aug.- early Sept. 2007
Key deliverables	<ul style="list-style-type: none">• Interim report on approach and early results• Publishable final report• Workshops to review approach and study results



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