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Help

REDAC NAS Operations Subcommittee

Jim Kuchar Fall 2021

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- 31 August 1 September, virtual meeting using WebEx
- Agenda
 - Director Remarks
 - Budget overview
 - Enterprise Concept Development; New Air Traffic Management Requirements
 - Enterprise Human Factors; ATC / Technical Operations Human Factors
 - Runway Incursion Reduction
 - Operations Concept Validation & Infrastructure Evolution
 - Weather Program; Weather Technology in the Cockpit
 - Flight Deck Data Exchange Requirements
 - Wake Turbulence
 - \circ Deep dives
 - NAS Integration of Transiting Operations (NITRO)
 - UAS Automation and Intelligent Systems; Pilot Certification Requirements for Multi-UAS Operations
 - UTM Roadmap
 - AEE Research on Operational Procedures
 - Air-Ground Integration Human Factors; Flight Deck Human Factors

Weather RE&D funding

In the prior winter/spring 2021 meeting, the NAS Ops subcommittee noted concern over significant reductions in weather-related RE&D funding and recommended that the FAA aggressively increase visibility into the importance of this line of research.

At its summer/fall 2021 meeting, the subcommittee was pleased to learn that FY22 weatherrelated RE&D funding is slated to be restored to more robust levels similar to earlier years that are more appropriate to the national need to conduct this research.

NAS Operations Subcommittee Finding 1 Environmental Impact Mitigation Through Advanced NAS Operations

- The subcommittee noted the significant increase in planned FY22 RE&D funding allocated towards environment and energy considerations.
- We observe that beyond the development of core technologies such as advanced fuels and reducedemissions propulsion systems, new air traffic management procedures may enable lower-noise lowerfuel-burn operations, with earlier implementation timelines. Some of these new procedures may be implemented in the near-term without requiring new technologies. In the longer-term, it will be important for the FAA to research and develop effective decision support systems for more complex procedural concepts to enhance NAS domestic and International efficiencies.
- In addition, the future vehicles may have different optimum performance profiles than current generation vehicles. The air traffic management system will need to seamlessly integrate these vehicles and provide them with trajectories tailored for optimum energy performance.
- Adding to the complexity of these problems is the requirement to balance changes across multiple stakeholders including the FAA, adjacent Air Navigation Service Providers (ANSPs), airspace users (airlines, general aviation, small and large UAS operators, Advanced Air Mobility operators, and commercial space operators), and outside communities and neighborhoods, involving both technical and non-technical (policy) issues.

NAS Operations Subcommittee Recommendation 1 Environmental Impact Mitigation Through Advanced NAS Operations

- The subcommittee recommends that the FAA continue to foster and strengthen linkages between new initiatives in AEE, ANG, and ATO (in particular, AJV-S) related to environmental impact mitigation through new technologies for NAS operations. Regular coordination between these organizations will help ensure that RE&D efforts are initiated in time and in a coordinated manner to support the introduction of new procedures and technologies that reduce the environmental impact of the nation's aviation system.
- Three example RE&D topics at the intersection of environment and NAS operations include
 - Development of ATC tools & procedures to enable adaptive low-workload efficient & safe systematic dispersion of departures
 - Exploring enhancements to the Terminal Sequencing and Spacing (TSAS) system that may be needed to efficiently accommodate a mix of aircraft types performing delayed deceleration approaches
 - Integration of future reduced-emissions vehicles for optimum trajectory profiles
- A roadmap for RE&D activities to support the introduction of these and other aspects of environmental impact reduction while ensuring safe and efficient NAS operations should be developed and executed.

NAS Operations Subcommittee Finding 2 Human Factors for Air Traffic Management

- The subcommittee received a briefing on the RE&D Enterprise Human Factors research activities, which highlighted a growing volume and variety of human factors research and development work compared to recent past years. The subcommittee was particularly pleased that research activities in this budget line are introducing activities related to addressing human factors needs and challenges associated with strategic air traffic management concepts, including traffic flow management.
- This research has broadened to include a focus on the human factors associated with the operational integration of complex traffic flow management concepts and decision support capabilities. Examples of research focus areas include:
 - The impact of trajectory-based operations (TBO) on the Traffic Flow Management Unit (TMU)
 - TMU regional coordination and decision making
 - Effective methods for TBO training.
- While the subcommittee is encouraged by the important focus of these activities on TBO-related considerations, the subcommittee is aware that emerging traffic flow management concepts, that build upon the foundation of TBO, must also be examined. These emerging traffic flow management concepts will require the introduction of new decision support capabilities, new training needs, and potentially changes to the decision-making process in the strategic management of traffic.

NAS Operations Subcommittee Finding 2 Human Factors for Air Traffic Management

- It will be important to define and pursue additional research into systems and procedures for ensuring
 effective multi-stakeholder collaborative decision-making using uncertain forecast information. Future
 concepts also depend on the use of advanced capabilities, such as machine learning/artificial
 intelligence, which present unique human factors challenges beyond those studied through TBO.
- The subcommittee considers the following focus areas are considered particularly urgent, due to the complexity of these future concepts and the challenges associated with the operational integration of new traffic flow management capabilities:
 - Future Flow Management
 - Performance Based Flow Management
- These concepts, and their maturation plans, are in development but are not considered focal areas for the Enterprise Human Factors research and development until Fiscal Year 2024. The complexity of these research needs will warrant continued investment in human factors.

NAS Operations Subcommittee Recommendation 2 Human Factors for Air Traffic Management

- The subcommittee recommends that the FAA continue to grow strategic enterprise human factors research and development funding and activities associated with longer-term strategic traffic flow management and collaborative decision making.
- The subcommittee also recommends accelerating the focus on human factors considerations
 associated with the FAA's info-centric vision for the NAS generally, and the Future Flow Management
 and Performance Based Flow Management concepts and plans specifically.
- In addition, given the progression to highly automated systems of the future, the subcommittee also recommends focus on human/machine teaming, and graceful degradation of automated systems for handoffs in off-nominal conditions from automation to human.

NAS Operations Subcommittee Finding 3 Flight Dynamics Research Related to Advanced Air Mobility

- New flight vehicle concepts, such as Electric Vertical Takeoff and Landing (eVTOL) aircraft for Advanced Air Mobility, may require new technologies to enable safe and effective manual or automated flight control. The flight dynamics and physics of these new vehicles are different from prior aircraft because of the difference in electric powertrain response time constants, in particular. The outcomes from this domain of R&D are vital for understanding the effect of eVTOL flight path control capabilities on airspace procedures design and management.
- At its fall meeting, the NAS Operations subcommittee received a briefing describing a study underway to explore issues related to flight control of eVTOL vehicles using NASA's Vertical Motion Simulator (VMS). The subcommittee observed that the current FAA R&D activities using the VMS seem mis-matched to the potentially very different flight dynamics of future vehicles. The specific research requirements and objectives that led to the decision to use the VMS were also not clear to the subcommittee.

NAS Operations Subcommittee Recommendation 3 Flight Dynamics Research Related to Advanced Air Mobility

 The subcommittee recommends that the FAA (with NASA) articulate and evaluate the requirements for using piloted motion-based simulators (such as the NASA Ames VMS or NASA Langley Cockpit Motion Facility (CMF)) for R&D of eVTOL aircraft entering the AAM markets. If use of a motion-based flight simulator is determined to be necessary, the FAA and NASA should ensure that the selected simulator has been appropriately modified to provide a high-fidelity emulation of the flight dynamics of these new aircraft types as well as the Human Machine Interfaces (HMI) of these new aircraft types.

Next NAS Ops Meeting: March 15-16, 2022

- Requested documents prior to next meeting
 - Concept of Operations for ATM Services in 2035
 - AI/ML Certification Research Plan

- Requested Deep Dive topics for Spring 2022 meeting:
 - xTM Framework and Operational View
 - UAS Integration Office, including aspects of SVO impacts on NAS Ops
 - ASSURE COE Portfolio Update
 - UTM Implementation Plan overview
 - BVLOS ARC rulemaking status / outcomes
 - Update on research on Highly Automated Vehicle HF Implications