ANG The Future of the NAS Starts Here

FAA Office of NextGen (ANG)

REDAC / NAS Ops

Review of FY2022 – 2025 Proposed Portfolio

New ATM Requirements

BLI Number: 1A07C

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New ATM Requirements Overview

What are the benefits to the FAA

- The New Air Traffic Management (ATM) Requirements program is needed to identify new opportunities to improve the efficiency and effectiveness of air traffic management operations
- Activities include the research and development of procedures, tools, and systems in support of operational improvements
- These developments support the NextGen goal of expanding capacity and improving the strategic management of operations in the NAS

What determines program success

- The service analysis and operational demonstration activities within this program support the development of operational improvements that will increase the number of arrivals and departures at major airports
- The results of these early development efforts will transition into future standards, tools, guidance, and applications necessary for safe and effective airspace operations

New ATM Requirements Program Support

People:

- Portfolio Manager: Jenine N. McKoy, ANG – C73
- Project Managers
- Subject Matter Experts (air traffic control specialists, meteorologists, information management and communications specialists)

Laboratories:

- Boeing Avionics Lab
- Honeywell IPS Labs
- Rockwell Collins Labs
- NASA Glenn Labs (communications standards development and validation work)
- NextGen Integration and Evaluation Capability (NIEC)
- Embry Riddle Florida Test Bed (FTB)

Current FY22 Accomplishments

- Completed gathering of data distribution platform requirements surrounding the A/G SWIM - Connected Aircraft concept. Continuing to develop a prototype data distribution environment that allows for the organization and distribution of connected aircraft software applications.
- Completed Artificial Intelligence / Machine Learning (AI/ML) Certification Scenarios and Alternatives Analysis which provide a recommended framework for how to assess FAA AI system software assurance and check-out requirements and begins to maps out where current certification processes are adequate and where gaps exist.
- Continued research to support the Flight and Flow Information for a Collaborative Environment Release 2 (FF-ICE/R2) concept. Completed Engineering Analysis Report, which provides verification and recommendations of FF-ICE/R2 mandatory services.
- Continued research to modernize the surveillance infrastructure, provide resiliency of surveillance services across the NAS, and develop/implement advanced surveillance data processing applications necessary for future.
- Work started on Next Generation Input Devices to support the definition of requirements and concept development for an enterprise solution to next generation input devices for automation systems in the NAS.
- Work started into researching Unmanned Aircraft Systems (UAS) support activities that focus on the integration of UAS into the NAS through the development of new FAA processes that will qualify the performance of supplemental third-party service providers in the provision of weather information.
- Completed Surveillance Architecture Alternatives Report which describes & defines surveillance architecture alternatives that support surveillance in the 2035 environment.

Weather Transition

The Weather Transition PLA identifies research concepts and capabilities that have appropriately matured and transitions them from RE&D to F&E funding. This PLA manages Acquisition Management System (AMS) Concept Maturity and Technical Development activities. It funds the development of Pre-Concept and Requirements Definition Readiness AMS artifacts. It also supports the transition of weather capabilities to operations.

The Weather Transition program is composed of the following four sub-projects:

1. Weather Requirements Service (WRS): Ensures the FAA identifies the best available weather needs, requirements, and information exists within the NAS and helps safeguard the NAS through continual weather requirements monitoring, levying, and oversight to preserve NAS weather compatibility for NextGen principles, systems, and operations.

2. Weather Information Modernization and Transition (WIMAT): Identifies obsolete and legacy weather products ripe for replacement with better weather information already available from the meteorology community to ensure compatibility with NextGen (SWIM) or other concepts.

3. Emerging Weather Requirements Service (EWRS): EWRS identifies future NAS weather needs at an enterprise level. EWRS identifies system agnostic needs that can be provided to the NAS for future systems, decision support tools, and consistency.

4. UAS Weather: This program will coordinate efforts to determine where third-party service providers will provide weather information beyond that provided for traditional aviation to assist non-traditional aviation users with their flight planning and operations.

Planned Research Activities

- FY22 - Coordinate efforts to determine where third-party service providers will provide weather information beyond that provided for traditional aviation to assist non-traditional aviation users with their flight planning and operations.
- FY23 - Develop an initial list of prioritized FY 2023 WIMAT/WRS/EWRS program support capabilities, activities, and candidates for change.
- FY24 - Develop an initial list of prioritized FY 2024 WIMAT/WRS/EWRS program support capabilities, activities, and candidates for change.
- FY25 - Develop an initial list of prioritized FY 2025 WIMAT/WRS/EWRS program support capabilities, activities, and candidates for change.

Expected Research Products

- Matured capabilities to support future weather information-enabled decision support for the NAS

Machine Learning/Artificial Intelligence in the NAS

This activity conducts engineering and analysis to support the potential use of Machine Learning/Artificial Intelligence (ML/AI) to support controllers in functions including aircraft separation. The ML/AI in the NAS program seeks to engage with industry partners in digitization, to outline learning algorithm lessons and develop a path to integrating user benefit driven AI application for improving the NAS.

Planned Research Activities

- FY22 – Complete initial safety risk management analysis for potential use of ML/AI in support of controller functions (deferred to align with Enterprise Concepts).
- FY23 – Conduct initial study using a limited sample size to determine the effectiveness of AI learning on data related to aircraft separation.
- FY24 – TBD
- FY25 – TBD

Expected Research Products

- Determine assess capabilities and controller functions that may be enhanced by the use of artificial intelligence
- Learning algorithm lessons take advantage of the digitization industry knowledge and enables the FAA to develop a path toward integrating user benefits-driven application in the NAS.
- Develop initial digital backbone, architectures, key metrics dashboard, identify critical deep learning algorithms and certification methods, as well as recommend the initial set of capabilities to be explored.

Post-departure Coordination and Airborne Negotiation (PCAN)

This activity continues the maturation of FF-ICE/R2 concept. The project will build upon the outcomes and lessons learned of previous projects including FF-ICE/R1 Demonstration and 4DT Live Flight Demonstration. The project will continue to investigate and perform required engineering analysis to mature the FF-ICE/R2 concept. Additionally, the project will include collaboration with other Air Navigation Service Providers (ANSPs) and airspace users, specifically as part of Table Top Exercises (TTXs) and validation activities.

Planned Research Activities

- FY22 – Analyze and validate developed use cases and operational scenarios for the re-evaluation process and clearance delivery.
- FY23 – None
- FY24 – None
- FY25 – None

Expected Research Products

- FF-ICE/R2 Support Package collected from International Panels
- Initial Engineering Analysis Reports – Manage Agreed Trajectory & Clearance Coordination

Command & Control in a Cloud

This program evaluates the current information sharing infrastructure by focusing on the application of cloud infrastructures to provide for future NextGen needs. NextGen has started investigation of cloud solutions for its National Airspace System (NAS) operational systems. As a result, the Enterprise Services Infrastructure Framework (ESIF) was developed to support the allocation of NAS functional capabilities to infrastructure with a specific focus on cloud infrastructure. With ESIF providing this cloud- analysis framework, NextGen has started an analysis of ERAM in the Cloud, as a next step towards bringing these NAS operational systems into a cloud environment.

Planned Research Activities

- FY22 – Develop prototype command and control instance in the cloud for a selected demonstrator system.
- FY23 – Prepare and deliver a technology transfer package for Command and Control in the Cloud technologies.
- FY24 – None
- FY25 – None

Expected Research Products

- Evaluation of and recommendations for cloud architecture to provide command and control services in the future.

Synchronization of Air/Ground SWIM (Connected Aircraft)

The activity will evaluate system architecture alternatives, performance and safety requirements, and establish an integrated roadmap for the development of future air traffic management services and policies that take advantage of the emerging air/ground connectivity. In order to ensure global interoperability, this activity will include the necessary coordination with applicable International Civil Aviation Organization (ICAO) technical panels to mature the development of a global Connected Aircraft concept in accordance with the Aviation System Block Upgrade (ASBU) framework.

Planned Research Activities

- FY22 - Integrated Connected Aircraft Framework Report to leverage ongoing efforts to ensure consistent messaging to inform future connected aircraft efforts
- FY23 - Data Distribution Platform Technical Report to establish platform to host a centralized application database with the necessary access for internal and external users to discover and download applications
- FY24 – TBD
- FY25 – TBD

Expected Research Products

- An integrated CA framework to further advance concepts that leverage the connected aircraft, including the exchange of safety critical information based on applicable performance standards

Next Generation Input Devices

This activity will support the definition of requirements and concept development for an enterprise solution to next generation input devices for automation systems in the NAS.

Planned Research Activities

- FY22 – Identify and evaluate candidate technologies suitable for an enterprise solution for automation systems in the NAS and develop transition strategy.
- FY23 – Down select identified candidate technologies for more in-depth assessment for automation systems in the NAS and complete report.
- FY24 – Develop transition strategy for NAS systems suitable for application of a next generation input device
- FY25 – TBD

Expected Research Products

- Recommendations for next generation input devices for automation systems in the NAS.

Surveillance Portfolio Analysis (SPA)

This program will modernize the surveillance infrastructure, provide resiliency of surveillance services across the NAS, and develop / implement advanced surveillance data processing applications necessary for future.

Planned Research Activities

- FY22 – Development of Surveillance Services Requirements, Architecture alternatives, and future technologies to further enhance existing Surveillance infrastructure
- FY23 – Develop requirements for ATM surveillance services including ATC weather provided by surveillance assets and accommodate new entrants identifying potential surveillance needs.
- FY24 – None
- FY25 – None

Expected Research Products

- Enhanced resiliency of surveillance services across the NAS and implement advanced surveillance data processing applications necessary for future
- Document the “As-Is” and “To-Be” Enterprise Surveillance Services (ESS) Architecture, define and analyze architecture alternatives, and develop plans to transition to the future ESS architecture

IP Based Command and Control Data Links

This activity will conduct engineering and analysis to support the potential use of internet-based data exchange for command and control applications.

Planned Research Activities

- FY22 – None
- FY23 – Complete initial analysis of performance, security requirements, and risk management analysis to support the potential use of internet-based data exchange for command and control applications.
- FY24 – Complete final analysis of performance, security requirements, and risk management analysis to support the potential use of internet-based data exchange for command and control applications.
- FY25 – Develop requirements for hardware application and link performance requirements to support the potential use of internet-based data exchange for command and control applications.

Expected Research Products

- Establish framework to potentially enable internet-based exchange of command and control information.

Emerging FY25 Focal Areas

- **Automation Evolution Strategy (AES)**
  - Seeks efficiencies for developing, operating, and sustaining NAS automation systems/services
- **Ubiquitous Communications**
  - Conduct assessment, develop a graduated framework, and develop initial performance requirements

New ATM Requirements

Research Requirements

- The New ATM Requirements program is needed to identify new opportunities to improve the efficiency and effectiveness of air traffic management operations. Activities include the research and development of procedures, tools, and systems in support of operational improvements.

Outputs/Outcomes

- Weather data integrated into air traffic management systems.
- Advanced communications technologies for data exchange between air and ground systems.
- Transition strategy and technology transfer package for Command and Control in the Cloud technologies.
- Enterprise solution to next generation input devices for automation systems in the NAS.
- Improvements of NAS Surveillance Services infrastructure.
- Analysis in the potential use of AI to support controller functions.
- Establish framework to enable internet-based exchange of command and control information

FY 2025 Planned Research

- Develop requirements for hardware application and link performance requirements to support the potential use of internet-based data exchange for command and control applications.
- Identify, evaluate, and document NAS Systems potentially suitable for command and control in a cloud environment.
- Identify obsolete and legacy weather products ripe for replacement with better weather information
- Develop transition strategy for NAS systems suitable for application of a next generation input device

Out Year Funding Requirements

F&E

FY22	FY23	FY24	FY25	FY26	FY27
$ 6M	$ 17M	$ 6M	$ 7M	$ 10M	$ 10M