

# REDAC / NAS Operations



Next**GEN**

*New ATM Requirements*

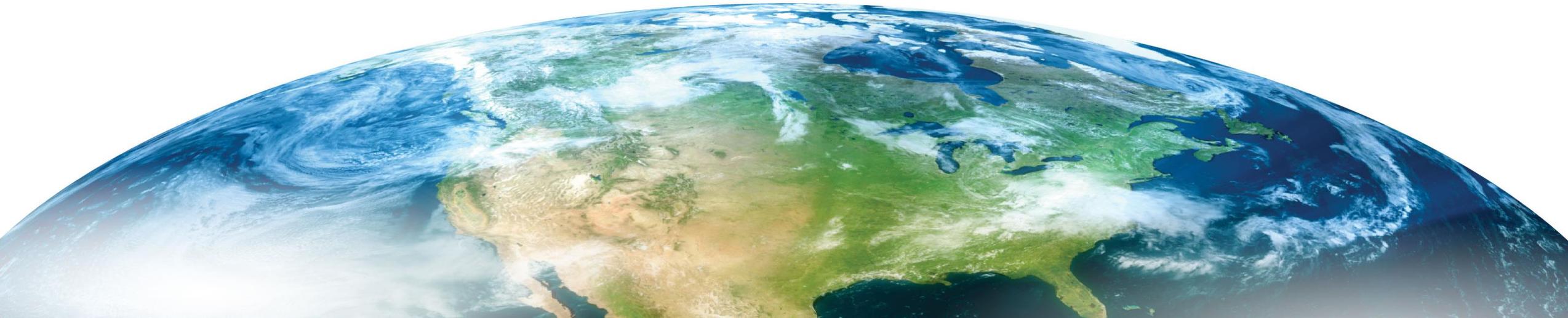
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*Review of FY 2021 - 2023*

*Proposed Portfolio*



# 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: Mark T. Palmer, ANG – C73
- Project Managers: ANG-C51, ANG-C52, ANG-C53, ANG-C64, ANG-B21
- 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 FY21 Accomplishments

- Ceiling and visibility information support prototypes developed and coordinating operational demonstrations to display pre-service functionality.
- Completed initial analysis of requirements for potential use of ML/AI in support of controller functions.
- Continued analysis of Connected Aircraft safety, risk, performance and security requirements
- 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.
- Work started to support the Flight and Flow Information for a Collaborative Environment Release 2 (FF-ICE/R2) concept. Investigating and performing required engineering analysis to mature the FF-ICE/R2 concept.
- Work starting 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 starting on IP Based Command and Control Data Links to conduct engineering and analysis to support the potential use of internet based data exchange for command and control applications.



# Weather Transition

This activity ensures that aviation weather research concepts are matured and technically developed under FAA guidelines to a level of readiness for operational use in the NAS. This includes Concept Maturity and Technology Development based work in support of the Research for Service Analysis and Service Analysis AMS lifecycle phases. The matured capabilities developed will support future weather information enabled decision support for the NAS.

## **Planned Research Activities**

- FY22 – Conduct studies surrounding the operational usage of convective weather information support capabilities, determine the performance level of current weather products and develop report.
- FY23 – Analyze current inflight icing capabilities at low flight levels to validate gaps and develop report.

## **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.
- FY23 – Conduct initial study using a limited sample size to determine the effectiveness of AI learning on data related to aircraft separation.

## 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.



# 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.

## **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

## 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 Automation 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.

## **Expected Research Products**

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



# 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 – 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.
- FY23 – 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.

\* Coordinating kickoff in FY21



# Emerging FY23 Focal Areas

- **Next Generation Automation Input Devices**
  - Supports the definition of requirements and concept development for an enterprise solution to next generation input devices for automation systems in the NAS
- **IP Based Command and Control Data Links**
  - Conducts engineering and analysis to support the potential use of internet based data exchange for command and control applications.



# 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.
- Establish framework to enable internet-based exchange of command and control information
- Analysis in the potential use of AI to support controller functions

## FY 2023 Planned Research

- Analyze current inflight icing capabilities at low flight levels to validate gaps and develop report.
- Develop requirements for hardware application and link performance requirements to support the potential use of internet-based data exchange for command and control applications.
- Develop data distribution platform to host a centralized application database with the necessary access for internal and external users to discover and download applications
- Complete final analysis of requirements for potential use of AI in support of controller functions.
- Identify, evaluate, and document NAS Systems potentially suitable for command and control in a cloud environment.
- Down select identified candidate technologies for more in-depth assessment for automation systems in the NAS and complete report.

## Out Year Funding Requirements

F&E	FY22	FY23	FY24	FY25	FY26
	\$ 6.0M	\$ 7.0M	\$ 7.0M	\$ 7.0M	\$10.0M