REDAC / NAS Ops

Review of FY 2022 Proposed Portfolio

NextGen – Wake Turbulence R,E&D BLI Number A12.a

Jillian Cheng (ANG-C51)



Wake R,E&D and Re-Categorization A12.a and 1A06B BLI#'s for FY21/22

- The NextGen objective is to safely increase capacity during peak demand periods.
- Wake RE&D to date has increased access to airport runways and airspace while maintaining or enhancing the safety of the NAS.
- Building on this success, the wake RE&D and RECAT efforts for this period
 - Mature wake standards, procedures, and operational concepts to the point they can be directly implemented by FAA.
 - Define functional requirements for new or existing systems if NAS infrastructure enhancements are required to implement the standards, procedures, and operational concepts.





Wake Turbulence R,E&D/BLI #: A12.a Overview Capabilities

People:

- Wake Program Manager: Jillian Cheng (ANG)
- Other federal resources: AIR Wake CSTA and AFS-400
- Contract support SMEs: 4 world renowned wake experts, two previous AFS Chief Science and Technology Advisors for Wake, retired branch manager for AFS-450

Organizations/Laboratories:

- Volpe NTSC: data collection and analysis, safety case development
- MITRE/CAASD: concept development, benefits analysis
- MIT/LL: wind and weather data analysis and weather algorithms development
- CSSI: en-route wake data analysis and concept exploration





Wake R,E&D– Accomplishments in FY2019

- Performed analysis of new aircraft types for safe wake categorization in the NAS.
- Collection and analysis of wake data to assess dynamic safe separation reduction that can be achieved with inclusion of winds
- Assessed feasibility of en-route lateral offset for wake mitigation through human in the loop simulation in support of CAP for FY16 Top 5 Safety Assessment
- Applied generic methodology to provide recommended separations for B77X
- Completed additional modules of software tool to assess flight data recorder data to establish wake encounter frequency in the NAS





Planned Research Activities

- Develop FAA wake separation recommendations to be applied to new aircraft entering service in 2020-2021 timeframe. This work will be incorporated into ATC Orders and associated automation to further enhance NAS capacity.
- Explore the use of aircraft wake transport and decay real-time data in determining wake mitigation to support future ATC operations.
- Continue measurement, modeling and analysis hardware capabilities to evaluate new aircraft wake hazards and capabilities of mitigating wake encounters
- Develop concept for use of real-time data in defining aircraft wake hazard area in enroute environment
- Assess UAS operations for wake risk mitigation and wake separation recommendations





Expected Research Products

- Each year there are 100 to 125 new aircraft types recognized by International Civil Aviation Organization (ICAO), which the FAA must assess for wake turbulence separation recommendations prior to their entry into service in the NAS.
- Wake encounter mitigation technology-aided concepts/procedures developed for piloted aircraft en-route trajectories – FY 2021
- Wake encounter mitigation technology-aided concepts/procedures developed for Unmanned Aircraft Systems (UAS) operating in the NAS - FY 2021
- Support the development of concepts for evolution from distance-based wake separations to time-based operations-FY 2020 – (perform all wake analysis in time domain and translate to distance when distance separation is in use)
- Complete cost/benefit assessment of transition from static to dynamic wake separation standards and procedures
 – FY 2020
- Develop/acquire enhanced wake/wind tracking sensors for collection of wake transport and decay data – ongoing activity





Expected Research Products (continued)

- Standards developed for real time in-flight observed weather information transmitted by aircraft – information needed for dynamic wake mitigation tools and other users of aircraft observed weather data –FY 2020
- Incorporate Canadian NRC en-route aircraft wake measurement data into the FAA wake transport and decay data base – FY2020
- In collaboration with Flight Standards Service, continued monitoring and enhancement of flight data recorder screenings of aircraft series for potential medium to low level wake encounter events-Ongoing Activity
- Update to Generic New Aircraft Type methodology to include repeatable processes for UAS type assessments-FY2021



Emerging FY22 Focal Areas

- Wake encounter mitigation technology-aided concepts/procedures developed for Unmanned Aircraft Systems (UAS) operating in the NAS
 - Repeatable processes for UAS type assessments
 - Extensibility for range of UAS types/operational performance characteristics and missions
- Develop FAA wake separation recommendations to be applied to new aircraft entering service.





Wake Turbulence R,E&D

Research Requirement

Wake turbulence research focuses on accommodating increased demand during peak demand periods. and increasing access to airport runways and airspace while maintaining or enhancing the safety of the National Airspace System (NAS)

Outputs/Outcomes

Products:

Develop Generic methodology for new aircraft types
Develop concepts and perform safety analyses to support authorization and implementation of dynamic wake separation tools and procedures

•Determine required wake separations for new aircraft

FY 2022 Planned Research

•Assessment of new aircraft types for wake separation recommendations.

•Continued wake data collection and analysis

•Wake encounter mitigation technology aided concepts/procedures developed for Unmanned Aircraft Systems (UAS) operating in the NAS

NARP Funding (\$M)*

FY 2019	FY 2020	FY 2021	FY 2022
\$5.7	\$5.8		

*Funding for the project's contracts

Wake



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NextGen – Wake Re-Categorization BLI Number 1A06B

Jeff Tittsworth & Jillian Cheng (ANG-C51)



Wake Re-categorization 1A06B

- The NextGen objective is to safely increase capacity during peak demand periods.
- Wake RECAT to date has met this objective by developing wake separation standards that are tailored to aircraft performance characteristics rather than aircraft weight.
- Building on this success, the wake RE&D and RECAT efforts for this period
 - Mature wake standards, procedures, and operational concepts to the point they can be directly implemented by FAA.
 - Define functional requirements for new or existing systems if NAS infrastructure enhancements are required to implement the standards, procedures, and operational concepts.





Wake Re-Categorization/BLI #:1A06B Capability Overview

People:

- Wake Research Manager: Jillian Cheng (ANG)
- Other federal resources: AIR Wake CSTA, AFS-400
- Contract support SMEs: 4 world renowned wake experts, two previous AFS Chief Science and Technology Advisors for Wake, retired branch manager for AFS-450

Organizations/Laboratories:

- Volpe NTSC: data collection and analysis, safety case development
- MITRE/CAASD: approach/departure speed analysis, benefits analysis
- MIT/LL: wind forecast algorithm development





Wake Re-Categorization– Accomplishments in FY19

- Finalized report on Human in the Loop simulations to address an increase in RECAT Categories without the use of additional ATC tools
- Documented methodology to assess new aircraft separations
- Concept development for dynamic wake separations





Planned Research Activities

- Develop safety assessments and functional requirements for modification to existing and new systems to support terminal and enroute dynamic wake separation solution
- Develop weather algorithm for using tactical real-time data for defining aircraft's wake hazard area.
- Develop wake risk mitigation procedure recommendations for UAS operations
- Develop system description for the enhanced Terminal Wind Forecast Algorithm to be used in determining the minimum time interval separation between aircraft





Expected Products

- Standards, procedures, and operational concept for terminal and enroute dynamic wake mitigation solutions.
- Functional requirements for adding Dynamic wake risk mitigation enhancements to existing and new ATC systems.
- Weather algorithm for use in determining aircraft's wake hazard area
- Safety assessments for terminal and enroute wake risk mitigation solutions.
- Wake risk mitigation procedures recommendations for UAS operations in the NAS.





Emerging FY22 Focal Area

• Safety assessments for Dynamic terminal (arrival, departure) and enroute wake risk mitigation solutions





Wake Re-Categorization (RECAT)

Research Requirement

The Wake Turbulence Re-Categorization (RECAT) project will develop the system adaptation, procedures, training, documentation and repeatable process for implementing the airport specific wake mitigation Wake Turbulence Re-Categorization Dynamic Pair-Wise Static separation standards.

Outputs/Outcomes

- Prototype algorithm for using AbO-wx in DSTs
- •Low fidelity simulation environment for evaluating dynamic separation information flow designs
- •Upgrade of analysis models to address use of dynamic separations

FY 2022 Planned Research

- Develop refined benefit and safety assessments of the dynamic wake risk mitigation solutions
- Continue Development of concepts for advanced wake separation management ATC tools required for controllers to effectively use dynamic wake risk mitigation separations

CIP Funding (\$M)

FY 2020	FY 2021	FY 2022	FY 2023
\$2.5	\$ 2.5M	\$ 2.5M	\$ 2.5M



